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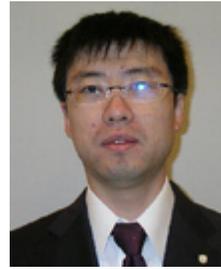
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Refereed academic journal

[leijing-206-006-01:2017] M. Pan and L. Jing. Energy Efficient Data Gathering for WSN-based Context-aware Applications. *International Journal of Ad Hoc and Ubiquitous Computing*, 25(1-2):65–74, 2017.

[y-wu-206-006-01:2017] Junbo Wang Yilang Wu and Zixue Cheng. Activity awareness for development support based on seamless repository. *International Journal of Machine Learning and Cybernetics*, 2017.

As project development gets more intensive, there are increasing needs of development support by reusing shared knowledge objects, such as technical know-how and project achievements, which grow along with developers' activities through multiple support systems. However, there is a large gap of knowledge in providing such development support, because of developers' divergent background knowledge, as well as distinct personal preferences in using different support systems. To bridge the knowledge gap, the major challenge is to improve the information coverage in correlating the knowledge from different support systems. This challenge derives two issues: one is the development data analytics to have a deep insight to the correlations among the knowledge objects that are developing and growing; and the other is the development system integration to utilize knowledge objects that are stored in different support systems. For development data analytics, we propose the development activity awareness using the terms-frequency and chained links-ratio (TFCLR) to measure the integrated contextual and relational correlation among knowledge objects. For development system integration, we implement the seamless repository as an integrated development environment. We experiment with the activity awareness for development support on the ICT field with English conducted as medium of development. The seamless repository integrates multiple support systems to cover more knowledge objects. And in comparison with other mentioned knowledge correlation measures, the one using TFCLR covers the most detailed information in knowledge objects. The quantified and visualized knowledge correlation produced by this study is a useful tool to bridge the knowledge gap in development.

[y-wu-206-006-02:2017] Hui-Huang Hsu Zixue Cheng Yilang Wu, Junbo Wang. A seamless repository for pervasive teamwork. *International Journal of Web and Grid Services*, 12(3):273–295, January 2016.

Mobile cloud-based collaborative workflow has pervasively empowered teamwork. However, it still suffers from collaborative workflow barriers, such as

workflow complexity, poor communication, and teamwork disruption. To ease collaborative workflow barriers, we propose and develop a seamless repository by integrating multiple support systems into a three-layered framework. Under the premises of availability, connectivity, and transparency, the three-layered seamless repository strengthens the collaborative workflow in pervasive teamwork. It supports various critical collaborative workflow activities such as issue tracking, revision control, content management, system visualisation, onsite participation tracking, and team communication. After a test period of one year, active teamwork involvement has been observed, which implies that the barriers are relieved. Furthermore, several hidden patterns of teamwork are discovered through the seamless repository, which are useful to improve future support for pervasive teamwork.

[y-wu-206-006-03:2017] J. Wang; Y. Wu; N. Yen; S. Guo; Z. Cheng. Junbo Wang, Yilang Wu, Neil Yen, Song Guo, and Zixue Cheng. *IEEE Communications Surveys & Tutorials*, 18(3):1758–1778, 2016.

Disaster management is a crucial and urgent research issue. Emergency communication networks (ECNs) provide fundamental functions for disaster management, because communication service is generally unavailable due to large-scale damage and restrictions in communication services. Considering the features of a disaster (e.g., limited resources and dynamic changing of environment), it is always a key problem to use limited resources effectively to provide the best communication services. Big data analytics in the disaster area provides possible solutions to understand the situations happening in disaster areas, so that limited resources can be optimally deployed based on the analysis results. In this paper, we survey existing ECNs and big data analytics from both the content and the spatial points of view. From the content point of view, we survey existing data mining and analysis techniques, and further survey and analyze applications and the possibilities to enhance ECNs. From the spatial point of view, we survey and discuss the most popular methods and further discuss the possibility to enhance ECNs. Finally, we highlight the remaining challenging problems after a systematic survey and studies of the possibilities.

[z-cheng-206-006-01:2017] Cheng Z., Zhao Q., Ding S., Ben A., and Chen W. Distinguished University Focusing on Computer Science and Engineering Education for Cultivation of Global IT Innovators. *Jisuanji Jiaoyu (Computer Education)*, (5):8–12, 2017.

The University of Aizu is one of the first group of universities in Japan that are selected in the Top Global University project. We introduce three char-

acteristics of the university: internationalization, IT specialty education, and the technical innovational and business startup in new era. We will also discuss the related educational research directions, and introduce the methodology and curriculum to achieve the education goal for educating innovative IT talents.

Refereed proceedings of an academic conference

[aiguo-206-006-01:2017] Masayuki Tanimoto and Aiguo He(Hirokuni Kurokawa). Omnidirectional FTV. pages 1–6, 2017.

> FTV (Free-viewpoint Television) enables users to view a 3D scene by freely changing the viewpoint. It was developed based on ray-space representation. Omnidirectional FTV is 360-degree video with free viewpoint function. Omnidirectional FTV with horizontal parallax is realized by using 3-dimensional (3D) spherical ray-space. Here, 3D spherical ray-space is extended to 4D to realize vertical parallax. Ray capture and view synthesis are analyzed in 4D spherical ray-space and verified experimentally. Omnidirectional views with full parallax are successfully generated.

[leijing-206-006-02:2017] L. Jing, Z. Dai, and Y. Zhou. Wearable Handwriting Recognition with an Inertial Sensor on a Nail. In *The 14th IAPR International Conference on Document Analysis and Recognition*, Nov. 2017.

[leijing-206-006-03:2017] L. Jing. A Lightweight Method to Detect Tooth-brushing Area Using a Six Axis Inertial Sensor. In *the 6th IEEE Global Conference on Consumer Electronics*, Oct. 2017.

[leijing-206-006-04:2017] L. Jing and Z. Cheng. Recognition of Daily Routines and Accidental Event with Multipoint Wearable Inertial Sensing for Seniors Home Care. In *The 2017 IEEE International Conference on Systems, Man, and Cybernetics*, Oct. 2017.

[y-wu-206-006-04:2017] Shanshan Zhang Amitangshu Pal Junbo Wang Yilang Wu, Krishna Kant. Disaster Network Evolution Using Dynamic Clustering of Twitter Data. In *2017 IEEE 37th International Conference on Distributed Computing Systems Workshops (ICDCSW), Atlanta, GA, 2017*, pages 348–353, 2017.

> Ad hoc smartphone networks can be used to augment communications degraded by disasters provided that the individual ad hoc clusters can reach

some 'connection gateways' to get out to the Internet. This capability can be provided by devices in the surrounding area that retain cellular connectivity in addition to the connectivity provided by the specially deployed emergency equipment, if any. The disconnected areas may not be known until they are back online; however, we need a mechanism to estimate them so that the gateway devices can be best recruited to provide the connectivity. This needs to be done in a dynamic environment because of the significant mobility in the wake of the disaster. In this paper, we propose a mechanism to estimate regions that are likely to be dense but disconnected, and with significant connected devices in and around them. Such regions are most likely to benefit from the ad hoc network. Because of the lack of direct information on people (or smartphone) density, we attempt to do this by analyzing the twitter data. We use our approach on the twitter data available on hurricane Sandy in 2012.

[y-wu-206-006-05:2017] Sato Kouichi Zixue Cheng Yilang Wu, Junbo Wang. A Dynamic Spatial Clustering for Emergency Response based on Hierarchical-Partition Model. In Procedia Computer Science, editor, *The 8th International Conference on Advances in Information Technology*, volume 111, pages 485–492, 2017.

Understanding the situation distribution is a fundamental but important step in the emergency response to disaster. There are various emergency related spatial data available on Internet; however, it is still a big challenge in clustering the dynamic big spatial data. In this study, we provide a dynamic spatial clustering (DSC) to efficiently load and cluster the spatial big data based on a hierarchical-partition model (HPM). We have modeled the DSC to understand the distribution of emergency (e.g. Kumamoto earthquake in May 2016) from spatial data in tweets. The major contributions in the HPM-based DSC include loading dynamic big spatial data with optimal utilization of external memory, and rapid clustering to detect the dense regions of targeted emergency.

[z-cheng-206-006-02:2017] Wu Y.and Kawaguchi T., Jing L., Wang J., and Cheng Z. Campus Digital Signage: Connection of Correlated Information between Distributor and Receiver. In *2017 31st International Conference on Advanced Information Networking and Applications Workshops (WAINA)*. IEEE, May. 2017.

The paper discuss how to effective share information in a university campus enviroment

[z-cheng-206-006-03:2017] Jing L. and Cheng Z. Recognition of daily routines and

accidental event with multipoint wearable inertial sensing for seniors home care. In *2017 IEEE International Conference on Systems, Man, and Cybernetics (SMC)*. IEEE, Oct. 2017.

This paper presents a method for detecting daily activities as well as accidents. Implementation and experiments are also shown

[z-cheng-206-006-04:2017] Sato K., Wang J., and Cheng Z. Degin of a Method to Support Twitter based Event Detection with Heterogeneous Data Resources. In *2017 IEEE 8th International Conference on Awareness Science and Technology (iCAST)*. IEEE, Nov 2017.

This paper discussed a method by which information on events detected by analysis of Tweets can be collected and extracted.

Unrefeered proceedings of an academic conference

[aiguo-206-006-02:2017] Masayuki Tanimoto and Aiguo He(Hirokuni Kurokawa). Ray-Space Processing for Omnidirectional FTV. In *IEICE Technical Report*, pages 31–36, Tokyo, Nov. 2017. IEICE, IEICE.

[leijing-206-006-05:2017] L. Jing and M. Yamazaki. Motion Capture with Inertial Sensors for Intuitive Robot Control. In *The 6th workshop of intelligent Home Robotics*, Mar. 2017.

Writing a part of textbook or technical book

[y-wu-206-006-06:2017] Junbo Wang Yilang Wu. *A Web-based System with Spatial Clustering to Observe the Changes of Emergency Distribution using Social Big Data*, chapter Behavior Engineering and Applications. the Springer International Series on Computer Entertainment and Media Technology. Springer International Publishing AG, Switzerland, 2018.

Research grants from scientific research funds and public organizations

[aiguo-206-006-03:2017] Aiguo He. Contributed to the success of a research project subsidized by Fukushima Prefectural Academic Education Promotion Foundation. 5 public lectures have been performed., 2017.

Summary of Achievement

[y-wu-206-006-07:2017] Yilang Wu Junbo Wang. Evolving Clustering for Streaming Spatial Big Data in Disaster Scenario, June 2018.

[y-wu-206-006-08:2017] Jun Inami Makoto Yokoo Akira Yagihashi Takuya Watanabe Yilang Wu Junbo Wang Yuji Mitsunaga Minatsu Ariga Tomoyuki Ikeda Tatsuki Kawaguchi, Takahiro Aoki. An ICT Framework of Globalization Branding Strategies Phase II: To Deliver the Local Attractiveness with Social Listening Data to the World, June 2018.

Academic society activities

[y-wu-206-006-09:2017] Qiangfu Zhao Goutam Chakraborty Iwate Prefectural Tadahiko Murata Robert Kozma Arkady Zgonnikov, Yilang Wu, October 2018.

Session C21: HUMAN AWARENESS COMPUTING: COMPUTATIONAL AWARENESS, URL: http://www.smc2018.org/approved-special-sessions/c21-human-awareness-computing-computational-awareness/

Advisor for undergraduate research and graduate research

[aiguo-206-006-04:2017] Makoto Yamaguchi. A Study of HCI for PHW Based Prosentation Support, University of Aizu, 2017.

Thesis Advisor: Aiguo He

[aiguo-206-006-05:2017] Yuka Katsushima. SKP-based Learning Contents Creation and Recommendation for C programming beginners, University of Aizu, 2017.

Thesis Advisor: Aiguo He

[aiguo-206-006-06:2017] Yu Yan. Programming Learning Support Methods based on Adaptive Hypermedia and Program Visualization, University of Aizu, 2017.

Thesis Advisor: Aiguo He

[z-cheng-206-006-05:2017] Tomoaki Aihara. Graduation thesis, School of Computer Science and Engineering, Mar. 2018.

Thesis Advisor: Z. Cheng

[z-cheng-206-006-06:2017] Yuta Sato. Graduation thesis, School of Computer Science and Engineering, Mar. 2018.

Thesis Advisor: Z. Cheng

[z-cheng-206-006-07:2017] Huicong Yu. Master thesis, Graduate School of Computer Science and Engineering, Sep. 2017.

Thesis Advisor: Z. Cheng

[z-cheng-206-006-08:2017] William Hutchinson Putnam III. Master thesis, Graduate School of Computer Science and Engineering, Mar. 2018.

Thesis Advisor: Z. Cheng

[z-cheng-206-006-09:2017] Fumihiro Yamada. Master thesis, Graduate School of Computer Science and Engineering, Mar. 2018.

Thesis Advisor: Z. Cheng

[z-cheng-206-006-10:2017] Daisuke Abe. Master thesis, Graduate School of Computer Science and Engineering, Mar. 2018.

Thesis Advisor: Z. Cheng

[z-cheng-206-006-11:2017] Takeyuki Sato. Master thesis, Graduate School of Computer Science and Engineering, Mar. 2018.

Thesis Advisor: Z. Cheng

Contribution related to the building or operation of the university computer system

[y-wu-206-006-10:2017] Development and Mantenance of the Campus Digital Signage System

Other significant contribution toward university planning, management, or administration

[aiguo-206-006-07:2017] Contributed to the success of PC-Koshien 2017, the high-school student programming contest hold in UoA every year since 2003. I have been working for PC-Koshien since its first time.

Summary of Achievement

[z-cheng-206-006-12:2017] Successfully achieved MEXT project "Top Global University" as a leader

Contributions related to regional education

[z-cheng-206-006-13:2017] Memorial speech for the 2017 General Assembly of Woman Protection of Rehabilitation of Ryo-Numa Area District, with Title Laughter and Communication - Comparison of Family Conversation between Japan and China Apr. 28, 2017, at the Aizu bange-machi Central Public Hall

Did you participate in students recruitment, support the alumni, and/or contact with student's parent? (Yes or No) If yes, please describe what you did.

[y-wu-206-006-11:2017] International students recruitment organized by Center for Globalization

Did you participate in Public Lectures, and/or Open Campus? (Yes or No) If yes, please describe what you did.

[aiguo-206-006-08:2017] Computer Science Summer Camp @ UoA 2017: Opened a new Cource Basic C Programming. This year, as the first time, 10 foreign students were invited. I have designed the English version of above course for the success of that invitation.; Public lectures;

Computer Communications Laboratory

Anh T. Pham
Professor

Cong-Thang Truong
Senior Associate Pro-
fessor

Tongiun Huang
Assistant Professor

In the AY2017, the Computer Communications Laboratory (CCL) has three faculty members, one visiting scholar, Dr. Ngoc T. Dang, our external research associate from Vietnam Posts and Telecomunications Institute of Technology (PTIT), and ten graduate students (MS/PhD) working as research assistants. We have extensive collaborations with different research groups in Vietnam, Korea, UK and France. Our research sponsors include both Japanese agencies, including Japan Society for Promotion of Science (JSPS), the Japan Science Society (JSS), Telecommunication Advancement Foundation (TAF) etc., and international ones, such as Electronics and Telecommunications Research Institute (ETRI, Korea) and National Foundation for Science and Technology Development (NAFOSTED, Vietnam).

Our research and education focus on the areas of computer networks, multimedia communications and networks, optical/wireless communications and networking technologies, communication engineering, and ubiquitous computing & its applications. Especially, we recently encompass following topics:

1. Visible light communications (VLC) and its Applications in Indoor Positioning. The future of lighting is currently moving in the direction of being multifunctional; modern light sources have the capacity for illumination and concurrent wireless data transmission. The merger of these two applications has been made possible through solid-state high brightness light emitting diode (LED) technology. Short-range optical wireless communication utilizing the visible spectrum emitted from the LEDs, referred to as visible light communication (VLC) transmits data via modulation of the light intensity. So far the VLC capability is above 1 Gbps with a reasonable coverage range that is applicable for home/office environment. The dual functionality required from the LED creates the unique opportunity for indoor localization which is much more precise than RF counter-

part. Our research focuses on development of smart lighting systems that support high-speed, multiuser data transmission and VLC-based indoor localization, which will play a crucial part in the paradigm of the Internet of Things.

2. Quality of Experience (QoE) Modelling. Multimedia contents are increasingly being created in different formats, standards, modalities, and complexities. Meanwhile, the users are consuming the contents through a variety of terminals and network connections. Different users may use a wide variety of terminals with very different capabilities (in terms of screen sizes, processors, etc.) to consume multimedia contents from different sources. This fact results in big challenges for providers to provide good Quality of Experience (QoE) for users today. In this research, we investigate the influence factors and models for the overall QoE perceived by users at their devices. Especially, through the models, we try to reveal the insights into the influence factors of the overall quality, thus leading to suggestions to improve the quality of multimedia contents.

3. Internet Video Streaming. In a recent study, Cisco predicts that 90 percent of the bits carried on the Internet will be video traffic in the near future. Video streaming over IP networks has been conventionally based on the Real-time Transport Protocol (RTP) or some variations of RTP. However, thanks to the abundance of Web platforms (including the Content Delivery Network - CDN) and broadband connections, HTTP (Hypertext Transfer Protocol) has become a cost effective solution for video/audio streaming nowadays. In this research, our purpose is to investigate the use of HTTP streaming for video content over the open Internet. In this context, adaptivity to network fluctuations is the most important feature. Further, we will try to support not only small resolution/bitrate video, but also large resolution (e.g. Full High-Definition) ones.

4. Free-space Optics/Millimeter-Wave Front/Backhaul of the 5G Mobile Networks. In this research, we propose hybrid architecture and enabling technologies for 5G mobile front/backhaul (F/BH) networks. We argue that a single-technology solution, either optical fiber (OF) or radio millimeter wave (mmW), is not sufficient for the 5G F/BH networks due to the requirements of enormous capacity, scalability, energy-efficiency and strict quality of service (QoS). Our contributions include fundamental studies on theoretical limits; development of analytical models and performance evaluation/optimization of novel hybrid architecture for 5G F/BH networks using three technologies of OF, mmW and free-space optics.

5. Quantum Key Distribution (QKD) over FSO. Due to the recent rapid growth of computing technologies, today's encrypted information based on classical computational complexities will soon no longer remain secure. Quantum

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cryptography, or quantum key distribution (QKD), relying on the physical laws of quantum mechanics, stands out as a more powerful cryptographic solution that enables the secret key to be shared securely over publicly unsecured communication channels in the presence of eavesdroppers. Conventional QKD systems are implemented over optical fiber. In this research, we focus on the development of QKD over FSO for both terrestrial and satellite channels. Our target is the design and development of QKD over FSO systems and protocols which are affordable to implement, flexible for quick deployment and re-deployment in emergency and wireless networks, and high key rate distribution.

We always welcome undergraduate and graduate students who are interested in the above mentioned research. For further information, visit our website at `http://www.u-aizu.ac.jp/labs/ce-cc/`.

Refereed academic journal

[pham-207-035-01:2017] T. Hayashi, Y. Watanabe, T. Miyazaki, A. T. Pham, T. Maeda, and S. Matsufuju. A Novel Class of Quadriphase Zero-Correlation Zone Sequence Sets. *IEICE Tran. on Fundamentals of Electronics, Communications and Computer Sciences*, E100-A(4):953–960, 2017.

> The present paper introduces the construction of quadriphase sequences having a zero-correlation zone. For a zero-correlation zone sequence set of N sequences, each of length l, the cross-correlation function and the side lobe of the autocorrelation function of the proposed sequence set are zero for the phase shifts τ within the zero-correlation zone z, such that $|\tau| \leq z$ ($\tau \neq 0$ for the autocorrelation function). The ratio $\frac{N(z+1)}{\ell}$ is theoretically limited to one. The proposed zero-correlation zone sequence set can be generated from an arbitrary Hadamard matrix of order n. The length of the proposed sequence set can be extended by sequence interleaving, where m times interleaving can generate $4n$ sequences, each of length $2m + 3n$. The proposed sequence set is optimal for $m = 0, 1$ and almost optimal for $m > 1$

[pham-207-035-02:2017] C. T. Nguyen, A-T H. Bui, V-D Nguyen, and A. T. Pham. Modified Tree-based Identification Protocols for Solving Hidden-Tag Problem in RFID Systems over Fading Channels. *IET Communications*, 11(7):1132–1142, 2017.

> Hidden-tag problem is one of the most important issues in the implementation of radio-frequency identification (RFID) systems. Due to effects of imperfect wireless channels, RFID tags can be hidden during the identification process by either another tag or an unsuccessful detection. The former is known as the capture effect (CE) while the latter is the detection error (DE). This study newly proposes two modified tree-based identification protocols, namely tweaked binary tree (TBT) and tweaked query tree (TQT), which are able to tackle the hidden-tag problem caused by both the CE and DE. The performance of the proposed TBT and TQT protocols, in terms of the average number of slots required to detect a tag, and the tag-loss rate, is evaluated in comparison with that of previously proposed ones. Computer simulations and numerical results confirm the effectiveness of the proposed protocols

[pham-207-035-03:2017] T. V. Pham, H. L. Minh, and A. T. Pham. Multi-User Visible Light Communication Broadcast Channels with Zero-Forcing Precoding. *IEEE Trans. on Communications*, 64(6):2509–2521, 2017.

This paper studies zero-forcing (ZF) precoding designs for multi-user multiple-input single-output visible light communication (VLC) broadcast channels. In such broadcast systems, the main challenging issue arises from the presence of multi-user interference (MUI) among non-coordinated users. In order to completely suppress the MUI, ZF precoding, which is originally designed for radio frequency (RF) communications, is adopted. Different from RF counterpart, VLC signal is inherently non-negative and has a limited linear range, which leads to an amplitude constraint on the input data signal. Unlike the average power constraint, obtaining the exact capacity for an amplitude-constrained channel is more cumbersome. In this paper, we first investigate lower and upper bounds on the capacity of an amplitude-constrained Gaussian channel, which are especially tight in the high signal-to-noise regime. Based on the derived bounds, optimal beamformer designs for the max-min fairness sum-rate and the maximum sum-rate problems are formulated as convex optimization problems, which then can be efficiently solved by using standard optimization packages

[pham-207-035-04:2017] H. V. Nguyen, P. V. Trinh, A. T. Pham, Z. Babar, D. Alanis, P. Botsinis, D. Chandra, S. X. Ng, and L. Hanzo. Network Coding Aided Cooperative Quantum Key Distribution Over Free-Space Optical Channels. *IEEE Access*, 5:12301–12317, 2017.

Realistic public wireless channels and quantum key distribution (QKD) systems are amalgamated. Explicitly, we conceive network coding aided cooperative QKD over free space optical systems for improving the bit error ratio and either the key rate or the reliable operational distance. Our system has provided a 55% key rate improvement against the state-of-the-art benchmarker

[pham-207-035-05:2017] T. V. Pham and A. T. Pham. Secrecy Sum-Rate of Multi-User MISO Visible Light Communication Systems with Confidential Messages. *Elsevier's OPTIK (Int. Journal for Light and Electron Optics)*, 151:65–76, 2017.

This paper studies the information theoretic secrecy sum-rate for multi-user multiple-input single-output (MU-MISO) visible light communication (VLC) systems with confidential messages. The well-known zero-forcing (ZF) precoding technique is employed to ensure confidentiality among legitimate users and, at the same time, to prevent eavesdropper(s) from obtaining any information. Different from radio frequency (RF) counterpart where the average input power constraint is usually imposed on the derivation of channel capacity, the input data signal of VLC systems is amplitude constrained, leading to a peak

input power constraint. The amplitude constraint gives rise to the complexity in obtaining an analytical expression for the capacity. In this paper, we analytically investigate a novel bound on the secrecy sum-rate of all legitimate users in MU-MISO VLC systems, which is valid in high signal-to-noise ratio (SNR) regime. The secrecy sum-rate performance is then derived for two scenarios: known and unknown eavesdropper's channel state information (CSI) at the transmitter.

[pham-207-035-06:2017] A-T H. Bui, C. T. Nguyen, T. C. Thang, and A. T. Pham. Design and Performance Analysis of a Novel Distributed Queue Access Protocol for Cellular-based Massive M2M Communications. *IEEE Access*, 6:3008–3019, 2018.

This paper proposes a novel access protocol based on the distributed queue (DQ) mechanism to effectively tackle the massive access issue in the cellular-based machine-to-machine (M2M) communications. To fully take the advantage of the DQ mechanism, we newly propose a method to avoid the DQ's inherent over-division problem by letting the base station first roughly probes the number of colliding devices in a random access opportunity. Based on the probing result, the base station then randomly divides these devices into a determined number of groups and "pushes" these groups to the end of a logical access queue. In addition, we develop an analytic model to accurately estimate the average access delay of the proposed protocol in the massive scenarios. Computer simulations are also performed to validate the correctness of the analytic model as well as the effectiveness of the proposed protocol in comparison with the LTE standard and conventional DQ access schemes.

[pham-207-035-07:2017] P. V. Trinh, T. V. Pham, N. T. Dang, H. V. Nguyen, S. X. Ng., and A. T. Pham. Design and Security Analysis of Quantum Key Distribution Protocol over Free-Space Optics Using Dual-Threshold Direct-Detection Receiver. *IEEE Access*, 6:4159–4175, 2018.

This paper proposes a novel design and analyzes security performance of quantum key distribution (QKD) protocol over free-space optics (FSO). Unlike conventional QKD protocols based on physical characteristics of quantum mechanics, the proposed QKD protocol can be implemented on standard FSO systems using subcarrier intensity modulation binary phase shift keying and direct detection with a dual-threshold receiver. Under security constraints, the design criteria for FSO transmitter and receiver, in particular, the modulation depth and the selection of dual-threshold detection, respectively, is analytically investigated. For the security analysis, quantum bit error rate,

ergodic secret-key rate, and final key-creation rate are concisely derived in novel closed-form expressions in terms of finite power series, taking into account the channel loss, atmospheric turbulence-induced fading, and receiver noises. Furthermore, Monte-Carlo simulations are performed to verify analytical results and the feasibility of the proposed QKD protocol

[thang-207-035-01:2017] Nam Pham Ngoc Anh T Pham Truong Cong Thang Huyen TT Tran, Cuong T Pham. A Study on Quality Metrics for 360 Video Communications. *IEICE TRANSACTIONS on Information and Systems*, 101(1):28–36, Jan. 2018.

360 videos have recently become a popular virtual reality content type. However, a good quality metric for 360 videos is still an open issue. In this work, our goal is to identify appropriate objective quality metrics for 360 video communications. Especially, fourteen objective quality measures at different processing phases are considered. Also, a subjective test is conducted in this study. The relationship between objective quality and subjective quality is investigated. It is found that most of the PSNR-related quality measures are well correlated with subjective quality. However, for evaluating video quality across different contents, a content-based quality metric is needed.

[thang-207-035-02:2017] Duc V Nguyen Huyen T Tran Truong Cong Thang, Pham Ngoc Nam. An Evaluation of Screen Content Casting over Mobile and Wireless Networks. *Wireless Personal Communications*, 97(3):4877–4895, 2017.

Thanks to the availability of many smart devices, displays, and broadband connections, screen casting/sharing has become an important functionality for user devices. Meanwhile, a new video standard called screen content coding (SCC) is going to be issued to support this trend. This paper presents a standard-compliant implementation and evaluation of SCC streaming to mobile devices. The study is targeted at a feasible design and settings for customer devices, supporting both content-generating side and content-consuming side. The evaluation results help to answer how a sending device should generate screen content videos, and how a receiving device could be implemented and adjusted in time-varying environments of mobile networks and wireless home networks. To the best of our knowledge, this is the first evaluation study for SCC casting.

[thang-207-035-03:2017] Nam Pham Ngoc Anh T Pham Truong Cong Thang Hung T Le, Thang Vu. Seamless mobile video streaming over HTTP/2 with

gradual quality transitions. *IEICE Transactions on Communications*, 100(5):901–909, May 2017.

HTTP Adaptive Streaming (HAS) has become a popular solution for media delivery over the mobile Internet. However, existing HAS systems are based on the pull-based HTTP/1.1 protocol, leading to high overheads (e.g., in terms of energy, processing, bandwidth) for clients, servers, as well as network nodes. The new HTTP/2 protocol provides a server push feature, which allows the client to receive more than one video segment for each request in order to reduce request-related overheads. In this study, we propose an adaptation method to leverage the push feature of HTTP/2. Our method takes into account not only the request-related overhead but also buffer stability and gradual transitions. The experimental results show that our proposed method performs well under strong throughput variations of mobile networks.

Refereed proceedings of an academic conference

[pham-207-035-08:2017] P. V. Trinh and A. T. Pham. Design and Secrecy Performance of Novel Two-Way Free-Space QKD Protocol using Standard FSO Systems. In *Proc. of the 2017 IEEE International Conference on Communications (ICC'17)*. IEEE COMSOC, IEEE Press, May 2017.

This paper proposes a novel two-way free-space quantum key distribution (QKD) protocol, which can be implemented using standard free-space optical (FSO) systems with subcarrier intensity-modulation (SIM) binary phase-shift-keying (BPSK) and direct-detection (DD) receiver. Different eavesdropping threats, including unauthorized receiver, beam-splitting, and intercept-resend attacks, are considered in the security analysis of the proposed protocol. Under the constraints on security requirements, we analytically investigate the design criteria for transmitter and receiver, in particular, the intensity modulation depth at the transmitter and the dual-threshold setting of the receiver in two-way free-space QKD systems. Quantum bit error rate (QBER), the ergodic secret-key rate, and the probability of detecting eavesdropper of the proposed system are analytically derived in closed-form expressions, considering the atmospheric loss, turbulence, and receiver noises.

[pham-207-035-09:2017] V. V. Mai, T. C. Thang, and A. T. Pham. CSMA/CA-based Uplink MAC Protocol Design and Analysis for Hybrid VLC/Wifi Networks. In *Proc. of the IEEE International Conference on Commu-*

nications (ICC'17), Workshop on Optical Wireless Communications. IEEE COMSOC, IEEE Press, May 2017.

This paper proposes a multi-channel medium access control (MAC) protocol for hybrid VLC/Wifi networks. The proposed MAC protocol is based on an integration of two standards, IEEE 802.15.7 VLC and IEEE 802.11 Wifi CSMA/CA(s) (Carrier Sense Multiple Access/Collision Avoidance). We newly add on top of current MAC protocols a sub-layer that runs dynamic channel selection by taking intelligent control decisions, regarding channel aware and traffic aware. System performance metrics are analytically studied based on a combination of queuing and Markov chain theories. Numerical results quantitatively show how the proposed protocols significantly outperform the conventional ones.

[pham-207-035-10:2017] T. V. Pham, H. L. Minh, and A. T. Pham. Multi-Cell VLC: Multi-User Downlink Capacity with Coordinated Precoding. In *Proc. of the IEEE International Conference on Communications (ICC'17), Workshop on Optical Wireless Communications.* IEEE COMSOC, IEEE Press, May 2017.

This paper studies the multi-user performance of multi-cell visible light communication (VLC) systems with coordinated precoding among cells. Practically, separated LED arrays are employed to properly illuminate a large room/office. This configuration enables a multi-cell VLC system, which is analogous to that in mobile cellular networks. In such multi-cell systems supporting multiple users, the received signal at a user can severely be degraded not only by the interference caused by the signals that are intended to other users within the cell (intra-cell interference) but also by interference from signals of the other cells (inter-cell interference). In order to remove these interferences, we propose a coordinated precoding technique which allows coordination between VLC cells. We then investigate the optimal precoding matrix design to maximize the achievable sum capacity of users. The maximization problem is formulated as a convex optimization problem which can be solved efficiently by using standard software packages. Numerical results show that the proposed coordinated precoding outperforms the non-coordinated one.

[pham-207-035-11:2017] A. T. Pham, T. C. Thang, J. Villegas, and M. Cohen. VLC-based Smart Supermarket (SMARTKet): Concepts and Enabling Technologies. In *Proc. of the IEEE 6th Globe Conference on Consumer Electronics (GCCE).* IEEE Consumer Electronics Society, IEEE Press, Oct. 2017.

We present the key concepts and design of our proposed framework for a smart supermarket (SMARTKet). We briefly introduce the infrastructure, smart functions, and enabling technologies of the SMARTKet implementation. We especially focus on the basic principles, performance evaluation in terms of localization accuracy, and proof-of-concept implementation of the indoor navigation system using visible light communications (VLC) localization technology in the context of SMARTKet.

[pham-207-035-12:2017] A-T H. Bui, C. T. Nguyen, T. C. Thang, and A. T. Pham. An Improved DQ Access Protocol for Cellular-based Massive M2M Communications. In *Proc. of the IEEE/CIC ICC China 2017*. IEEE/CIC, IEEE Press, Oct. 2017.

This paper proposes an improved multiple access protocol based on the Distributed Queue (DQ) mechanism for cellular-based massive Machine-to-Machine (M2M) communications. The key concept of our protocol is to initially employ a subsets division step before starting the DQ mechanism. To validate the effectiveness of the proposal, we evaluate the performance of the proposed protocol over present Long-Term Evolution (LTE) networks with ultra-dense scenarios. Simulation results confirm that in the low load region, the proposed scheme offers comparable performance to the conventional DQ-based protocol and outperforms the standard Access Class Barring (ACB) scheme. In dense scenarios with high traffic, however, the proposed protocol outperforms both conventional DQ and the ACB in terms of delay.

[pham-207-035-13:2017] H. D. Le, C. T. Nguyen, V. V. Mai, N. T. Dang, and Anh T. Pham. On the Performance of TCP Cubic over Fading Channels with AMC Schemes. In *Proc. of the International Conference on Advanced Technologies for Communications (ATC) 2017*. Radio & Electronics Association of Vietnam and IEEE COMSOC, IEEE Press, Oct. 2017.

In this paper, we analyze the TCP Cubic throughput performance over a Nakagami-m slow-fading wireless channel with impacts of adaptive modulation and coding (AMC) schemes. The loss event, which includes a transport-layer congestion loss and physical-layer random packet loss is first analyzed thanks to corresponding finite-state Markov models. The average normalized throughput can be, thus, calculated taking both the losses into consideration. Computer simulations are performed to validate our analysis. The results show that the TCP throughput can be maximized by optimally setting system parameters.

[pham-207-035-14:2017] T. V. Pham and A. T. Pham. Cooperation Strategies and Optimal Precoding Design for Multi-User Multi-Cell VLC Networks. In *Proc. of the IEEE GLOBECOM '17*. IEEE COMSOC, IEEE Press, Dec. 2017.

> This paper investigated the comparative performance of different cell cooperation strategies for multi-cell multi-user visible light communications (VLC) networks. In practical deployment of VLC, multiple LED arrays are deployed to provide sufficient illumination for large rooms/offices. As a consequence, multi-cell configurations are a natural progression for indoor VLC networks. In this study, to support multiple users simultaneously by means of precoding technique, each VLC cell is formed by 4 separated LED arrays. In such multi-cell networks, a user can be severely interfered not only by the signals that are intended to other users within the cell (intra-cell interference) but also by the signals for users of the other cells (inter-cell interference). In order to suppress these interferences, cell cooperation can be applied for precoder designs. We consider several strategies of cell cooperation and investigate the design of optimal precoding matrix corresponding to each cooperative strategy to maximize the achievable sum capacity of users. Comprehensive numerical results are shown to compare the performance of the considered cooperation strategies.

[pham-207-035-15:2017] A-T H. Bui, C. T. Nguyen, T. C. Thang, and A. T. Pham. A Novel Effective DQ-Based Access Protocol with Load Estimation for Massive M2M Communications. In *Proc of the IEEE GLOBECOM'17, Workshop on Emerging Technologies for 5G and Beyond Wireless Mobile Networks*. IEEE COMSOC, IEEE Press, Dec. 2017.

> This paper proposes a novel effective protocol based on the Distributed Queue (DQ) mechanism to tackle the massive access issue in the cellular-based Machine-to-Machine (M2M) communications. To fully take the advantage of the DQ mechanism, we propose a novel method to avoid the inherent over-division problem by letting the base station first roughly probes the number of colliding devices in a Random Access Opportunity. Based on the probing result, the base station then randomly divides these devices into a determined number of groups and "pushes" these groups to the end of a logical access queue. In addition, we develop an analytical model to accurately estimate the average access delay of the proposed protocol in the massive scenarios. Computer simulations are also performed to validate the correctness of the

analytical model as well as the effectiveness of the proposed protocol in comparison with the LTE standard and conventional DQ access schemes.

[thang-207-035-04:2017] Truong Cong Thang Duc V Nguyen, Huyen TT Tran. Impact of delays on 360-degree video communications. In *in Proc. TRON Symposium (TRONSHOW), 2017*, Tokyo, Dec. 2017.

Internet of Things (IoT) and Virtual/Augmented Reality (VR/AR) are shaping our future by merging the digital and the physical words. In this trend, 360-degree video which is a key component of VR/AR is becoming increasingly popular nowadays. For effective transmission of bandwidth-intensive 360-degree videos over the network, viewport-adaptive streaming has been introduced. In this paper, we study the impact of the response delay on viewport-adaptive streaming of 360-degree videos. Specifically, we focus on two key components of the response delay which are 1) adaptation interval and 2) client buffering delay. Experiment results show that viewport-adaptive streaming is only effective under short adaptation intervals and buffering delays. Under long response delay such as in HTTP Adaptive Streaming, it is found that viewport-adaptive methods are even worse than viewport-independent one.

[thang-207-035-05:2017] Anh T Pham Truong Cong Thang Duc V Nguyen, Huyen TT Tran. A New Adaptation Approach for Viewport-adaptive 360-degree Video Streaming. In *in Proc. IEEE International Symposium on Multimedia (ISM)*, Taichung, Taiwan, Dec. 2017.

In this paper, we propose a new adaptation approach for viewport-adaptive streaming of 360-degree videos over the Internet. The proposed approach is able to systematically decide quality levels of tiles according to user head movements and network conditions by taking into account not only prediction errors but also user head movements in each adaptation interval. Experimental results show that the proposed approach can effectively adapt 360-degree videos to both varying network conditions and user head movements. Compared to existing approaches, the proposed approach can improve the average viewport quality by up to 3.9dB and reduce the standard deviation of the viewport quality by up to 50

[thang-207-035-06:2017] Truong Cong Thang Tien-Dung Pham, Phuong Luu Vo. Improving DASH Performance in a Network with Caching. In *in Proc. ACM Eighth International Symposium on Information and Communication Technology*, Nha Trang, Vietnam, Dec. 2017.

Dynamic Adaptive Streaming over HTTP (DASH) has been widely used in online video streaming nowadays. To reduce network congestion, popular videos are replicated in the intermediate cache nodes. However, with DASH, the intermediate cache node may lead to bitrate oscillations due to the difference in the throughputs from the end user to the cache node and from that to the origin server. In this paper, we develop an adaptation logic for DASH that can reduce bitrate oscillations. Our proposed adaptation logic combines both throughput-based and buffer-based adaptation methods. Extensive simulations show the efficiency of our proposed method.

[thang-207-035-07:2017] Cuong T Pham Nam Pham Ngoc Duc V Nguyen Truong Cong Thang Minh Nguyen, Dang H Nguyen. An adaptive streaming method of 360 videos over HTTP/2 protocol. In *in Proc. IEEE NICS2017*, Hanoi, Vietnam, Nov. 2017.

Nowadays, 360-degree video has become an important component of virtual reality (VR) technology. Unfortunately, this state-of-the-art content type requires a huge bandwidth from a server to a client. In order to solve the bandwidth problem in streaming VR videos over HTTP/2, a dynamic adaptation method is crucial. In this paper, we propose a novel adaptive streaming method based on tiled streaming. By using H.265 standard, a video at the server is divided into spatial tiles, each of which is subdivided into multiple temporal segments. In order to support adaptive streaming method from client, each tile is also encoded into different versions. The priority of tiles is defined based on the user's viewport. Then, the priority feature of HTTP/2 is used to request the server to push the tiles of higher priority first. This ensures that the visible tiles will arrive at the client and be decoded first. Besides, in the case of bandwidth fluctuation, we use the stream termination feature to cancel pushing the tiles that would arrive at the client after their playout deadlines.

[thang-207-035-08:2017] Cuong T Pham Yong Ju Jung Truong Cong Thang Huyen TT Tran, Nam Pham Ngoc. A subjective study on QoE of 360 video for VR communication. In *in Proc. IEEE 19th International Workshop on Multimedia Signal Processing (MMSP)*, Luton, UK, Oct. 2017.

Currently, more and more 360-degree videos (or 360 videos for short) are being provided via the Internet. This kind of videos can render a virtual reality (VR) environment via a head-mounted display (HMD). However, understanding the quality of experience (QoE) of 360 videos is a big challenge because user experience in VR is a very complex phenomenon. In this paper, the QoE

of 360 videos is considered in terms of four aspects, namely perceptual quality, presence, acceptability, and cybersickness. Subjective tests are designed to investigate the influences of important factors including encoding parameters, content characteristics, and device types on QoE aspects. In addition, a comparison of perceptual quality and acceptability between VR and non-VR rendering modes, which refer to watching 360 videos with and without using an HMD respectively, is also made in this study. To the best of our knowledge, this is the first study that covers these four QoE aspects and a large number of influence factors.

[thang-207-035-09:2017] Cuong Manh Bui Minh Hong Pham Truong Cong Thang Huyen TT Tran, Nam Pham Ngoc. An evaluation of quality metrics for 360 videos. In *in Proc. IEEE Ninth International Conference on Ubiquitous and Future Networks (ICUFN)*, Milan, Italy, Jul. 2017.

360 videos are becoming more and more popular on video streaming platforms. However, a good quality metric for 360 videos is still an open issue. In this work, we investigate both objective and subjective quality metrics for 360 videos. The goals are to understand the perceived quality range provided by existing mobile 360 videos and, especially, to identify appropriate objective quality metrics for 360 video communications. To that end, a subjective test is conducted in this study. Then, the relationship between objective quality and subjective quality is investigated. Especially, ten objective quality measures are computed, considering the coding distortion measurement, cross-format distortion measurement, and end-to-end distortion measurement. It is found that most of the objective quality measures are well correlated with subjective quality. Also, among the evaluated quality measures, PSNR is shown to be the most appropriate for 360 video communications.

Research grants from scientific research funds and public organizations

[pham-207-035-16:2017] Anh T. Pham (PI). Japan Telecommunication Advancement Foundation (TAF) Research Grant, 2016-2018.

[pham-207-035-17:2017] Anh T. Pham (PI). Japan Society for Promotion of Science (JSPS), KAKENHI 15K00134, 2015-2017.

[pham-207-035-18:2017] Anh T. Pham (Main Researcher). National Foundation

for Science and Technology Development (NAFOSTED, Vietnam), 2016-
2018.

Academic society activities

[pham-207-035-19:2017] Anh T. Pham, 2017.

> Senior member

[pham-207-035-20:2017] Anh T. Pham, 2017.

> Member

[pham-207-035-21:2017] Anh T. Pham, 2017.

> Member

[pham-207-035-22:2017] Anh T. Pham, 2017.

> Member of TPC for many other international conferences, including Globe-
> com'17 OWC-WS, ATC'17, ICUFN'17, NICS'17

[pham-207-035-23:2017] Anh T. Pham, 2017.

> Peer Reviewer for many Transactions and Journals of IEEE, OSA and IE-
> ICE, including IEEE Transactions on Communications, IEEE/OSA Journal
> of lightwave Technology, IEEE/OSA Journal of Optical Communications and
> Networks, OSA Optics Express, IEEE Communications Letters etc.

Patent

[pham-207-035-24:2017] Julian Villegas and Anh Pham. Indoor localization sys-
tem using near-ultrasound signals, August 2017.

Advisor for undergraduate research and graduate research

[pham-207-035-25:2017] Vuong V. Mai. PhD Thesis: Cross-layer Design, Anal-
ysis, and Optimization for Optical Wireless Communication Networks,
University of Aizu, 2017.

> Thesis Advisor: Anh T. Pham

Summary of Achievement

[pham-207-035-26:2017] Phuc V. Trinh. PhD Thesis: Hybrid Architecture and Performance Improvement for Fifth-Generation (5G) Mobile Backhaul Networks, University of Aizu, 2017.

Thesis Advisor: Anh T. Pham

[pham-207-035-27:2017] Le Van Cong. Master Thesis: Modeling and Performance Analysis of Multi-rate FSO Networks using Multi-state Markov Chain, University of Aizu, 2017.

Thesis Advisor: Anh T. Pham

[pham-207-035-28:2017] Nguyen Ngoc Tu. Master Thesis: Performance Analysis of FSO Systems using SIM-MPSK Modulations over Atmospheric Turbulence, University of Aizu, 2017.

Thesis Advisor: Anh T. Pham

[t-huang-207-035-01:2017] Paul Aguirre. Graduation thesis, School of Computer Science and Engineering, 2018.

Thesis Advisor: T. Huang

[t-huang-207-035-02:2017] Satoru Chimoto. Graduation thesis, School of Computer Science and Engineering, 2018.

Thesis Advisor: T. Huang

Contribution related to student management(for example, solution of a student-related problem)

[t-huang-207-035-03:2017] I served as C6 class mentor

Embedded Systems Laboratory

Junji Kitamichi
Professor

Yoichi Tomioka
Associate Professor

The Embedded Systems Laboratory was established in July, 2013. In April, 2015, Prof. Tomioka joined in the Embedded Systems Laboratory. Embedded systems are products which computers are embedded, and the research region of the embedded systems is very wide, such as software, hardware, and middle-ware, from theory to application, calculation performance, power consumption, safety, and development methods. We are researching the following themes out of many research topics about embedded systems.

1. Safety Embedded System

(a) Formal Approach for Circuits Design and Systems Design

(b) Design Method of Safety Systems

2. Hardware acceleration of Heuristic Approaches for Combinatorial Optimization Problems

3. Image Processing and its Power-efficient Accelerator

(a) Video Analysis and Privacy Protection for Surveillance Camera

(b) Deep learning hardware

(c) Application of Image recognition to Lithography Hotspot Detection

(d) Image forensics

Members of the Embedded Systems Laboratory

Prof. Junji Kitamichi:

He received the B.S. and Ph.D degrees in information and computer sciences from Osaka University, Japan, in 1988 and 1999, respectively. In 1991, he joined the Department of Information and Computer Sciences at Osaka University, Japan, as a research associate. From 1999 to 2002, he was with Cybermedia Center at Osaka University, where he was assistant professor. In 2002, he joined School

of Computer Science and Engineering, the University of Aizu, Japan. He was a professor at the University of Aizu from 2013. His research interests include formal methods for VLSI design, dynamically reconfigurable systems, formal design and verification of safety systems, heuristics and parallel algorithms for combinatorial optimization problems.

Prof. Yoichi Tomioka: He received his B.E., M.E., and D.E. degrees from Tokyo Institute of Technology, Tokyo, Japan,in 2005, 2006, and 2009, respectively. He was a research associate at Tokyo Institute of Technology till 2009. He was an assistant professor in the Division of Advanced Electrical and Electronics Engineering at Tokyo University of Agriculture and Technology till 2015. Since 2015, he has been an associate professor in School of Computer Science and Engineering at the University of Aizu. His research interests include image processing, hardware acceleration, high performance computing, electrical design automation, and combinational algorithms.

Students : B3:Sho Endo, Shun Okazaki, Yuki Okada, Reon Kobayashi, Seigo Kon, Yoshiki Tanabe, Tomoyuki Ara, Rintaro Mikawa

B4: Masayuki Tokutake, Ken Watanabe, Shiori Tanikawa, Shuhei Suzuki, Hiroki Ishii, Issei Onodera, Sachi Takahashi, Yoshiaki Ejiri

M1:Sho Ikeda, Dai Funayama, Shu Takenoshita, Yusuke Sekiguchi

M2:Hiroki Saito

Refereed academic journal

[ytomioka-208-033-01:2017] Yoichi Tomioka Shota Saito and Hitoshi Kitazawa. A Theoretical Framework for Estimating False Acceptance Rate of PRNU-based Camera Identification. *IEEE Trans. on Information Forensics and Security*, 12(9):2026–2035, September 2017.

Refereed proceedings of an academic conference

[kitamiti-208-033-01:2017] Junji Kitamichi Sho Ikeda, Yoichi Tomioka. Parallel Computing of Neural Network Algorithm for Fixed Channel Assignment Problem in Cellular Radio Networks with CUDA. In *The 2017 International Symposium on Nonlinear Theory and Its Applications*, pages C2L–E, 2017.

In recent years, graphics processing units (GPUs) have been used for faster numerical calculation because they have many cores and can calculatevia parallel computing. In this paper, we propose a CUDA C program that aims to accelerate the extended maximum neural network algorithm for the fixed channel assignment problem (FCAP) in cellular radio networks using a general-purpose GPU (GPGPU). We evaluate the developed program using the existing benchmark problem in the FCAP. Results show that the processing speed of the developed program is 2.4 times to 15.1 times faster than in the case of using only a CPU.

Unrefeered proceedings of an academic conference

[kitamiti-208-033-02:2017] Junji Kitamichi Sachi Takahashi. A Proposal of Genetic Algorithm using a Local Search as Mutation for a Fixed Channel Assignment Problem in a Cellular Radio Communication. In *The 80th National Convension of IPSJ*, pages 2K–03, 2017.

[kitamiti-208-033-03:2017] Junji Kitamichi Dai Funayama. Modeling a Safety Embedded System Considering External Factors using LTSA. In *2017 Touhoku-Section Joint Convention of Institutes of Electrical and Information Engineers*, page 2B17, 2017.

[ytomioka-208-033-02:2017] Shuhei Suzuki and Yoichi Tomioka. Efficient Generation of Lithography Hotspot Detector based on Transfer Learning. In

IEICE Technical Report (VLD2017-106), volume 115, pages 103–108, Feburary 2018.

(in Japanese)

[ytomioka-208-033-03:2017] Yukihide Kohira Masayuki Tokutake, Yoichi Tomioka and Hiroshi Saito. Cloud Area Estimation using Convolutional Neural Networks. In *Proc. of Tohoku Branch Workshop of the Meteorological Society of Japan*, December 2017.

[ytomioka-208-033-04:2017] Yusuke Sekiguchi and Yoichi Tomioka. Threshold Optimization of Quantized HOG for Reliable Human Detection. In *Tohoku-Section Joint Convention of Institutes of Electrical and Information Engineers*, August 2017.

[ytomioka-208-033-05:2017] Shu Takenoshita and Yoichi Tomioka. Scaling Factor Estimation Using Three Peak Frequencies Related to Periodic Interpolation Artifacts. In *Tohoku-Section Joint Convention of Institutes of Electrical and Information Engineers*, August 2017.

Research grants from scientific research funds and public organizations

[ytomioka-208-033-06:2017] Yoichi Tomioka. Japanese Young Researcher Research Grant from Nakajima Foundation, 2017.

Academic society activities

[kitamiti-208-033-04:2017] Kitamichi J., 2017.

Member

[kitamiti-208-033-05:2017] Kitamichi J., 2017.

Member

[ytomioka-208-033-07:2017] Yoichi Tomioka, 2017.

TPC member of SASIMI (Synthesis And System Integration of Mixed Information technologies)

Advisor for undergraduate research and graduate research

[kitamiti-208-033-06:2017] Hiroki Saito. Development of a Real Time Operating System for a Processor with a Fault Detection Function and its Evaluation, Graduate school, 2017.

[kitamiti-208-033-07:2017] Hiroki Ishii. Acceleration for Minimum p-Quasi Clique Cover Problem using Intel AVX and OpenMP, University of Aizu, 2017.

[kitamiti-208-033-08:2017] Issei Onodera. Development of RTOS TOPPERS/ASP for a MIPS32 Processor System, University of Aizu, 2017.

[kitamiti-208-033-09:2017] Sachi Takahashi. Improvement of Solution Accuracy for FCA using GA with Gradient Descent M ethod as Mutation, University of Aizu, 2017.

[kitamiti-208-033-10:2017] Yoshiaki Ejiri. Implementation of Human Detection algorithm using parallel programing wit h XMOS, University of Aizu, 2017.

[ytomioka-208-033-08:2017] Masayuki Tokutake. Convolutional Neural Network based Cloud Detection from Sky Images, Undergraduate school, March 2018.

[ytomioka-208-033-09:2017] Shiori Tanikawa. Evaluation of Human Region Extraction using Fully Convolutional Networks for Privacy Protection, Undergraduate school, March 2018.

[ytomioka-208-033-10:2017] Shuhei Suzuki. A Construction Method of Lithography Hotspot Detector based on Transfer Learning, Undergraduate school, March 2018.

[ytomioka-208-033-11:2017] Ken Watanabe. Circulated Systolic Array Processor for Binary Convolutional Neural Networks, Undergraduate school, March 2018.

Others

[ytomioka-208-033-12:2017] Yoichi Tomioka and Stanislav Sedukhin. Design and Analysis of a Brain-inspired CNN Accelerator, 2017.

RIEC Brain Architecture Workshop (invited talk)

Summary of Achievement

[ytomioka-208-033-13:2017] Yoichi Tomioka Shota Saito and Hitoshi Kitazawa. A Theoretical Framework for Estimating False Acceptance Rate of PRNU-based Camera Identification, 2017.

the Seventh Symposium on Biometrics, Recognition and Authentication

[ytomioka-208-033-14:2017] Yoichi Tomioka Shota Saito and Hitoshi Kitazawa. A Theoretical Framework for Estimating False Acceptance Rate of PRNU-based Camera Identification, 2017.

the Seventh Symposium on Biometrics, Recognition and Authentication (invited talk)

[ytomioka-208-033-15:2017] Yoichi Tomioka Shota Saito and Hitoshi Kitazawa. A Theoretical Framework for Estimating False Acceptance Rate of PRNU-based Camera Identification, 2017.

the Seventh Symposium on Biometrics, Recognition and Authentication (invited presentation)

Contributions related to syllabus preparation

[ytomioka-208-033-16:2017] ITA18 Sensing and Control Engineering

Preparation of course examination to measure comprehension

[ytomioka-208-033-17:2017] Member who prepares entrance examination questions

[ytomioka-208-033-18:2017] Member who selects entrance examination questions

[ytomioka-208-033-19:2017] Member who grades entrance examinamation

Advisor of a student club or circle

[ytomioka-208-033-20:2017] Robo Mouse

Did you participate in Faculty Development? (Yes or No) If yes, please describe what you did.

[ytomioka-208-033-21:2017] Arrangement of FD lecture

Did you participate in Public Lectures, and/or Open Campus? (Yes or No) If yes, please describe what you did.

[ytomioka-208-033-22:2017] Openlab (Summer session), Video Processing System for Safty and Security

[ytomioka-208-033-23:2017] Openlab (Autumn session), Video Processing System for Safty and Security

[ytomioka-208-033-24:2017] Fukushima Nishi Highschool, Basic to State-of-the-arts Image Analysis

[ytomioka-208-033-25:2017] Iwaki Sakuragaoka high school, Basic to State-of-the-arts Image Analysis

Division of Information and Systems

Robot Engineering Laboratory

Keitaro Naruse
Senior Associate Professor

Yuichi Yaguchi
Associate Professor

Refereed academic journal

[yaguchi-301-015-01:2017] W. Chen, Y. Yaguchi, K. Naruse, Y. Watanobe, and K. Nakamura. QoS-aware Robotic Streaming Workflow Allocation in Cloud Robotics Systems. *IEEE Transactions on Services Computing*, PP(99):1–1, 2017.

Current solutions of computation offloading for cloud robotics face challenges: 1) traditional approaches do not consider the characteristics of networked cloud robotics (NCR)(e.g., heterogeneity and robotic cooperation); 2) they fail to capture the characteristics of tasks in a robotic streaming workflow (RSW) (e.g., strict latency requirements and different task semantics); and 3) they do not consider quality-of-service (QoS) issues for cloud robotics. In this paper, we address these issues by proposing a QoS-aware RSW allocation algorithm for NCR with joint optimization of latency, energy efficiency, and cost, while considering the characteristics of RSW and NCR. We first propose a novel framework that combines robot individuals, robot clusters, and a remote cloud for computation offloading. We then formulate the joint QoS optimization problem for RSW allocation in NCR while considering latency, energy consumption, and operating cost, and show that the problem is NP-hard. Next, we construct a data flow graph based on the characteristics of RSW and NCR, and transform the RSW allocation problem into a mixed-integer linear programming problem. To obtain an optimal solution in reasonable time, we also develop a heuristic-based algorithm. Experiments demonstrate significant performance gains, with improved QoS and reduced execution times.

Refereed proceedings of an academic conference

[yaguchi-301-015-02:2017] Y. Yaguchi, M. Omura, and T. Okumura. Geometrical mapping of diseases with calculated similarity measure. In *2017 IEEE International Conference on Bioinformatics and Biomedicine, Workshop on BHI*, pages 1131–1134, November 2017.

Disease similarity is a useful measure that has potential application to various aspects of medicine. One such application is the mapping of diseases in a two-dimensional plane, which can be the foundation of a useful diagnostic reminder method called the "pivot and cluster strategy." However, the mapping of diseases using a similarity measure has yet to be explored. This article investigates such a mapping, and quantifies its basic characteristics. We first

collected mutual similarity data for 1,550 diseases using a machine learning approach. The calculated similarity data were then used to map the diseases using a "multidimensional scaling" algorithm. Quantitative analysis indicated that it is difficult to express all the diseases on the map and yet still show the similarity information between the items. Then, by restricting the input, the algorithm performed well in practice. To our knowledge, this is the first study to investigate the automated mapping of diseases on a plane for use in clinical practice.

[yaguchi-301-015-03:2017] Y. Yaguchi, K. Moriuchi, and K. Amma. Comparison of camera configuration for real-time drone route planning in 3D building maze. In *2017 IEEE 8th International Conference on Awareness Science and Technology (iCAST)*, pages 244–249, November 2017.

In this research, we investigate what camera settings are effective for an indoor automatic search system. We recommend installing RGB cameras with depth sensors like the Kinect and show how they should be installed to facilitate searches in indoor environments such as buildings with multiple floors. To validate camera configurations, the RTA* algorithm is used for automatic searching and we also measured how fast a drone could move to goal points in a simulation of a 3D-building model. We also studied various patterns of restart points because a drone has limited battery life, which restricts the available flight time. In the experiment, we allowed six batteries and each flight could last 600 seconds. This experiment showed that we should use three cameras positioned on the forward, upward, and backward of a drone to conduct a 3D building floor search because drones can easily rotate in the yaw direction, but cannot rotate in the pitch direction. We also showed that once the drone had returned to its start position for a battery replacement, it should restart from that point for effective searching.

[yaguchi-301-015-04:2017] Y. Yaguchi, Y. Nitta, S. Ishizaka, T. Tannai, T. Mamiya, K. Naruse, and S. Nakano. Formation control for different maker drones from a game pad. In *2017 26th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)*, pages 1373–1378, September 2017.

This paper describes a generalized software interface for formation flying by drones from different manufacturers. Conventional research into formation flight assumes that the drones all have the same power and functionality. However, consider a disaster response, where we might assemble a platoon

of drones to sense the environment and to search for survivors by combining the different functions of drones provided by different manufacturers. The difficulties of controlling formation flight by such a variety of drones include both different mechanical specifications and different interfaces from the manufacturers for activating the same command. In this research, we construct a generalized interface for drones from each manufacturer using OpenRTM-aist. We can then assemble these drones and establish formation flight by using a virtual leader-follower system. The leader and the follower positions are calculated by using speed and rotation data from feedback information such as the GPS, velocity and rotation data from each individual machine. We also investigate good features of flight commands that can express the attributes of the representative motion of the drones. From our experiments, we show that we can establish formation flight using drones of different power and from multiple manufacturers.

[yaguchi-301-015-05:2017] I. Otani, Y. Yaguchi, K. Nakamura, and K. Naruse. Quantitative Evaluation of Streaming Image Quality for The Robot Teleoperation. In *2018 23rd International Symposium on Artificial Life and Robotics*, pages 230–235, January 2018.

In this paper, we define a novel measure of streaming video quality for remotely operated robots. Controlling robots remotely is crucial for disaster response, and many attempts have been made to create such systems. Wireless communication, which is used in remote-control systems for unmanned vehicles, change dynamically and the streaming quality also changes to the quality of the network; however, wireless conditions are not typically measured in conventional robot systems. We are developing a quality measure for remote control using video proprieties such as delay and degrading of image quality as Quality of Control (QoC). In this paper, we introduce this QoC measure using delay and degrading of image quality curves in simulation environments, and we discuss the implications for robot system design.

[yaguchi-301-015-06:2017] R. Yamada, Y. Yaguchi, and M. Yoshida. Performances of 3D mapping and odometry tools, and of a visualization system for analyzing accidents of unmanned aerial vehicles. In *2018 23rd International Symposium on Artificial Life and Robotics*, pages 389–394, January 2018.

Our target is to replace the accident conditions of the unmanned aerial vehicles (UAVs) using data obtained from the sensors and flight recorder loaded

on the UAVs to analyze their causes. In this paper, we have first investigated the performances of three types of tools for 3D mapping and odometry to reproduce the surrounding environment and its orbit, and found that the tool using the LIDAR data are more accurate and can reproduce broader areas compared with methods that use monocular and stereo camera images. Second, we applied an optical flow method to images taken by a monocular camera rotating with 4 types of velocities, and found that imaging over 120 fps is required to analyze accurately the velocity field of the rotating and falling UAV. Finally, we have developed a visualization system that displays the reproduced situations of the UAV flights and accidents on a computer screen.

Unrefeered proceedings of an academic conference

[yaguchi-301-015-07:2017] D. Yoshino, Y. Watanobe, Y. Yaguchi, K. Nakamura, J. Ogawa, and K. Naruse. Proposal of MQTT and MQTT-SN Communication Interfaces on RT Middleware for IoR System Construction. In *The 18th Meeting of SICE System Integration Department, SI2018*, 2017.

[yaguchi-301-015-08:2017] Y. Yaguchi and K. Moriuchi. Real-time 3D Maze Searching by A Drone Using The Depth Cameras. In *2017 JSME Conference on Robotics and Mechatronics, ROBOMECH2017*, 2017.

[yaguchi-301-015-09:2017] D. Yoshino, Y. Watanobe, Y. Yaguchi, K. Nakamura, and K. Naruse. Application possibility of OpenRTM-aist-based integrated robot systems using CORBA interfaces and brokered Pub/Sub messaging interfaces. In *2017 JSME Conference on Robotics and Mechatronics, ROBOMECH2017*, 2017.

[yaguchi-301-015-10:2017] Y. Yaguchi, Y. Nitta, S. Ishizaka, T. Tannai, T. Mamiya, K. Naruse, and S. Nakano. RT Components for Formation Flight with The Hetero Manufacturer Drones. In *2017 JSME Conference on Robotics and Mechatronics, ROBOMECH2017*, 2017.

[yaguchi-301-015-11:2017] K. Amma, Y. Yaguchi, Y. Watanobe, and K. Naruse. Constructing Cloud base RTM and automatic deploy to Raspberry Pi. In *2017 JSME Conference on Robotics and Mechatronics, ROBOMECH2017*, 2017.

[yaguchi-301-015-12:2017] I. Otani and Y. Yaguchi. The Simple Robot Prototyping for RT-Midlleware of the FaBo.inc Sensors. In *2017 JSME Conference on Robotics and Mechatronics, ROBOMECH2017*, 2017.

[yaguchi-301-015-13:2017] M. Yoshida and Y. Yaguchi. 3D Environment Map Reconstruction with Aerial Camera on A Drone. In *2017 JSME Conference on Robotics and Mechatronics, ROBOMECH2017*, 2017.

Advisor for undergraduate research and graduate research

[yaguchi-301-015-14:2017] Ikumi Otani. Graduation Thesis: Quantitative evaluation of streaming image quality for the robot teleoperation, University of Aizu, 2017.

Thesis Advisor: Y. Yaguchi

[yaguchi-301-015-15:2017] Kazutake Suzuki. Graduation Thesis: A Characters Select Recommendation System for League of Legends Beginners, University of Aizu, 2017.

Thesis Advisor: Y. Yaguchi

[yaguchi-301-015-16:2017] Masaki Sakuma. Graduation Thesis: Comparison of Cameras and Sensors for 3D Mapping by using mobile robot, University of Aizu, 2017.

Thesis Advisor: Y. Yaguchi

[yaguchi-301-015-17:2017] Pham Hung Cuong. Master Thesis: Sensor Fusion of 3D LiDAR and Fish-eye Camera for Landscape Mapping, University of Aizu, 2017.

Thesis Advisor: Y. Yaguchi

[yaguchi-301-015-18:2017] Yuta Oshima. Master Thesis: Generation of similar disease map based on disease similarity and sparse network, University of Aizu, 2017.

Thesis Advisor: Y. Yaguchi

[yaguchi-301-015-19:2017] Yukinori Inoue. Master Thesis: Collision Avoidance for Drone Fleets using Potential Method, University of Aizu, 2017.

Thesis Advisor: Y. Yaguchi

Summary of Achievement

[yaguchi-301-015-20:2017] Takaaki Mamiya. Master Thesis: Data Fusion of LI-DAR and Stereo Camera for Real Time 3D Dense Mapping, University of Aizu, 2017.

Thesis Advisor: Y. Yaguchi

Contributions related to syllabus preparation

[yaguchi-301-015-21:2017] A undergraduate school course syllabus constructed: [IT03] Digital Image Processing

[yaguchi-301-015-22:2017] A graduate school course syllabus constructed: [ITC05] Pattern Recognition and Machine Learning

[yaguchi-301-015-23:2017] A graduate school course syllabus constructed: [ITA06] Image Rcognition and Understanding

Advisor of a student club or circle

[yaguchi-301-015-24:2017] Circle Advisor: Pokemon Circle

[yaguchi-301-015-25:2017] Circle Advisor: Confort Utopian Orchestra

[yaguchi-301-015-26:2017] Circle Advisor: Soccer Circle

Contribution related to educational planning management

[yaguchi-301-015-27:2017] A member of Curriculum Working Group

Other significant contribution toward university planning, management, or administration

[yaguchi-301-015-28:2017] A member of PC Koshien

[yaguchi-301-015-29:2017] A member of entrance examination working group

Proposal/implementation of a new industry

[yaguchi-301-015-30:2017] A vice chairman of the investigation and review meeting of wireless system related to grasp of flight position of small unmanned aerial vehicles, Tohoku Integrated Communication Bureau

[yaguchi-301-015-31:2017] A member of the bid for UTM to be implemented in Fukushima Robot Test Field

Contribution toward education for employees of regional industries

[yaguchi-301-015-32:2017] A lecturer of the Fukushima Robot Software Study Meeting

Other noteworthy contribution related to regional industries

[yaguchi-301-015-33:2017] A member of the Fukushima Prefecture Industry-Robot Technology Development Support Project

Did you participate in Public Lectures, and/or Open Campus? (Yes or No) If yes, please describe what you did.

[yaguchi-301-015-34:2017] Open Campus: Summer Stage and Autumn Stage

Do you have experience of University-Industry collaboration? If yes, please describe your experience. (for UBIC's information)

[yaguchi-301-015-35:2017] Commissioned research: UAV Security, East-Japan Accounting Center, co.

[yaguchi-301-015-36:2017] Commissioned research: Motion recognition of drive recorder on forklift, Toolmart, co.

Division of Information and Systems

Computer Arts Laboratory

Michael Cohen
Professor

Satoshi Nishimura
Senior Associate Professor

Villegas Orozco Julian Alberto
Associate Professor

Most of the courses taken by engineers and computer science students emphasize scientific discipline and accumulation of "truth." Computer Arts Lab. activities include such technically objective factors, but also encourage original expression, subjectively motivated by æsthetics rather than "correctness," sometimes "putting the art before the course!" Unlike many other labs' activities that try to converge on a "right answer," artistic disciplines encourage originality, in which the best answer is one that is like no one else's.

The Computer Arts Lab., including through its resident Spatial Media Group,[1] is researching projects including practical and creative applications[2] of virtual reality and mixed (augmented, enhanced, hybrid, mediated) reality and virtuality; panoramic interfaces and spatially-immersive displays (especially stereotelephonics, spatial sound, and stereography); wearable and mobile applications, computing, and interfaces; and networked multimedia, with related interests in CVEs (collaborative virtual environments), groupware and CSCW (computer-supported collaborative work); hypermedia; digital typography and electronic publishing; force-feedback displays; telecommunication semiotics (models of teleconferencing selection functions); information furniture; way-finding and navigation; entertainment computing; ubicomp (ubiquitous computing), calm (ambient), and pervasive technology. We are particularly interested in narrowcasting commands, conference selection functions for adjusting groupware situations in which users have multipresence, virtually existing in more than one space simultaneously. We investigate realtime interactive multimedia interfaces— auditory, visual, haptic, and multimodal:

Auditory We are exploring interfaces for multichannel sound, including stereo,

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[1] http://u-aizu.ac.jp/~mcohen/spatial-media/
[2] https://u-aizu.ac.jp/research/researchlist/enlist?searchActivity=5

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quadraphonic, and nearphones (mounted on our ^S_Cha$_i$r^e rotary motion platform), as well as speaker array systems in the **U**niversity-**B**usiness **I**nnovation **C**enter 3D Theater.[3] Julián Villegas[4] leads a **S**tudent **C**ooperative **C**lass **P**roject on Pure Data ("Pd"),[5] and also teaches an advanced graduate level course on Acoustic Signal Analysis[6] (formerly Music Technology). Lab faculty members Michael Cohen[7] and Julián teach the ITC02: "Intro. to Sound and Audio" graduate school course,[8] featuring extensive experiential learning featuring applications such as Audacity[9] and Pure Data,[10] including tablet-based courseware (an iPad is issued to each student). That course is a prerequisite for "ITA10: Spatial Hearing and Virtual 3D Sound ,"[11] which was originally started by Prof. Jie Huang in the Human Interface Lab.

We support a Computer Music Studio, featuring keyboard synthesizers and computer music workstations complemented by assorted amplifiers, racks, mixers, and effects processors.

Visual We promote creative applications of scientific visualization, encouraging the use of Mathematica[12] and stereoscopy,[13] including chromastereoscopy[14] (3D images with depth layers cued by color). The annual Chromastereoptic Picture Contest[15] exhibition is mounted[16] in the university library. We enjoy exploiting the unique large-format immersive stereographic display in the UBIC 3D Theater. The "M-Project" student CAD and CG circle[17] is hosted

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[3] http://www.ubic-u-aizu.jp/shisetsu/kengaku.html

[4] http://u-aizu.ac.jp/~julian

[5] http://onkyo.u-aizu.ac.jp/index.php/classes/pd/

[6] http://u-aizu.ac.jp/official/curriculum/syllabus/2018_2_E_005.html#ITA10, http://onkyo.u-aizu.ac.jp/classes/music-tech/

[7] http://u-aizu.ac.jp/~mcohen

[8] http://u-aizu.ac.jp/official/curriculum/syllabus/2018_2_E_005.html#ITC02A, http://u-aizu.ac.jp/~mcohen/welcome/courses/AizuDai/graduate/Sound+Audio/syllabus.html

[9] http://audacity.sourceforge.net

[10] http://puredata.info

[11] http://u-aizu.ac.jp/official/curriculum/syllabus/2018_2_E_005.html#ITA10, http://onkyo.u-aizu.ac.jp/index.php/classes/3d-sound/

[12] http://u-aizu.ac.jp/~mcohen/welcome/courses/AizuDai/Mma.html

[13] http://u-aizu.ac.jp/~mcohen/spatial-media/stereograms.html

[14] http://www.chromatek.com

[15] http://web-ext.u-aizu.ac.jp/~mcohen/welcome/courses/AizuDai/undergraduate/HI&VR/ChromadepthPictureContest

[16] http://u-aizu.ac.jp/en/intro/facilities/library/library5.html, http://u-aizu.ac.jp/intro/facilities/library/library5.html

[17] http://mpro-aizu.blogspot.com

in our lab, under the supervision of Profs. Satoshi Nishimura[18] and Michael Cohen. Students use various CAD authoring tools— such as 3DStudioMax, Blender, Maya, and Sketch-Up, as well as Illustrator and PhotoShop— to make digital contents such as videos. A photomosaic of our faculty was compiled, both hyperlinked[19] and flickering.[20] We are also exploring creative applications of panoramic imaging and object movies, including a virtual tour of the university[21] and photospheres of the university in Spring[22] and Winter[23].

Haptic We are also exploring the use of haptic interfaces, including force-display joysticks and a rotary motion platform (the "^S_Cha$_i$r^e [for 'shared chair'] Internet Chair"). We also convene annual **C**reative **F**actory **S**eminars.[24] In conjunction with Prof. Rentaro Yoshioka[25] of the Active Knowledge Engineering Lab., we conduct a CFS workshop[26] on Haptic Modeling and 3D Printing,[27] using force-feedback CAD workstations[28] to make models that are then rapid prototyped (as stereolithograms) with a personal fabricator, closing the "idea (stored in brain neurons) – information (stored as bits) – matter (atoms)" pathway.

Multimodal Using such multimodal interfaces, our students have crafted driving simulators, location-based games, and synæsthetic (cross-sensory modality) visual and haptic music players (rendering songs as light shows[29] or dancing chairs[30]). Using visual sensing techniques, narrowcasting postures can be recognized, and used to control distributed chatspaces or virtual concerts. We are interested in exploring using figurative interfaces to express

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[18]http://u-aizu.ac.jp/e-intro/e-faculty/e-undergraduate/e-undergraduate2/e-nisim.html

[19]http://u-aizu.ac.jp/~mcohen/welcome/UoAmosaic/faculty2.html

[20]http://u-aizu.ac.jp/~mcohen/welcome/UoAmosaic/faculty.gif

[21]http://u-aizu.ac.jp/~mcohen/welcome/courses/AizuDai/undergraduate/HI&VR/VirtualTour/

[22]https://theta360.com/s/gdDcKZaDaa9PKL5F9eeJ4T47A

[23]https://theta360.com/s/3SiAETczscXILlKMb5CldF5RE

[24]http://web-int.u-aizu.ac.jp/official/faculty/sad/CFSlist.pdfl

[25]http://u-aizu.ac.jp/~rentaro

[26]http://u-aizu.ac.jp/official/curriculum/syllabusCFS/2018CFSlist.pdf

[27]http://u-aizu.ac.jp/official/curriculum/syllabus/2018_2_E_008.html#CFS

[28]http://geomagic.com/en/products-landing-pages/sensable

[29]http://sonic.u-aizu.ac.jp/spatial-media/mixedreality/Videos/CITMixedReality_Demo.wmv

[30]http://sonic.u-aizu.ac.jp/spatial-media/mixedreality/Videos/keitai+Schaire2.mov

emotion and to control narrowcasting privacy using a media mixing system for advanced conferencing features. We are also exploring extensions of Open Wonderland,[31] an open-source framework for developing virtual reality environments. Group members developed windshield wipers that dance, featuring beat detection, a digital phase-locked loop, and articulated wiper gestures.[32] Lately we have been playing with the Unity[33] IDE, including deployment in HMDs, such as the HTC Vive.[34]

We are also exploring mobile (nomadic, portable) computing. We have developed and published the "Twhirleds" app[35] on Google Play for Android[36] and Apple iTunes App Store for iOS.[37] Such *keitai*-based interfaces can be used to control internet appliances, panoramic imaging, spatial sound, or motion platforms.

A advanced undergraduate course on "Human Interface and Virtual Reality"[38] and a parallel graduate course "Multimedia Machinima"[39] surveys many of these topics, contextualized by "machinima" (machine cinema) using game engine "Unity,"[40] featuring student-designed and -programmed, computer-generated interactive stories with 3D animation— including texture maps, photographic compositing, audio effects, speech synthesis, background music— and segments on panoramic and turnoramic imagery, stereopsis, and groupware.

Other activities:

We host an annual symposium, the Int. Symposium on Spatial Media,[41]. The theme for '17–'18 was "Spatial Sound," and we invited four international guests for a 3-day conference with technical sessions, student demonstrations, and a social program.

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[31] http://openwonderland.org

[32] http://u-aizu.ac.jp/~mcohen/spatial-media/VMPMyRide

[33] https://unity3d.com/

[34] https://www.vive.com/

[35] http://u-aizu.ac.jp/~mcohen/spatial-media/Twhirleds/

[36] https://play.google.com/store/apps/details?id=jp.ac.u_aizu.Twhirleds

[37] https://itunes.apple.com/us/app/twhirleds/id962674836

[38] http://u-aizu.ac.jp/official/curriculum/syllabus/2018_1_E_016.html#IT06, http://web-int.u-aizu.ac.jp/~mcohen/welcome/courses/AizuDai/undergraduate/HI&VR/

[39] u-aizu.ac.jp/official/curriculum/syllabus/2018_2_E_005.html#ITA33, http://web-int.u-aizu.ac.jp/~mcohen/welcome/courses/AizuDai/graduate/Multimedia_Machinima/

[40] https://unity3d.com

[41] http://u-aizu.ac.jp/~mcohen/welcome/ISSM/17-18/

Division of Information and Systems

Our lab sponsors several student performance circles, including the Yosakoi Dance Circle,[42] and DMC, the **D**isco **M**ix **C**lub.We also sponsor the Dual Boot (Ultimate Frisbee) Flying Disc Club.[43]

Through the research & development, the deployment & integration of stereographic, spatial sound, haptic, and mobile applications, including virtual and mixed reality, we nurture scientific and artistic interest in advanced computer–human and human–human communication. Our ultimate domain is the exploration of interfaces and artifacts that are literally sensational.

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[42]http://u-aizu.ac.jp/circles/yosakoi
[43]http://u-aizu.ac.jp/circles/dualboot

Refereed academic journal

[nisim-302-016-01:2017] Hiroaki Yui and Satoshi Nishimura. A cost effective graph-based partitioning algorithm for a system of linear equations. *International Journal of Computational Science and Engineering*, 16(2):181–190, 2018.

There are many techniques for reducing the number of operations in directly solving a system of sparse linear equations. One such method is nested dissection (ND). In numerical analysis, the ND algorithm heuristically divides and conquers a system of linear equations, based on graph partitioning. In this article, we present a new algorithm for the first level of such graph partitioning, which splits a graph into two roughly equalised subgraphs. The algorithm runs in almost linear time. We evaluate and discuss the solving costs by applying the proposed algorithm to various matrices.

Refereed proceedings of an academic conference

[julian-302-016-01:2017] Julián Villegas, Jeremy Perkins, and Seunghun J. Lee. Psychoacoustic roughness as proxy of creakiness in White Hmong. In *Proc. Seoul Int. Conf. on Speech Sciences*, Nov 2017.

Creakiness of vocalic regions in White Hmong (a Hmong dialect with a three-way phonation contrast: modal, creaky and breathy tones) was measured with a state-of-the-art software predictor and with one based on an objective model of psychoacoustic roughness. Similar results for the two classifiers were found when comparing creaky vs. modal tones, but roughness classifier performance discriminating breathy and creaky tones, in comparison with the other classifier, was found to be subpar. These results suggest that roughness could be a good predictor of non-modal phonation, but further analysis and modifications are needed to improve roughness-based prediction of creakiness.

[julian-302-016-02:2017] Jeremy Perkins, Seunghun J. Lee, and Julián Villegas. Psychoacoustic roughness as a measure of creakiness in two dialects of Zhuang. In *Proc. Seoul Int. Conf. on Speech Sciences*, Nov 2017.

We investigated the tonal systems of Wuming and Du'an Zhuang via a production study focusing on F0 and creaky phonation. Results revealed that (1) there is evidence of a phonation contrast among tones 2 and 4 in Wuming Zhuang and (2) no such phonation contrast exists in Du'an Zhuang, where F0 alone distinguishes each tone. The study utilized an objective measurement

of psychoacoustic roughness as a proxy of creakiness, revealing the phonation contrast in Wuming Zhuang. In contrast, another method of creakiness detection, Covarep, did not reveal any such creakiness difference. Roughness and Covarep creakiness detection algorithms differ then, with roughness providing a more sensitive measure of creaky phonation in this case.

[julian-302-016-03:2017] Anh T. Pham, Truong Cong Thang, Julián Villegas, and Michael Cohen. VLC-BASED SMART SUPERMARKET (SMARTKET): KEY CONCEPTS AND ENABLING TECHNOLOGIES. In *Proc. IEEE 6th Global Conf. on Consumer Electronics (GCCE)*, NAGOYA, JAPAN, OCTOBER 2017.

WE PRESENT THE KEY CONCEPTS AND DESIGN OF OUR PROPOSED FRAMEWORK FOR A SMART SUPERMARKET (SMARTKET). WE BRIEFLY INTRODUCE THE INFRASTRUCTURE, SMART FUNCTIONS, AND ENABLING TECHNOLOGIES OF THE SMARTKET IMPLEMENTATION. WE ESPECIALLY FOCUS ON THE BASIC PRINCIPLES, PERFORMANCE EVALUATION IN TERMS OF LOCALIZATION ACCURACY, AND PROOF-OF-CONCEPT IMPLEMENTATION OF THE INDOOR NAVIGATION SYSTEM USING VISIBLE LIGHT COMMUNICATIONS (VLC) LOCALIZATION TECHNOLOGY IN THE CONTEXT OF SMARTKET.

[JULIAN-302-016-04:2017] JULIÁN VILLEGAS, NAOKI FUKASAWA, AND YURINA SUZUKI. IMPROVING ELEVATION PERCEPTION IN SINGLE-LAYER LOUDSPEAKER ARRAY DISPLAY USING EQUALIZING FILTERS AND LATERAL GROUPING. In *Proc. 143 Audio Eng. Soc. Int. Conv.*, OCT. 2017.

A SYSTEM TO IMPROVE THE PERCEPTION OF ELEVATED SOURCES IS PRESENTED. THIS METHOD RELIES ON "EQUALIZING FILTERS," A TECHNIQUE THAT AIMS TO COMPENSATE FOR UNINTENDED CHANGES IN THE MAGNITUDE SPECTRUM PRODUCED BY THE PLACEMENT OF LOUDSPEAKERS WITH RESPECT TO THE DESIRED LOCATION. IN THE PROPOSED METHOD, WHEN SOURCES ARE ON THE HORIZON, A MAXIMUM OF TWO LOUDSPEAKERS ARE USED FOR REPRODUCTION. OTHERWISE, THE HORIZON SPATIALIZATION IS MIXED WITH ONE THAT USES SIDE LOUDSPEAKERS GROUPED BY LATERAL DIRECTION. RESULTS FROM A SUBJECTIVE EXPERIMENT SUGGEST THAT THE PROPOSED METHOD IS CAPABLE OF PRODUCING ELEVATED IMAGES, BUT THE PERCEIVED ELEVATION RANGE IS SOMEWHAT COMPRESSED.

[JULIAN-302-016-05:2017] JULIÁN VILLEGAS AND SHOMA SAITO. ASSISTING SYSTEM FOR GROCERY SHOPPING NAVIGATION AND PRODUCT REC-

OMMENDATION. IN *Proc. IEEE 6th Global Conf. on Consumer Electronics (GCCE)*, NAGOYA, JAPAN, OCTOBER 2017.

WE PRESENT THE KEY CONCEPTS AND DESIGN OF OUR PROPOSED FRAMEWORK FOR A SMART SUPERMARKET (SMARTKET). WE BRIEFLY INTRODUCE THE INFRASTRUCTURE, SMART FUNCTIONS, AND ENABLING TECHNOLOGIES OF THE SMARTKET IMPLEMENTATION. WE ESPECIALLY FOCUS ON THE BASIC PRINCIPLES, PERFORMANCE EVALUATION IN TERMS OF LOCALIZATION ACCURACY, AND PROOF-OF-CONCEPT IMPLEMENTATION OF THE INDOOR NAVIGATION SYSTEM USING VISIBLE LIGHT COMMUNICATIONS (VLC) LOCALIZATION TECHNOLOGY IN THE CONTEXT OF SMARTKET.

Research grants from scientific research funds and public organizations

[julian-302-016-06:2017] Seunghun Lee and George Van Driem. Phonetics Phonology and New Orthographies: Helping Native Language Communities in the Himalayas (PhoPhoNo). JSPS - SNSF grant, 2017-2020.

Academic society activities

[julian-302-016-07:2017] Julián Villegas, 2017.

Elevated to Senior Member

Patent

[julian-302-016-08:2017] Julián Villegas and Anh T. Pham. Indoor localization system using near-ultrasound signals, 2017.

Advisor for undergraduate research and graduate research

[julian-302-016-09:2017] Naoki Fukasawa. Perception of spatialized Risset tones, University of Aizu, Mar 2018.

This research aimed at building an acoustic environment for Virtual Reality (VR) spatialization of sound. To test the built VR program, a subjective experiment was conducted to compare the judgements of virtual sound images

processed with two methods: Default spatializ tion in Unity and using HRTF convolution. The results indicated that the proposed environment could be used for other method comparisons in the future.

[julian-302-016-10:2017] Yurina Suzuki. Improving sound perception in elevation using single layer loudspeaker array display, University of Aizu, Mar 2018.

The purpose of this study is to improve the localization in elevation of sound sources coming from a single-layer loudspeaker array. In this thesis, we used a method using equalizing filters to create elevated sound images. The experiment was performed eliciting how people perceive the elevated sound source. They were asked the direction they perceive of the sound using elevation and azimuth angle. The results indicate that sound perception was improved by using a loudspeaker grouping method.

[julian-302-016-11:2017] Mutsuko Ishihara. Computer-assisted singing experience, University of Aizu, Mar 2018.

This research aimed at building an acoustic environment for Virtual Reality (VR) spatialization of sound. To test the built VR program, a subjective experiment was conducted to compare the judgements of virtual sound images processed with two methods: Default spatializ tion in Unity and using HRTF convolution. The results indicated that the proposed environment could be used for other method comparisons in the future.

[julian-302-016-12:2017] Shoma Saito. Assisting System for Grocery Shopping Navigation and Product Recommendation, University of Aizu, Mar 2018.

We present a system for grocery shopping by recommending products according to those currently in a shopping basket, and supporting users in finding their way to the location of recommended item in store. Our goal is supporting users in finding their way from their current position to the location of a determined item. And suggesting items to user that analysis by big data.

[nisim-302-016-02:2017] Yumi Matsui. Master Thesis: The design of a multi-threaded processor for real-time ray tracing, University of Aizu, 2018.

Thesis Advisor: S. Nishimura

[nisim-302-016-03:2017] Ayako Komizu. Graduation Thesis: Representation of lens effects by post-processing, University of Aizu, 2018.

Thesis Advisor: S. Nishimura

[nisim-302-016-04:2017] Takuya Mimori. Graduation Thesis: The Modeling and Numerical Simulation of Wadaiko, University of Aizu, 2018.

> Thesis Advisor: S. Nishimura

[nisim-302-016-05:2017] Natsuki Iwabuchi. Graduation Thesis: Finding play position using a recurrent neural network, University of Aizu, 2018.

> Thesis Advisor: S. Nishimura

[nisim-302-016-06:2017] Rei Kobayashi. Graduation Thesis: Web-based cooperative rendering using a kd-tree, University of Aizu, 2018.

> Thesis Advisor: S. Nishimura

Contributions related to syllabus preparation

[julian-302-016-13:2017] "Sound and Audio Processing": 14 meetings, each meeting comprises lecture (100 min) and exercise (50 min) session

[julian-302-016-14:2017] "Introduction to Pure-data" A visual programming tool for multimedia": 14 meetings, each meeting comprises lecture (100 min) and exercise (50 min) session

Contribution related to faculty personnel (outside scouting, etc.)

[julian-302-016-15:2017] Served as member of the Community for prevention of harassment

Contribution related to on-campus/off-campus publicity work

[julian-302-016-16:2017] Served as member of the Community Affairs Planning Committee

Other significant contribution toward university planning, management, or administration

[julian-302-016-17:2017] Served as president of SAISUA: the Support Association for Int. Students of the University of Aizu

Did you participate in students recruitment, support the alumni, and/or contact with student's parent? (Yes or No) If yes, please describe what you did.

[julian-302-016-18:2017] Created one problem of the PC-Koshien 2017 problem set

[julian-302-016-19:2017] Proctor for the General Entrance Examination AY 2017

[julian-302-016-20:2017] CS Field examiner for the Graduate School Entrance Exam AY 2017

Did you participate in Public Lectures, and/or Open Campus? (Yes or No) If yes, please describe what you did.

[julian-302-016-21:2017] Participated in both 2017 Open Campus events

[julian-302-016-22:2017] Public lecture series on basic Spanish

Pattern Processing Laboratory

Jung-pil Shin
Senior Associate Professor

Naru Hirata
Senior Associate Professor

Refereed academic journal

[jpshin-303-011-01:2017] Jungpil Shin Hyung-Jin Mun, Sunghyuck Hong. A Novel Secure and Efficient Hash Function with Extra Padding against Rainbow Table Attacks. *Cluster Computing (Springer)*, pages 1–13, May 2017.

> User authentication is necessary to provide services on an application system and the Internet. Various authentication methods are used such as ID/PW, biometric, and OTP authentications. One of the popular authentications is ID/PW authentication. As an inputted password is transferred by one-way hash function and then stored in DB, it is difficult for the DB administrator to figure out the password inputted by the user. However, when DB is leaked, and there is the time to decode, the password can be hacked. The time and cost to decode the original message from the hash value corresponding a short password decrease. Therefore, if the password is short, then attacking cost is low, and password crack possibility is high. In the case where an attacker utilizes pre-computing rainbow tables, and the hash value of short passwords is leaked, the password that the user inputted can be cracked. In this research, to block rainbow table attacks, when the user generates a short password, by adding additional messages of identification information of a system or the user and extending the length of the password, we try to resolve the vulnerability of short passwords. By proposing a model to minimize the length of the password and the authority accordingly in mobile devices on which inputting passwords is not easy, we take security into consideration. Our proposal model is strong against rainbow table attack and provides efficient password system to users. It contributes to resolving password vulnerability and upgrades mobile users' convenience in typing passwords.

[jpshin-303-011-02:2017] Jungpil Shin-Insoo Koo Sana Ullah Jan, Young Doo Lee. Sensor Fault Classification Based on Support Vector Machine and Statistical Time-Domain Features. *IEEE Access*, 5(1):8682–8690, May 2017.

> This paper deals with the problem of fault detection and diagnosis in sensors considering erratic, drift, hard-over, spike, and stuck faults. The dataset containing samples of the above-mentioned fault signals, was acquired as follows: normal data signals were obtained from a temperature-to-voltage converter by using an Arduino Uno microcontroller board and Matlab. Then, faults were simulated in normal data to get 100 samples of each fault, where one sam-

ple is composed of 1000 data elements. A support vector machine (SVM) was used for data classification in one-versus-rest manner. The statistical time-domain features, extracted from a sample, were used as a single observation for training and testing SVM. The number of features was varied from 5 to 10 to examine the effect on accuracy of SVM. Three different kernel functions used to train SVM include linear, polynomial, and radial-basis function (RBF) kernels. The fault occurrence event in fault samples was chosen randomly in some cases to replicate a practical scenario in industrial systems. The results show that increase in number of features from 5 to 10 hardly increase the total accuracy of classifier. However, using ten features gives highest accuracy for fault classification in an SVM. An increase in number of training samples from 40 to 60 caused an overfitting problem. The k-fold cross validation technique was adopted to overcome this issue. The increase in number of data elements per sample to 2500 increases the efficiency of classifier. However, increase in number of training samples to 400 reduces the capability of SVM to classify stuck fault. The receiver operating characteristics (ROC) curve comparison shows the efficiency of SVM over neural network.

[jpshin-303-011-03:2017] Cheol Min Kim Jungpil Shin. Non-touch Character Input System Based on Hand Tapping Gestures Using Kinect Sensor. *IEEE Access*, 5(1):10496–10505, May 2017.

There have been a lot of studies on the text input system using the image-based hand gesture recognition. However, hand gesture languages such as sign languages, finger alphabets, and aerial handwriting treated in the previous works have some problems to be commonly used. The aerial handwriting requires much time for writing and recognition. The sign languages and finger alphabets demand quite a knowledge and practice for using it, which results in restricting the number of their users. As a solution to the problems, this paper proposes a new character input system based on hand tapping gestures for Japanese hiragana and English characters that can be used to facilitate human-computer interaction. The hand tapping gestures are motions for tapping keys on aerial virtual keypads by hands, which can be effectively used as a hand alphabet by anyone including hearing impaired individuals. For hiragana characters, the hand used for tapping a key and the number of stretched fingers of the hand decide the consonant part of characters, and thereby the aerial virtual keypad. The character to be entered is determined by tapping the key on the virtual keypad corresponding to the desired vowel. Because we adopt a key layout similar to the Japanese and English flick keyboard of smart

phones, our hand tapping gestures can be easily used by anyone with only a brief description. The users can effectively interact with computers by using our non-touch input system where only the Kinect sensor is used without any keyboard, mouse or body-worn device. We expect that our character input system will open a new channel for human-computer interaction.

[jpshin-303-011-04:2017] Yu-Ting Tsai-Aniello Castiglione Chin-Ling Chen, Jung-pil Shin and Francesco Palmieri. Securing information exchange in VANETs by using pairing-based cryptography. *International Journal of Foundations of Computer Science [SCI]*, 28(6):781–797, June 2017.

Vehicular Ad Hoc Networks are mainly implemented to enable the interchange of huge amount of information among vehicles and between vehicles and control entities such as road side units or base stations, providing support for a comfortable and safe driving experience. However, due to the recent proliferation of cybersecurity threats, securing such a critical exchange of information becomes a fundamental prerequisite. In this paper, we propose a novel security scheme based on bilinear pairing-based cryptography to improve the security of the information exchanged in VANETs. Such scheme relies on the Elliptic Curve Discrete Logarithm Problem to provide anonymity and robust security features, and on Message Authentication Codes for verifying the vehicles' identities. The proposed solution is able to achieve mutual authentication between involved entities and prevent impersonation, replay and insider attacks, at the expense of minimum overhead so that also big-data scale communications can be safely supported in the VANET environment.

[jpshin-303-011-05:2017] Cheol Min Kim Hyung-Jin Mun Jungpil Shin, Zhaofeng Liu. Writer Identification Using Intra-stroke and Inter-stroke Information for Security Enhancements in P2P Systems. *Journal of Peer-to-Peer Networking and Applications (Springer) [SCI]*, pages 1–10, Sep. 2017.

Chinese language has enormous number of characters and complicated stroke structures. So it is very difficult to efficiently and accurately identify a Chinese writer from his/her handwritings. This paper proposes a novel writer identification method for Chinese characters commonly used in Japan which can be used in peer-to-peer (P2P) systems. As a preliminary task, we have analyzed the shapes of strokes and the types of block division structures in Chinese characters and selected some characters for writer identification. The method consists of two efficient algorithms, i.e. the Hidden-feature analysis

and the Block-type model, which respectively utilize intra-stroke and inter-stroke features of handwritings to enhance the writer identification accuracy. The Hidden-feature analysis makes template classes of reference characters with online features of training samples such as pen-pressure, pen-speed, pen-altitude, and pen-azimuth of each stroke. The Block-type model also creates such classes for writer identification based on offline features, i.e. the positional information about blocks of sample characters. The experimental results show that the Hidden-feature analysis requires eight Chinese characters while the Block-type model requires only four characters and four ones to achieve writer identification accuracy over 98%. Additionally, the results also demonstrate that any eight Chinese characters are enough to achieve an identification accuracy over 99.9% when the combination of the two algorithms is applied.

[jpshin-303-011-06:2017] Yusuke Shimizu and Jungpil Shin. User-Friendly Interactive Chinese Character Education System and Its Effect. *International Journal of Emerging Multidisciplinary Research*, pages 19–29, 2017.

This paper presents a novel friendly and interactive Chinese character (Kanji in Japanese) learning system to enable elementary school students and foreign people living in Japan and to learn Kanji by an interesting and efficient way. By interacting with the network between the client application for students and the server application for teachers, teachers can grasp circumstances of education of all students in real-time. When students select and input characters they want to learn, the client application checks whether each stroke is unbalanced or not, and it is corrected if unbalanced. If there are no unbalanced strokes, a

[jpshin-303-011-07:2017] Keun Soo Yun Jungpil Shin, Cheol Min Kim. Non-touch Character Input Using the Virtual Keyboard in Smart Devices. *Journal of Advanced Research in Dynamical and Control Systems (Elsevier)*, 15:494–502, Oct. 2017.

Background/Objectives: There are many input methods which can be utilized in various situations where users want to interact with smart devices. The purpose of this research is to develop an easy learning non-touch character input method of smart devices. Methods/Statistical analysis: The input method is designed so that users can input characters using a virtual QWERTY keyboard displayed on the screen without any lengthy explanation. Recognizing aerial movements of a key pointer such a fingertip and some object with a thin end in images obtained from the built-in camera of the smart device, the method supports users' text inputs to smart devices even when their hands are

dirty or wet or they are holding an object. Findings: We have implemented the key pointer recognition method using a template matching. The results of experiments show that all the averages of accuracies of character input with a fingertip, pointer, needle-nose pliers and chopsticks are higher than 98.62%for each character when it is required that the key pointer should be stayed over the target key for at least 1.0 second. The accuracy rate is higher than the previous studies on the non-touch character input method. The five point rating scale questionnaire on our character input method shows that the users evaluate our system as higher than 4.0 for all the categories such as learn ability, efficiency, errors, memorability, and user satisfaction. Improvements/Applications: The proposed method will help users to effectively interact with smart devices without any special tool in various situations where users have difficulty in touching the devices.

[naru-303-011-01:2017] Ryuhei Yamada, Hiroki Senshu, Noriyuki Namiki, Takahide Mizuno, Shinsuke Abe, Fumi Yoshida, Hirotomo Noda, Naru Hirata, Shoko Oshigami, Hiroshi Araki, Yoshiaki Ishihara, and Koji Matsumoto. Albedo Observation by Hayabusa2 LIDAR: Instrument Performance and Error Evaluation. *Space Science Reviews*, 208(1):49–64, 2017.

The Japanese asteroid explorer Hayabusa2 was launched at the end of 2014. Hayabusa2 is supposed to observe the near-Earth C-type asteroid 162173 Ryugu (1999 JU3) and bring surface material samples back to Earth in 2020. It is equipped with Light Detection and Ranging (LIDAR) instrument for laser ranging which can be used to measure the intensities of transmitted and received pulses. The intensity data can be used to estimate the normal albedo of Ryugu at a laser wavelength of 1.064 um. To perform this estimation, we determined the transfer functions of the laser module and receiver to convert the intensity data into pulse energies, along with the utilization ratio of the returned pulse energy, through verification tests of the LIDAR flight model. Then, we evaluated the error of the normal albedo. This error is affected not only by the performance of the LIDAR but also by the slope and roughness of the asteroid's surface. In this paper, we focus on the error in the normal albedo due only to the instrument error, which will be 18.0 % in an observation at a nominal altitude of 20 km.

[naru-303-011-02:2017] S. Yamamoto, T. Matsunaga, T. Nakamura, Y. Sekine, N. Hirata, and Y. Yamaguchi. An Automated Method for Crater Count-

ing Using Rotational Pixel Swapping Method. *IEEE Transactions on Geoscience and Remote Sensing*, 55(8):4384–4397, 2017.

We develop a fully automated algorithm for determining the geological ages by crater counting from the digital terrain model (DTM) and the digital elevation model (DEM) taken by remote-sensing observations. The algorithm is based on the rotational pixel swapping method, which uses a multiplication operation between the original DTM/DEM data and the rotated data to detect impact craters. Our method does not need binarization and/or noise reduction, because noise components are automatically erased. We show that our method can detect not only simple craters but also complex circular structures such as imperfect, degraded, or overlapping craters. We demonstrate that this method succeeds in the automatic detection of hundreds to thousands of impact craters, and the estimated ages are consistent with those by manual counting in previous works. In addition, it is shown that the calculation time by this method is more than several hundred times faster than by previous methods.

[naru-303-011-03:2017] T. Mizuno, T. Kase, T. Shiina, M. Mita, N. Namiki, H. Senshu, R. Yamada, H. Noda, H. Kunimori, N. Hirata, F. Terui, and Y. Mimasu. Development of the Laser Altimeter (LIDAR) for Hayabusa2. *Space Science Reviews*, 208(1):33–47, 2017.

Hayabusa2 was launched on 3 December 2014 on an H-IIA launch vehicle from the Tanegashima Space Center, and is, at the time of writing, cruising toward asteroid 162137 Ryugu (1999 JU 3). After reaching the asteroid, it will stay for about 1.5 years to observe the asteroid and collect surface material samples.

[naru-303-011-04:2017] Wataru Ueno, Hirohide Demura, and Naru Hirata. HARMONICS: A Visualization Tool for Hayabusa and Hayabusa 2 Missions. *TRANSACTIONS OF THE JAPAN SOCIETY FOR AERONAUTICAL AND SPACE SCIENCES*, 60(3):132–136, 2017.

We developed a tool for visualizing the spatial geometry of objects and field-of-view (FOV) of scientific instruments for mission plans and data analysis of Hayabusa and Hayabusa 2, and named "HARMONICS (Hayabusa Remote MONItoring and Commanding System)." We also implemented a graphical user interface to simulate a changing FOV. Displaying arbitrary viewpoints over a time sequence helps determine the geometry observed and supports later data analysis. HARMONICS loads ancillary data with the SPICE kernel format: position and attitude of the spacecraft, properties of scientific instru-

ments and target's shape model, etc. Here, we report on the system details and enhanced functions of HARMONICS compared to the original version in 2005.

[naru-303-011-05:2017] T. Imamura, H. Ando, S. Tellmann, M. Peatzold, B. Heausler, A. Yamazaki, T.M. Sato, K. Noguchi, Y. Futaana, J. Oschlisniok, S. Limaye, R.K. Choudhary, Y. Murata, H. Takeuchi, C. Hirose, T. Ichikawa, T. Toda, A. Tomiki, T. Abe, Z. Yamamoto, H. Noda, T. Iwata, S. Murakami, T. Satoh, T. Fukuhara, K. Ogohara, K. Sugiyama, H. Kashimura, S. Ohtsuki, S. Takagi, Y. Yamamoto, N. Hirata, G. L. Hashimoto, M. Yamada, M. Suzuki, N. Ishii, T. Hayashiyama, Y. J. Lee, and M. Nakamura. Initial performance of the radio occultation experiment in the Venus orbiter mission Akatsuki. *Earth, Planets, and Space*, 69:137, 2017.

After the arrival of Akatsuki spacecraft of Japan Aerospace Exploration Agency at Venus in December 2015, the radio occultation experiment, termed RS (Radio Science), obtained 19 vertical profiles of the Venusian atmosphere by April 2017. An onboard ultra-stable oscillator is used to generate stable X-band downlink signals needed for the experiment. The quantities to be retrieved are the atmospheric pressure, the temperature, the sulfuric acid vapor mixing ratio, and the electron density. Temperature profiles were successfully obtained down to 38 km altitude and show distinct atmospheric structures depending on the altitude. The overall structure is close to the previous observations, suggesting a remarkable stability of the thermal structure. Local time-dependent features are seen within and above the clouds, which is located around 48-70 km altitude. The H2SO4 vapor density roughly follows the saturation curve at cloud heights, suggesting equilibrium with cloud particles. The ionospheric electron density profiles are also successfully retrieved, showing distinct local time dependence. Akatsuki RS mainly probes the low and middle latitude regions thanks to the near-equatorial orbit in contrast to the previous radio occultation experiments using polar orbiters. Studies based on combined analyses of RS and optical imaging data are ongoing.

[naru-303-011-06:2017] Takahiro Iwata, Kohei Kitazato, Masanao Abe, Makiko Ohtake, Takehiko Arai, Tomoko Arai, Naru Hirata, Takahiro Hiroi, Chikatoshi Honda, Naoya Imae, Mutsumi Komatsu, Tsuneo Matsunaga, Moe Matsuoka, Shuji Matsuura, Tomoki Nakamura, Aiko Nakato, Yusuke Nakauchi, Takahito Osawa, Hiroki Senshu, Yasuhiko Takagi, Kohji Tsumura, Naruhisa Takato, Sei-ichiro Watanabe,

Maria Antonietta Barucci, Ernesto Palomba, and Masanobu Ozaki. NIRS3: The Near Infrared Spectrometer on Hayabusa2. *Space Science Reviews*, 208(1):317–337, 2017.

NIRS3: The Near Infrared Spectrometer is installed on the Hayabusa2 spacecraft to observe the target C-type asteroid 162173 Ryugu at near infrared wavelengths of 1.8 to 3.2 um. It aims to obtain reflectance spectra in order to detect absorption bands of hydrated and hydroxide minerals in the 3 um-band. We adopted a linear-image sensor with indium arsenide (InAs) photo diodes and a cooling system with a passive radiator to achieve an optics temperature of 188 K, which enables to retaining sufficient sensitivity and noise level in the 3 um wavelength region. We conducted ground performance tests for the NIRS3 flight model (FM) to confirm its baseline specifications. The results imply that the properties such as the signal-to-noise ratio (SNR) conform to scientific requirements to determine the degree of aqueous alteration, such as CM or CI chondrite, and the stage of thermal metamorphism on the asteroid surface.

[naru-303-011-07:2017] M. Arakawa, K. Wada, T. Saiki, T. Kadono, Y. Takagi, K. Shirai, C. Okamoto, H. Yano, M. Hayakawa, S. Nakazawa, N. Hirata, M. Kobayashi, P. Michel, M. Jutzi, H. Imamura, K. Ogawa, N. Sakatani, Y. Iijima, R. Honda, K. Ishibashi, H. Hayakawa, and H. Sawada. Scientific Objectives of Small Carry-on Impactor (SCI) and Deployable Camera 3 Digital (DCAM3-D): Observation of an Ejecta Curtain and a Crater Formed on the Surface of Ryugu by an Artificial High-Velocity Impact. *Space Science Reviews*, 208(1):187–212, 2017.

The Small Carry-on Impactor (SCI) equipped on Hayabusa2 was developed to produce an artificial impact crater on the primitive Near-Earth Asteroid (NEA) 162173 Ryugu (Ryugu) in order to explore the asteroid subsurface material unaffected by space weathering and thermal alteration by solar radiation. An exposed fresh surface by the impactor and/or the ejecta deposit excavated from the crater will be observed by remote sensing instruments, and a subsurface fresh sample of the asteroid will be collected there. The SCI impact experiment will be observed by a Deployable CAMera 3-D (DCAM3-D) at a distance of, 1 km from the impact point, and the time evolution of the ejecta curtain will be observed by this camera to confirm the impact point on the asteroid surface. As a result of the observation of the ejecta curtain by DCAM3-D and the crater morphology by onboard cameras, the subsurface structure and the physical properties of the constituting materials will

be derived from crater scaling laws. Moreover, the SCI experiment on Ryugu gives us a precious opportunity to clarify effects of microgravity on the cratering process and to validate numerical simulations and models of the cratering process.

[naru-303-011-08:2017] Kazunori Ogohara, Masahiro Takagi, Shin-ya Murakami, Takeshi Horinouchi, Manabu Yamada, Toru Kouyama, George L. Hashimoto, Takeshi Imamura, Yukio Yamamoto, Hiroki Kashimura, Naru Hirata, Naoki Sato, Atsushi Yamazaki, Takehiko Satoh, Naomoto Iwagami, Makoto Taguchi, Shigeto Watanabe, Takao M. Sato, Shoko Ohtsuki, Tetsuya Fukuhara, Masahiko Futaguchi, Takeshi Sakanoi, Shingo Kameda, Ko-ichiro Sugiyama, Hiroki Ando, Yeon Joo Lee, Masato Nakamura, Makoto Suzuki, Chikako Hirose, Nobuaki Ishii, and Takumi Abe. Overview of Akatsuki data products: definition of data levels, method and accuracy of geometric correction. *Earth, Planets and Space*, 69(1):167, 2017.

We provide an overview of data products from observations by the Japanese Venus Climate Orbiter, Akatsuki, and describe the definition and content of each data-processing level. Levels 1 and 2 consist of non-calibrated and calibrated radiance (or brightness temperature), respectively, as well as geometry information (e.g., illumination angles). Level 3 data are global-grid data in the regular longitude, latitude coordinate system, produced from the contents of Level 2. Non-negligible errors in navigational data and instrumental alignment can result in serious errors in the geometry calculations. Such errors cause mismapping of the data and lead to inconsistencies between radiances and illumination angles, along with errors in cloud-motion vectors. Thus, we carefully correct the boresight pointing of each camera by fitting an ellipse to the observed Venusian limb to provide improved longitude, latitude maps for Level 3 products, if possible. The accuracy of the pointing correction is also estimated statistically by simulating observed limb distributions. The results show that our algorithm successfully corrects instrumental pointing and will enable a variety of studies on the Venusian atmosphere using Akatsuki data.

[naru-303-011-09:2017] Takehiko Satoh, Takao M. Sato, Masato Nakamura, Yasumasa Kasaba, Munetaka Ueno, Makoto Suzuki, George L. Hashimoto, Takeshi Horinouchi, Takeshi Imamura, Atsushi Yamazaki, Takayuki Enomoto, Yuri Sakurai, Kosuke Takami, Kenta Sawai, Takashi Nakakushi, Takumi Abe, Nobuaki Ishii, Chikako Hirose, Naru Hirata, Manabu Yamada, Shin-ya Murakami, Yukio Yamamoto, Tet-

suya Fukuhara, Kazunori Ogohara, Hiroki Ando, Ko-ichiro Sugiyama, Hiroki Kashimura, and Shoko Ohtsuki. Performance of Akatsuki/IR2 in Venus orbit: the first year. *Earth, Planets and Space*, 69(1):154, 2017.

The first year (December 2015 to November 2016) of IR2 after Akatsuki's successful insertion to an elongated elliptical orbit around Venus is reported with performance evaluation and results of data acquisition. The single-stage Stirling-cycle cryo-cooler of IR2 has been operated with various driving voltages to achieve the best possible cooling under the given thermal environment. A total of 3091 images of Venus (1420 dayside images at 2.02 um and 1671 night-side images at 1.735, 2.26, and 2.32 um) were acquired in this period. Additionally, 159 images, including images of stars for calibration and dark images for the evaluation of noise levels, were captured. Low-frequency flat images (not available in pre-launch calibration data) have been constructed using the images of Venus acquired from near the pericenter to establish the procedure to correct for the IR2 flat-field response. It was noticed that multiple reflections of infrared light in the PtSi detector caused a weak but extended tail of the point-spread function (PSF), contaminating the night-side disk of Venus with light from the much brighter dayside crescent. This necessitated the construction of an empirical PSF to remove this contamination and also to improve the dayside data by deconvolution, and this work is also discussed. Detailed astrometry is performed on star-field images in the H-band (1.65 um), hereby confirming that the geometrical distortion of IR2 images is negligible.

Refereed proceedings of an academic conference

[jpshin-303-011-08:2017] Feng Lin Jungpil Shin Guan-Chen Li, Chin-Ling Chen and Cheng Gu. Design of a Secure Emergency Communication System Based on Cloud for Pregnancy. In *The 12th International Conference on Green, Pervasive and Cloud Computing(GPC-2017.) Lecture Notes in Computer Science(LNCS)*, volume 10232, pages 585–595, Amalfi Coast, Italy, May 2017.

Due to the high maternal mortality, it is particularly necessary to attend pregnant woman by emergency communication system as timely treatment to avoid maternal deaths. In this paper, we propose an emergency communication system based on cloud computing and mobile devices for a pregnant woman to have a more efficiently and timely treatment. Moreover, security

is the utmost important issue. The proposed scheme integrates proxy authorization of the Schnorr's signature, symmetric encryption technology, a message authentication code, and RFC 2631 to protect the communication messages and the pregnant woman's privacy not been revealed or stolen.

[jpshin-303-011-09:2017] Chin-Ling Chen Jungpil Shin Ji Yang, Yu-Xia Yao. Design and Implementation of Web Microblogging System. In *2017 IEEE International Conference on Applied System Innovation(IEEE ICASI 2017)*, pages 1504–1507, Sapporo, Japan, May 2017.

With the rapid development of computer and network technology, micro-blog system provides to exchange information and proceed social life. It provides very favorable ways. Especially, how to quickly obtain information and release information, sharing of information in today's society become a research direction for a big data. In this paper, we based on Struts2, JSP, MySql, Ajax and JQuery related technologies to propose a personal micro-blog system.

[jpshin-303-011-10:2017] Jungpil Shin Naoaki Ishigami. Feature Extraction for Signature Synthesis. In *International Conference on Convergence Technology (ICCT2017)*, number W-14-15, pages 838–839, Hokkaido, Japan, July 2017.

Signature is one of a biometric authentication. This Characters are basically transformed for prevent another person using it. However, it is very difficult to make sensible signature because character transformation method has not a rule. This paper shows method to create signature which along a rule that read from among the signature to exist. We generated such a signature by using Affine transformation and Bezier curve. The base of emphasizing individuality in stroke signature is built.

[jpshin-303-011-11:2017] Cheol Min Kim Jungpil Shin. Oriental Brush Simulation using 3 Dimensional Action. In *ACM 2017 Research in Adaptive and Convergent Systems (ACM RACS 2017)*, pages 116–119, Krakow, Poland, Sep 2017.

Calligraphy is an art of beautiful handwriting seen widely in Oriental countries. The principle tool for oriental calligraphers is the oriental brush which has characteristics different from a pen. The purpose of this paper is to realize a simulation of the expressive oriental brush with a pen tablet and a web camera. Especially we have focused on the effects of the pressure that the calligrapher gives to the oriental brush. The information from the tablet such as the xy-coordinates, pressure, altitude, and azimuth of the pen can

be utilized to simulate the oriental brush. However the pen pressure values obtained from the pen tablet are not suitable for an elaborate simulation of the oriental brush in that the calligrapher cannot closely control the pressure. In our system, the calligrapher uses a device brush, i.e., a device pen with attached hairs, as a substitute for the oriental brush. The system measures the z-coordinate of the brush, i.e., the height from the surface of the tablet to the center of gravity of the brush bristles, by using a web camera and utilizes it as a parameter for the brush pressure. The aerial movements of the brush are reflected to the various aspects such as the shape and size of the droplet, ink consumption, ink diffusion, and ink scratchiness, which enables users to write calligraphy with the device brush with a feeling that they use a real oriental brush and to make more delicate expressions.

[jpshin-303-011-12:2017] Cheol Min Kim Chin-Ling Chen Kotaro Maruyama, Jungpil Shin. User Authentication using Leap Motion. In *ACM 2017 Research in Adaptive and Convergent Systems (ACM RACS 2017)*, pages 213–216, Krakow, Poland, Sep 2017.

There is a rising interest in non-touch human-computer interaction and enhanced user authentication. We think that the hand gesture will play an important role in non-touch HCI and that it will be requested to reinforce user authentication associated with the hand. In this paper, we propose a novel method to authenticate each user by recognizing his/her hand with Leap motion. We get the reference and test data about three dimensional positions of finger joints by letting users put his/her hand over Leap motion. We identify and verify a user by comparing the intra-digit and inter-digit feature values calculated from the three dimensional coordinates of finger joints. Twenty persons have participated as examinees in our experiments and we have measured the hand of each user 30 times. The experimental results show that we can get the identification rate 84.65% based on only distances between joints as intra-digit features. This implies that hand biometrics such as distances and angles between finger joints can be used to authenticate the user who interacts with computing devices using hand gestures.

[jpshin-303-011-13:2017] Jungpil Shin Yong-Yuan Deng, Chin-Ling Chen and Kun-Hao Wang. Cryptanalysis of Yang et al.'s handover authentication scheme for mobile network environment. In *1st International Symposium on Computer Science and Intelligent Control (ISCSIC 2017)*, pages 152–157, Budapest, Hungary, Oct. 2017.

Due to the progress of mobile computing and communication technologies,

people are easily using their mobile devices doing lots of applications through wireless communication. Lots of information and personal data are transmitted through the network. Therefore, to protect these data and resist unauthorized access is an important issue. Based on mobile cloud computing environment, Yang et al. proposed a secure, private, and efficient handover authentication scheme for mobile devices and access points. But there still exist some security weaknesses. Their proposed scheme does not fully satisfy user untraceability, even forward and backward secrecy. Our proposed scheme solves these defects, achieves mutual authentication, data integrity, user anonymity, user untraceability, forward and backward secrecy, and resist replay attack.

[jpshin-303-011-14:2017] Nian-Qiao Zhang Jungpil Shin Chin-Ling Chen, Yung-Wen Tang. Neurofeedback Based Attention Training for Children with ADHD. In *The 8th International Conference on Awareness Science and Technology (iCAST 2017)-(Best Paper Awarded)*, pages 93 – 97, Taichung, Taiwan, Nov. 2017.

In recent years, neurofeedback training becomes a gradual non-pharmacological treatment trend for attention-deficit/hyperactivity disorder (ADHD) to improve attention. In this study, we design a 3D game to improve and assess children with ADHD. We observed the brainwave change to integrate computer game training to explore the impact of training on children. In the process of the training, children can learn to focus and relax. And then children can further to control attention and meditation, helping to improve the efficiency of their learning and inhibit the frequency of ADHD symptoms. After training, we record these data and analyze the parameters and brainwave status. In addition, we found the progress obviously on children with ADHD through the game training. The prosed scheme can give a feedback and improve children's attention and meditation significantly.

[jpshin-303-011-15:2017] Akm Ashiquzzaman Jungpil Shin Md Rashedul Islam Rasel Ahmed Bhuiyan, Abdul Kawsar Tushar. Reduction of Gesture Feature Dimension for Improving the Hand Gesture Recognition Performance of Numerical Sign Language. In *IEEE International Conference On Computer and Information Technology (ICCIT 2017)*, number ID-337, pages ID–337, Dhaka, Bangladesh, December 2017.

A major form of non-touch human-computer interaction (HCI) is hand gesture recognition. This is one of the appealing ways to interact with computers

and a natural part of how we communicate. However, as a part of HCI, human hand gesture recognition is a challenging issue. From this point of view, this paper presents an effective hand gesture recognition system with hand feature selection for low cost video acquisition device. In this proposed model, hand features are extracted from video frame using discrete wavelet transformation and singular value decomposition. A genetic algorithm with effective fitness function is used to select optimal hand features by eliminating redundant and irrelevant features for improving the recognition performance. Finally, support vector machine is used to recognize the hand gestures for numerical hand gesture accuracy of American Sign Language. The proposed model is validated using a constructed hand gesture dataset. The proposed model is compared with non-feature selection based models, where the feature selection-embedded model outperforms the traditional hand recognition process.

[jpshin-303-011-16:2017] Keun Soo Yun Jungpil Shin, Md Abdur Rahim. Continuous Motion Detection using Histogram of Oriented Gradients. In *International Conference on Business Solutions for MSME Enterprises (ICSMB 2018)*, pages 61–62, Manila, Philippines, Jan. 2018.

In this paper, we present a continuous motion detection using Histogram of Oriented Gradients. Motion detection plays a fundamental role in any object tracking or video surveillance. The proposed method of motion detection is a matching of the foreground references images and current images. There are two different approaches can be defined. The first frame is to represent the scene background that is usually set to the first captured and the other is the presence of vacillating elements in which movements will be the targets. Thus a pixel is classified as foreground if its current value is considerably difference from its value in the reference frame. We proposed block matching method that is carried out by changing from pixel movement into cell movement.

[jpshin-303-011-17:2017] Keun Soo Yun Md Abdur Rahim, Jungpil Shin. Integrated Recognition of Handwritten and Printed Character using Machine Learning Algorithm. In *International Conference on Business Solutions for MSME Enterprises (ICSMB 2018)*, pages 63–64, Manila, Philippines, Jan. 2018.

In this paper, we present machine learning method to recognize the character. It is developed off-line strategies for the integrated handwritten and printed English character and numbers. This method improves the character recognition method. Preprocessing of the Character is used binarization,

thresholding and segmentation method. The proposed method is based on the use of Natural Language Toolkit (NLTK) to classify the characters and trained using the Back Propagation algorithm. In the proposed system, the input image captured by digital camera is a colored image. The image can be handwritten or printed text. The proposed system uses some techniques for remove the background noise and feature extraction to detect and classify the handwritten and printed text. System compromises four phases preprocessing, segmentation, feature extraction and character recognition. The proposed system can detect both small and capital letter and numbers with maximum accuracy.

Writing a part of textbook or technical book

[jpshin-303-011-18:2017] Jungpil Shin. *Handwritten Style English Font Generation Reflected Personality,*, chapter 22, pages 330–344. Advanced Engineering Research and Applications (AERA). Research India Publications, April 2017.

Academic society activities

[jpshin-303-011-19:2017] Jungpil Shin, Sep. 2017.

Program Committee (held in Rome, Italy 10 - 14, 2017)

[jpshin-303-011-20:2017] Jungpil Shin, Oct. 2017.

Program Committee (held in Athens, Greece, October 8 - 12, 2017.)

[jpshin-303-011-21:2017] Jungpil Shin, Dec. 2017.

Program Committee (held in Cancun, Mexico, December 18-21, 2017.)

[jpshin-303-011-22:2017] Jungpil Shin, 2017 2017.

Program Committee, (held in Honolulu, USA, June 25-30, 2017)

[jpshin-303-011-23:2017] Jungpil Shin, Oct. 2017.

Program Committee Chair (held in Daegu, Korea, Oct. 11-14, 2017)

[jpshin-303-011-24:2017] Jungpil Shin, Sep. 2017.

International Advisory Chair (held in Krakow, Poland, Sep. 20-23, 2017)

[jpshin-303-011-25:2017] Jungpil Shin, 2017.

> An executive director

[naru-303-011-10:2017] Chair of the committee for information system, The Japanese Society for Planetary Sciences

[naru-303-011-11:2017] A Member of the steering committee, The Japanese Society for Planetary Sciences

Advisor for undergraduate research and graduate research

[jpshin-303-011-26:2017] Kotaro Maruyama. Master Thesis: Detection of Characteristic of Dysgraphia and Comparison with Medical Evaluation using Handwriting, University of Aizu, Feb. 2017.

> Thesis Advisor: Jungpil Shin

[jpshin-303-011-27:2017] Taku Yamano. Graduation Thesis: Verification of Educational Quality using Calligraphy Learning System, University of Aizu, Feb 2017.

> Thesis Advisor: Jungpil Shin

[jpshin-303-011-28:2017] Hiromasa Omote. Graduation Thesis: Character Input System Using Kinect Sensor, University of Aizu, Feb. 2017.

> Thesis Advisor: Jungpil Shin

[jpshin-303-011-29:2017] Ryo Kanno. Graduation Thesis: Keyboard Input by Movement of Finger using Myo Armband, University of Aizu, Feb. 2017.

> Thesis Advisor: Jungpil Shin

[jpshin-303-011-30:2017] Tsuyoshi Tajima. Graduation Thesis: User Authentication via Hand Gesture using Myo Armband, University of Aizu, Feb. 2017.

> Thesis Advisor: Jungpil Shin

[jpshin-303-011-31:2017] Mei Onodera. Graduation Thesis: Handedness Detection of Online Handwriting, University of Aizu, Feb. 2017.

> Thesis Advisor: Jungpil Shin

Summary of Achievement

Others

[jpshin-303-011-32:2017] Nian-Qiao Zhang Jungpil Shin Chin-Ling Chen, Yung-Wen Tang. Best Paper Awarded: Neurofeedback Based Attention Training for Children with ADHD,, Nov. 2017.

The 8th International Conference on Awareness Science and Technology (iCAST 2017), pp. 93 - 97, Nov. 8-10, 2017, The Splendor Hotel, Taichung, Taiwan.

Scholarly paper prepared by undergraduate/graduate student(s) you advised

[jpshin-303-011-33:2017] Cheol Min Kim Hyung-Jin Mun Jungpil Shin, Zhaofeng Liu. Writer Identification Using Intra-stroke and Inter-stroke Information for Security Enhancements in P2P Systems. *Journal of Peer-to-Peer Networking and Applications (Springer) [SCI]*, pages 1–10, Sep. 2017.

[jpshin-303-011-34:2017] Yusuke Shimizu and Jungpil Shin. User-Friendly Interactive Chinese Character Education System and Its Effect. *International Journal of Emerging Multidisciplinary Research*, 1(1):19–29, Sep. 2017.

[naru-303-011-12:2017] Wataru Ueno, Hirohide Demura, and Naru Hirata. HARMONICS: A Visualization Tool for Hayabusa and Hayabusa 2 Missions. *TRANSACTIONS OF THE JAPAN SOCIETY FOR AERONAUTICAL AND SPACE SCIENCES*, 60(3):132–136, 2017.

Advisor of a student club or circle

[jpshin-303-011-35:2017] Advisor of EBS Circle

[jpshin-303-011-36:2017] Advisor of fhoto-grafia Circle

Contribution related to the building or operation of the university computer system

[naru-303-011-13:2017] ISTC steering committee

Contribution related to planning administration for research, research conferences, or international research

[jpshin-303-011-37:2017] Invited Speaker, Human Computer Interaction and Pattern Recognition, Jungpil Shin, at Ulsan Univ., Korea, June, 2017.

[jpshin-303-011-38:2017] Invited Speaker, Nontouch interface for Human Computer Interaction, Jungpil Shin, at Hallym Univ., Korea, Sep. 2017.

[jpshin-303-011-39:2017] Invited Speaker, Pattern Recognition for Future Technology, Jungpil Shin, at Ulsan Univ., Korea, Dec. 2017.

[jpshin-303-011-40:2017] Invited Speaker, Human Computer Interaction using Human Action, Jungpil Shin, at Industrial Convention, Korea, March, 2018.

Did you participate in Public Lectures, and/or Open Campus? (Yes or No) If yes, please describe what you did.

[jpshin-303-011-41:2017] Presentation of the Demonstration Programs at the Open Campus Festival held at the University of Aizu on Aug. 2017

[jpshin-303-011-42:2017] Presentation of the Demonstration Programs at the Open Campus Festival held at the University of Aizu on Oct. 2017

[naru-303-011-14:2017] exhibition in Open Campus of the University of Aizu, 2017.8.11

[naru-303-011-15:2017] lecture in Aizu-Wakamatsu 5th Junior Highschool, Aizu-Wakamatsu, 2017.7.18

[naru-303-011-16:2017] lecture in Aizu-Wakamatsu 1st Junior Highschool, Aizu-Wakamatsu, 2017.10.6

[naru-303-011-17:2017] lecture in Kaneyama Village, Fukushima, 2017.8.4

[naru-303-011-18:2017] lecture in Aizu-Wakamatsu Kawahigashi Junior Highschool, Aizu-Wakamatsu, 2017.11.7

[naru-303-011-19:2017] exhibition in Open Campus of the University of Aizu, 2017.10.7-8

Summary of Achievement

Research achievement that can be used for University-Industry collaboration and its characteristics.(for UBIC's information)

[jpshin-303-011-43:2017] Cursive Style Handwritten Character Synthesis System:1. Synthesizing cursive style characters with probabilistic and natural concatenation between strokes, while not restricting the number of strokes

[jpshin-303-011-44:2017] Kanji Learning System:Verification of educational effect of Kanji learning system for smartphone

[jpshin-303-011-45:2017] Writer Identification System: Enabling low cost writer identification using small number of handwritten character.

[jpshin-303-011-46:2017] Handwriting Recognition Drawn on Screen with Laser-pointer: Enabling the algorithm for Graffiti alphabet character and numeral character recognition.

[jpshin-303-011-47:2017] Simulating Oriental Brush Character Considered With Aerial Action of Pen Tablet: 1.By acquiring the z-coordinate of the pen, more delicate oriental brush characters are able to be expressed. 2.More natural scratchiness, diffusion of the oriental brush are able to be expressed.

[jpshin-303-011-48:2017] User Identification using Leap Motion Controller: 1.We can investigate (1) Inter information among finger joints and (2) Intra information of each finger, e.q. angle of finger joints. 2. The identification rate for 25 persons can be more than 95percent. 3.Goal: A person can be identified only by putting on top of leap motion. Only use the palm of one hand. 4. There is a low risk that we could be lost or stolen. It is used in substitution for a password of the computer.

[jpshin-303-011-49:2017] Character Input System using Fingertip Detection with Kinect Sensor: 1.Able to do quickly input-output of the character. 2.The system can use anyone 3.Increase the method of communication.

[jpshin-303-011-50:2017] Finger Alphabet Recognition for Character Input using Smart Device: This system can be input at a little away distance, because camera of the smart device is recognized fingertips. Users can input characters at a little away location.

[jpshin-303-011-51:2017] Gesture based Non-touch Flick Character Input System 1. To resolve the underlying problem of the advanced system in the study that characters can input without touching a device 2. To use gestural flick input method using

hand gestures, whichever, user will select input character by viewing the display screen. No need to require a lot of knowledge and practicing it. 3. Support for quick input by intuitive operation

[jpshin-303-011-52:2017] Automatic Recognition and Clinical Evaluation of Neurological Movement Disorders using Handwriting 1. Based on long-standing research experience of handwriting, we provide a high-quality user-friendly interactive system for clinical evaluation of handwriting for patients with movement disorders. 2. Our first goal is to automatically characterize the handwriting of patients by extracting the disease-specific features of handwriting data. 3. We use commercially available high-quality, low cost acquisition device for getting handwriting data. 4. This research is expected to make low cost and patient friendly computer aided system for diagnosing neurological disorders.

[jpshin-303-011-53:2017] Hand Gesture Interface Development for Automatic Diagnosis of Movement Disorder Disease 1. Use gesture data to evaluate the movement disorder disease. 2. Build a convenient, low cost motion capture system that can be used for detecting disease of the patient while performing daily life activities. 3. Machine-learning and deep learning approaches will be used to automatic diagnosis and evaluation of Parkinson disease.

Do you have experience of University-Industry collaboration? If yes, please describe your experience. (for UBIC's information)

[jpshin-303-011-54:2017] Cooproject with Movement disorder with Fukushima Medical University and Takeda Sogo Hospital, 2017

Division of Information and Systems

Human Interface Laboratory

Masahide Sugiyama
Professor

Jie Huang
Senior Associate Professor

Konstantin Markov
Senior Associate Professor

Refereed proceedings of an academic conference

[j-huang-304-012-01:2017] Y. Sato, A. Saji, and J. Huang. A 3D Sound Localization System Using Two Side Loudspeaker Matrices. oct, page = 2017.

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[j-huang-304-012-02:2017] Y. Ono, A. Saji, and J. Huang. Frontal sound localization with headphone systems characteristics of each device. oct, page = 2017.

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[markov-304-012-01:2017] K. Markov J. Yu. Deep Learning based Personality Recognition from Facebook Status Updates. In *IEEE 8th International Conference on Awareness Science and Technology*, 2017.

Many approaches have been proposed to automatically infer users personality from their social networks activities. However, the performance of these approaches depends heavily on the data representation. In this work, we apply deep learning methods to automatically learn suitable data representation for the personality recognition task. In our experiments, we used the Facebook status updates data. We investigated several neural network architectures such as fully-connected (FC) networks, convolutional networks (CNN) and recurrent networks (RNN) on the myPersonality shared task and compared them with some shallow learning algorithms. Our experiments showed that CNN with average pooling is better than both the RNN and FC.

Unrefeered proceedings of an academic conference

[sugiyama-304-012-01:2017] M. Sugiyama. Properties of Generalized Anti Magic Graphs. In IPSJ, editor, *Proc. of IPSJ*, pages 6A–06. IPSJ, IPSJ, March 2018.

[sugiyama-304-012-02:2017] M. Sugiyama. Generation and Its Property of Anti-Magic Graphs. In IPSJ Tohoku Chapter, editor, *Technical Report of IPSJ Tohoku Chapter*, pages No.2017–3–9. IPSJ Tohoku Chapter, IPSJ, Dec 2017.

[sugiyama-304-012-03:2017] M. Sugiyama. Magic Graph Generation on Polyhedrons using SAT Solver. In IPSJ Tohoku Chapter, editor, *Technical Re-*

port of IPSJ Tohoku Chapter, pages No.2017–2–3. IPSJ Tohoku Chapter, IPSJ, Feb 2018.

Advisor for undergraduate research and graduate research

[j-huang-304-012-03:2017] Shun Kanno. Graduation Thesis: Creation of virtual impact sounds with different impression from a real sampled original, University of Aizu, 2017.

Thesis Advisor: Huang, J.

[j-huang-304-012-04:2017] Ryo Takamura. Graduation Thesis: The relation of elevation perception in the side area with level changes in frequency subbands, University of Aizu, 2017.

Thesis Advisor: Huang, J.

[j-huang-304-012-05:2017] Atsushi Uemura. Graduation Thesis: Platform for comparing sound spatialization methods in virtual reality, University of Aizu, 2017.

Thesis Advisor: Huang, J.

[j-huang-304-012-06:2017] Koki Nagamine. Graduation Thesis: The size and positions of side loudspeaker matrices for sound image generation in front and upper areas, University of Aizu, 2017.

Thesis Advisor: Huang, J.

[j-huang-304-012-07:2017] Toru Kibushi. Master Thesis: 3D Sound by 5.1 channel home theater systems –Cancelling of HRTFs caused by loudspeaker positions–, University of Aizu, 2017.

Thesis Advisor: Huang, J.

Others

[markov-304-012-02:2017] K. Markov. Introduction to Deep Learning and its applications to Health Informatics, 2017.

Invited Talk, Fukushima Medical University

Contributions related to syllabus preparation

[sugiyama-304-012-04:2017] Discrete Systems

[sugiyama-304-012-05:2017] Digital Signal Processing

[sugiyama-304-012-06:2017] Applied Albegra

[sugiyama-304-012-07:2017] Complex Analysis

Advisor of a student club or circle

[sugiyama-304-012-08:2017] Outdoor circle

Other significant contribution toward university planning, management, or administration

[sugiyama-304-012-09:2017] Director General

Proposal/implementation of a company plan that addresses the current status of the region and establishes ties with the university.

[sugiyama-304-012-10:2017] Working Group on Blind and Computer: I&I

Did you participate in Public Lectures, and/or Open Campus? (Yes or No) If yes, please describe what you did.

[markov-304-012-03:2017] Took part in both Summer and Autumn Open Campus events. Demonstrated th UoA Deep Learning Cloud computing cluster.

[sugiyama-304-012-11:2017] Open Campus in University Festival

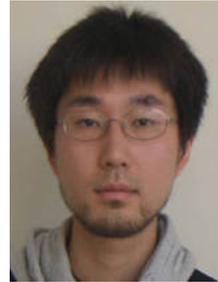[sugiyama-304-012-12:2017] Tree+ing Event in University Festival

Computer Graphics Laboratory

Shigeo Takahashi
Professor

Pierre-Alain Fayolle
Associate Professor

Yohei Nishidate
Associate Professor

Laboratory information:

Members of the Computer Graphics Laboratory conduct research into physics-based modeling of different phenomena, visualization and shape modeling. Innovative approaches to graphical user interfaces and direct interaction methods, modeling, rendering, simulation and visualization are under development. Created mathematical models are used for graphical representation of natural and complex phenomena.

Research areas include:

- Visualization of surface and volume data, which results from finite element, boundary element and finite difference modeling.

- Nanomechanics modeling. Finite element and molecular mechanics modeling of micro- and nanostructures.

- Ray-tracing simulation for lens design.

- Augmented reality interface for different fields of human activity.

- Using graphics processing units for physics-based modeling and animation.

- Development of algorithms for shape modeling, analysis and understanding (operations on shape, segmentation and reconstruction).

- Topological data mining/representation for scientific/mathematical visualization.

- Visual representation of texts and networks for information visualization.

- Map schematization including 2D railway maps, 3D urban maps, map annotations, aesthetic designs, etc.

- Modeling human visual perception and its application to visual analytics.

Professors of the Computer Graphics Laboratory deliver courses in Computer Graphics, Numerical Analysis, Multimedia Systems, Modeling and Visualization. Graduation projects are related to computer graphics, human-computer interaction, physics-based modeling, visualization, and animation.

Refereed academic journal

[fayolle-305-013-01:2017] Alexander Belyaev and Pierre-Alain Fayolle. On modified Gordon-Wixom interpolation schemes and their applications to nonlinear and exterior domain problems. *Numerical Algorithms*, 77(3):691–708, 2018.

We introduce and study extensions and modifications of the Gordon-Wixom transfinite barycentric interpolation scheme (Gordon and Wixom, SIAM J. Numer. Anal. 11(5), 909-933, 1974). We demonstrate that the modified Gordon-Wixom scheme proposed in Belyaev and Fayolle (Comput. Graph. 51, 74-80, 2015) reproduces harmonic quadratic polynomials in convex domains. We adapt the scheme for dealing with the exterior of a bounded domain and for the exterior of a disk, where we demonstrate that our interpolation formula reproduces harmonic functions. Finally, we show how to adapt the Gordon-Wixom approach for approximating p-harmonic functions and to derive computationally efficient approximations of the solutions to boundary value problems involving the p-Laplacian.

[nisidate-305-013-01:2017] Y. Nishidate and I. Khmyrova. Numerical Procedure for Modeling of Light Emitting Diode with Mesh-Like Electrode. *Journal of Physics: Conf. Ser.*, 936:012010, 2017.

A computational procedure is presented for numerical modeling of the light emitting diode (LED) with top p-electrode designed as a mesh with the strips of rectangular cross section. Isotropic light emission in the LED's active region and light reflection from the bottom electrode are considered. Three-dimensional Laplace equation for electric potential is solved by finite element method. The numerical model incorporates mapped infinite element to account for potential decay far away from the LED structure and finite element model developed for boundary condition at semiconductor-air interface in the mesh opening. Simulation results demonstrate the effect of the mesh's geometrical parameters on the total output power.

[shigeo-305-013-01:2017] H.-Y. Wu, S. Takahashi, and R. Ishida. Overlap-Free Labeling of Clustered Networks Based on Voronoi Tessellation. *Journal of Visual Languages and Computing*, 44:106–119, 2018.

Properly drawing clustered networks significantly improves the visual readability of the meaningful structures hidden behind the associated abstract relationships. Nonetheless, we often degrade the visual quality of such clustered

graphs when we try to annotate the network nodes with text labels due to their unwanted mutual overlap. In this paper, we present an approach for aesthetically sparing labeling space around nodes of clustered networks by introducing a space partitioning technique. The key idea of our approach is to adaptively blend an aesthetic network layout based on conventional criteria with that obtained through centroidal Voronoi tessellation. Our technical contribution lies in choosing a specific distance metric in order to respect the aspect ratios of rectangular labels, together with a new scheme for adaptively exploring the proper balance between the two network layouts around each node. Centrality-based clustering is also incorporated into our approach in order to elucidate the underlying hierarchical structure embedded in the given network data, which also allows for the manual design of its overall layout according to visual requirements and preferences. The accompanying experimental results demonstrate that our approach can effectively mitigate visual clutter caused by the label overlaps in several important types of networks.

Refereed proceedings of an academic conference

[fayolle-305-013-02:2017] Pierre-Alain Fayolle, Oleg Fryazinov, and Alexander Pasko. Rounding, Filleting and Smoothing of Implicit Surfaces. In *Proceedings of CAD17*, pages 278–282, 2017.

Modern developments in geometric modelling allow for using a variety of geometry representations in a wide range of applications. As new representations are introduced, one wants to adapt existing processing techniques and methods used with the other representations. One example of such techniques is filleting. It is well known how to perform rounding and filleting for parametric representations, but there is limited prior work for implicit surfaces and procedural volumetric objects. In this work, we discuss possible implementations of filleting, rounding and smoothing operations applied to objects defined in an implicit form by zero level-sets of continuous scalar fields (usually called implicit surfaces). This representation is useful to define a wide range of primitives and operations, including complex geometry such as procedural microstructures. It is possible to simply define these operations, if the scalar field corresponds to the distance to the surface of the object of interest. In practice, however, the distance property can be obtained analytically only for a very limited set of primitives and operations and is easily lost by some common operations in shape modelling, such as,

for example, non-uniform scaling. In this work, we propose to use a numerical method to compute a signed distance field on the basis of an arbitrary continuous scalar field.

[nisidate-305-013-02:2017] Y. Nishidate and I. Khmyrova. Numerical Modeling of the Impact of Top Designed Electrode on LED's Output Performance. In *4th International Conference on Simulation and Modeling Methodologies, Technologies and Applications (SMTA 2017)*, page 033, Sapporo, Japan, Dec. 29–30 2017.

Light-emitting diodes (LEDs) with mesh-like design of top metal electrode with mesh strips of rectangular crossection are studied. Light emission in the LED's active region is assumed to be isotropic. The developed numerical model takes into account light reflection from the bottom electrode. Three-dimensional Laplace equation for electric potential is solved by finite element method. The numerical model incorporates mapped infinite element to account for potential decay far away from the LED structure and finite element model developed for boundary condition at semiconductor-air interface in the mesh opening. Modeling revealed an expected saturation of the total output optical power at very large mesh pitches at. It is also pointed out that the interplay between increasing potential values and reduced mesh openings should be taken into consideration in design of the mesh-like patterned electrodes.

[nisidate-305-013-03:2017] Y. Nishidate and I. Khmyrova. Numerical Procedure for Modeling of Light Emitting Diode with Mesh-Like Electrode. In *6th International Conference on Mathematical Modeling in Physical Sciences (IC-MSQUARE)*, pages Session 1.1–4, Pafos, Cyprus, Aug. 28–31 2017.

A computational procedure is presented for numerical modeling of the light emitting diode (LED) with top p-electrode designed as a mesh with the strips of rectangular cross section. Isotropic light emission in the LED's active region and light reflection from the bottom electrode are considered. Three-dimensional Laplace equation for electric potential is solved by finite element method. The numerical model incorporates mapped infinite element to account for potential decay far away from the LED structure and finite element model developed for boundary condition at semiconductor-air interface in the mesh opening. Simulation results demonstrate the effect of the mesh's geometrical parameters on the total output power.

[nisidate-305-013-04:2017] Y. Nishidate, I. Khmyrova, Yu. Kholopova, E. Polushkin, A. Kovalchuk, V. Zemlyakov, and S. Shapoval. Modeling of InGaN/GaN Light-Emmitting Diodes with Designed p-Electrode. In *41st Workshop on Compound Semiconductor Devices and Integrated Circuits held in Europe (WOCSDICE2017)*, pages 87–88, Las Palmas de Gran Canaria, Spain, May. 21-24 2017.

> Light-emitting diodes (LEDs) with InGaN/GaN quantum wells and mesh-like designed top metal electrode are studied. Isotropic light emission in the LED's active region and light reflection from the bottom electrode are considered. Threedimensional Laplace equation for electric potential is solved by finite element method. The numerical model incorporates mapped infinite element to account for potential decay far away from the LED structure and finite element model developed for boundary condition at semiconductor-air interface in the mesh opening. Simulation results demonstrate the effect of the mesh geometrical parameters on the total output power.

[nisidate-305-013-05:2017] I. Khmyrova, Y. Nishidate, J. Kholopova, E. Polushkin, V. Zemlyakov, and S. Shapoval. Modeling of Light-emitting Diode with Mesh-like Top Electrode: Finite-radius Wire Approximation against Mesh Strips with Rectangular Crossection. In *Progress In Electromagnetics Research Symposium (PIERS2017)*, pages 87–88, St Petersburg, Russia, May. 22-25 2017.

> In this paper we present results of computer modeling of the LED with mesh-like top electrode based on FEM-model for solution of three-dimensional Laplace equation and numerical procedure developed for modeling of light extraction via the mesh openings.

[shigeo-305-013-02:2017] H.-Y Wu, S. Takahashi, S.-H. Poon, and M. Arikawa. Introducing Leader Lines into Scale-Aware Consistent Labeling. In Editor M. P. Peterson, editor, *Advances in Cartography and GI-Science: Selections from the International Cartographic Conference 2017*, pages 21–40. ICA, Springer, 2017.

> Consistently placing annotation labels across map scales often poses a problem due to the restriction of the screen space. This problem becomes further exacerbated when we navigate by arbitrarily zooming in and out of digital maps on mobile devices. In this paper, we introduce leader lines to conventional techniques for scale-aware consistent labeling to accommodate more annotation labels on the map domain while retaining their plausible arrange-

ment. The overall visibility of annotation labels is optimized using genetic algorithms while avoiding their unwanted popping effects and sudden leaps regardless of the change in the map scale. The feasibility of the proposed approach is demonstrated by experimental results including comparison with relevant techniques.

[shigeo-305-013-03:2017] H.-Y. Wu, S. Takahashi, S.-H. Poon, and Masatoshi Arikawa. Scale-Adaptive Placement of Hierarchical Map Labels. In B. Kozlikova, T. Schreck, and Editors T. Wischgoll, editors, *Short Paper Proceedings of the 19th Eurographics Conference on Visualization (EuroVis2017)*, pages 1–5. The Eurographics Association, 2017.

Nowadays, digital map services provide a large amount of spatial data and thus facilitate users to dynamically navigate map contents across multiple scales on small mobile devices. In this context, consistently placing map labels in interactive navigation is important but still technically challenging, especially when the labels are associated with multiple layers, which are inherent in map contents. In this paper, we introduce a genetic-based approach to optimize the placement of annotation labels with different ranges of map scales by maximizing label visibility of the existing scale while avoiding unwanted mutual overlaps and sudden popping effects. This is accomplished by grouping the label IDs into multiple chromosomes according to their importance and then forming composite chromosomes, each of which is reordered to optimize the overall visibility of the labels. Our formulation also allows the individual labels to move across the scale adaptively in order to further improve label placement on the respective scales. We show several experimental results to present the effectiveness of the proposed approach.

[shigeo-305-013-04:2017] H.-Y. Wu, Y. Niibe, K. Watanabe, S. Takahashi, M. Uemura, and I. Fujishiro. Making Many-to-Many Parallel Coordinate Plots Scalable by Asymmetric Biclustering. In *Notes Proceedings of the 10th IEEE Pacific Visualization Symposium (PacificVis2017)*, pages 305–309, 2017.

Datasets obtained through recently advanced measurement techniques tend to possess a large number of dimensions. This leads to explosively increasing computation costs for analyzing such datasets, thus making formulation and verification of scientific hypotheses very difficult. Therefore, an efficient approach to identifying feature subspaces of target datasets, that is, the subspaces of dimension variables or subsets of the data samples, is required to describe the essence hidden in the original dataset. This paper proposes

a visual data mining framework for supporting semiautomatic data analysis that builds upon asymmetric biclustering to explore highly correlated feature subspaces. For this purpose, a variant of parallel coordinate plots, many-to-many parallel coordinate plots, is extended to visually assist appropriate selections of feature subspaces as well as to avoid intrinsic visual clutter. In this framework, biclustering is applied to dimension variables and data samples of the dataset simultaneously and asymmetrically. A set of variable axes are projected to a single composite axis while data samples between two consecutive variable axes are bundled using polygonal strips. This makes the visualization method scalable and enables it to play a key role in the framework. The effectiveness of the proposed framework has been empirically proven, and it is remarkably useful for many-to-many parallel coordinate plots.

Writing a part of textbook or technical book

[fayolle-305-013-03:2017] Alexander Belyaev and Pierre-Alain Fayolle. *Generalized Barycentric Coordinates in Computer Graphics and Computational Mechanics*, chapter 3 - Transfinite Barycentric Coordinates. CRC Press, 2017.

Research grants from scientific research funds and public organizations

[shigeo-305-013-05:2017] Shigeo Takahashi (as the Principal Investigator). Ministry of Education Scientific Research Fund (Scientific Research (B)): Dynamic layout optimization for annotated information visualization, 2016–2018.

[shigeo-305-013-06:2017] Shigeo Takahashi (as a Co-Investigator). Ministry of Education Scientific Research Fund (Scientific Research on Innovative Areas) Consolidation of Visualization Platform Toward Facilitating Sparse Modeling, 2013–2017.

Academic society activities

Summary of Achievement

[fayolle-305-013-04:2017] Pierre-Alain Fayolle, 2017.
            GRAPP17 - Program committee member

[fayolle-305-013-05:2017] Pierre-Alain Fayolle, 2018.
            GRAPP18 - Program committee member

[fayolle-305-013-06:2017] Pierre-Alain Fayolle, 2017.
            CAD - Computer Aided Design, reviewer

[fayolle-305-013-07:2017] Pierre-Alain Fayolle, 2018.
            CAD - Computer Aided Design, reviewer

[fayolle-305-013-08:2017] Pierre-Alain Fayolle, 2017.
            CGI17 - Computer Graphics International, reviewer

[fayolle-305-013-09:2017] Pierre-Alain Fayolle, 2017.
            GRAPP17 - International Conference on Computer Graphics, Theory and Applications, reviewer

[fayolle-305-013-10:2017] Pierre-Alain Fayolle, 2018.
            GRAPP18 - International Conference on Computer Graphics, Theory and Applications, reviewer

[fayolle-305-013-11:2017] Pierre-Alain Fayolle, 2017.
            IJIG - International Journal of Images and Graphics, reviewer

[fayolle-305-013-12:2017] Pierre-Alain Fayolle, 2017.
            JVLC - Journal of Visual Language and Computing, reviewer

[fayolle-305-013-13:2017] Pierre-Alain Fayolle, 2017.
            TVC - The Visual Computer, reviewer

[fayolle-305-013-14:2017] Pierre-Alain Fayolle, 2017.
            JOVI - Journal of Visualization, 2017

[fayolle-305-013-15:2017] Pierre-Alain Fayolle, 2018.
            TOG - Transactions on Graphics, reviewer

[nisidate-305-013-06:2017] Y. Nishidate, Sep. 2017.

> Reviewer, Applied Optics

[shigeo-305-013-07:2017] Shigeo Takahashi, 2016–.

> Associate Editor, International Journal: Computer Graphics Forum

[shigeo-305-013-08:2017] Shigeo Takahashi, 2015–.

> Associate Editor: International Journal: Computational Visual Media

[shigeo-305-013-09:2017] Shigeo Takahashi, June 2017.

> Programme Co-Chair of the STAR track of the 19th EG/VGTC International Conference on Visualization (EuroVis 2017)

[shigeo-305-013-10:2017] Shigeo Takahashi, August 2017.

> Conference Co-Chair, The Symposium on Visual Information Communication and Interaction (VINCI2017)

Advisor for undergraduate research and graduate research

[fayolle-305-013-16:2017] Riki Iwanabe. Web-based 3D Kanji creation, The University of Aizu, 2018.

> BSc. dissertation

[fayolle-305-013-17:2017] Yuji Yoshida. Web-based 3D object control via head tracking, The University of Aizu, 2018.

> BSc. dissertation

[fayolle-305-013-18:2017] Shogo Suzuki. Web-based implicit surface modeler, The University of Aizu, 2018.

> BSc. dissertation

[fayolle-305-013-19:2017] Tomohiko Nagahisa. User-assisted reverse modeling, The University of Aizu, 2018.

> BSc. dissertation

[fayolle-305-013-20:2017] Ryota Mukai. Implementation of an implicit surface meshing algorithm using functional programming, The University of Aizu, 2018.

Summary of Achievement

BSc. dissertation

[fayolle-305-013-21:2017] Hokuto Yamaguchi. Multiple offsetting of implicit surfaces, The University of Aizu, 2018.

BSc. dissertation

[fayolle-305-013-22:2017] Shingo Ito. Reverse CSG construction of implicit surfaces and applications, The University of Aizu, 2018.

MSc. dissertation

[nisidate-305-013-07:2017] Yuichi Nakata. Graduation thesis, University of Aizu, 2018.

Thesis Advisor: Y. Nishidate

[nisidate-305-013-08:2017] Kei Kato. Graduation thesis, University of Aizu, 2018.

Thesis Advisor: Y. Nishidate

[nisidate-305-013-09:2017] Takamichi Suzuki. Graduation thesis, University of Aizu, 2018.

Thesis Advisor: Y. Nishidate

[nisidate-305-013-10:2017] Kohei Higuchi. Graduation thesis, University of Aizu, 2018.

Thesis Advisor: Y. Nishidate

[nisidate-305-013-11:2017] Megumi Takato. Graduation thesis, University of Aizu, 2018.

Thesis Advisor: Y. Nishidate

[nisidate-305-013-12:2017] Yuji Tamakawa. Graduation thesis, University of Aizu, 2018.

Thesis Advisor: Y. Nishidate

[shigeo-305-013-11:2017] Takahiro Higuchi. Graduation Thesis: Evaluation Study on Contour-Based Depth Enhancement of 3D Objects, University of Aizu, February 2018.

Thesis Advisor: Shigeo Takahashi

[shigeo-305-013-12:2017] Yuka Yoshida. Graduation Thesis: Interactive Design of Schematic Patterns in Railway Maps, University of Aizu, February 2018.

> Thesis Advisor: Shigeo Takahashi

[shigeo-305-013-13:2017] Ken Maruyama. Graduation Thesis: Improved Foldability of 3D Meshes by Optimizing the Order of Edge Cuts, University of Aizu, February 2018.

> Thesis Advisor: Shigeo Takahashi

Others

[fayolle-305-013-23:2017] CPFD - Committee for the Promotion of Faculty Development, committee member

Contributions related to syllabus preparation

[nisidate-305-013-13:2017] Numerical Analysis (role: Course Coordinator)

[nisidate-305-013-14:2017] Finite Element Modeling and Visualization (role: Master course instructor)

Preparation of course examination to measure comprehension

[shigeo-305-013-14:2017] CG-ARTS cerfification, CG engineering examinzation committee member, CG-ARTS Society

Contribution related to the building or operation of the university computer system

[nisidate-305-013-15:2017] Computer System 2 Replace Working Group (role: Committee Member)

Contribution related to educational planning management

Summary of Achievement

[nisidate-305-013-16:2017] Honors Program Working Group (role: Committee Member)

[shigeo-305-013-15:2017] Member of the University of Aizu Employment Duty Related Invention Deliberation Council

[shigeo-305-013-16:2017] Member of the University of Aizu Cooperative Research, Etc. Acceptance Deliberation Committee

[shigeo-305-013-17:2017] Member of the University of Aizu Mid-Term Plan Working Group

[shigeo-305-013-18:2017] CAIST Advisory Board Member

[shigeo-305-013-19:2017] Coordinatory of IT Field for Undergraduate Courses

Other significant contribution toward university planning, management, or administration

[nisidate-305-013-17:2017] PC-Koshien Programming Section (role: Problem Preparation Committee)

[nisidate-305-013-18:2017] PC-Koshien Programming Section, Preliminaly and Final Contests (role: Judge)

[nisidate-305-013-19:2017] Entrance Exam (role: Problem Proposals, Problem Creation, and Marking)

[nisidate-305-013-20:2017] Entrance Exam by Commendation(role: Problem Proposals, Problem Creation, and Marking)

Contributions related to regional education

[nisidate-305-013-21:2017] Computer Science Summer Camp (role: Executive Committee)

[nisidate-305-013-22:2017] Computer Science Summer Camp (role: Computer Graphics Course Coordinator)

Did you participate in Public Lectures, and/or Open Campus? (Yes or No) If yes, please describe what you did.

[nisidate-305-013-23:2017] organized place to exhibit, recruited students to explain, provided materials to exhibit.

[shigeo-305-013-20:2017] Computer Graphics for Modeling and Visualizing Complexities (Summer and Autumn)

Biomedical Information Technology Laboratory

Wenxi Chen
Professor

Xin Zhu
Senior Associate Professor

Yasuhiro Hisada
Associate Professor

Biomedical Information Technology Laboratory (BIT Lab.) is seeking - to develop diversified methodologies for seamless and persistent monitoring of various vital signs by making use of innovative measurement principles. - to develop algorithms for theoretical simulation, signal processing, image processing and data mining to reveal statistical links between incidence of various diseases and dynamics of health condition. - to construct an integrated infrastructure SHIP (Scalable Healthcare Integrated Platform) for lifelong healthcare by full use of the latest ICT advancement in IoT, AI, big data and etc. - to foster a new discipline Metrology of Health or Healthology to quantify the overall health status from an integrative standpoint and to untangle the causal connections among longevity and relevant determinants such as pathogeny and immunity, meteorological and environmental factors, and social-behavioral-psychoneurotic interactional aspects.

Prof. Chen's research activities continued focusing on the ICT-based healthcare domain to develop a long-term strategy for daily healthcare. Prof. Chen conducted several projects. These studies developed an Internet-based infrastructure, including a series of instrumentation for seamless monitoring of vital signs without disturbing subjects in daily life activities, and a variety of algorithms for in-depth data mining and big data analytics in biomedical application. Several cooperative studies with external institutions and companies were implemented for field trial and exploring possibility of commercialization. - A cooperative study with four nursing homes aimed to collect elderly data and to assess the system performance through field trial. - A cooperative study with Bange Welfare General Hospital collected clinical data from patients suffered from kidney disorder, and evaluated the therapeutic effect during dialysis. - A cooperative study with Simplex Quantum Inc. developed API libraries for healthcare application and relevant commercialized products.

Prof. Zhu's research is focused on biomedical signal processing, image processing, and cardiac modeling and simulation. His collaboration research supported by JSPS with Fukuoka University is to develop an organic model for the study on the mechanism of atrial fibrillation. Currently, he is also studying the computer-aided diagnosis of colorectal polyps from colonoscopy videos/images using deep learning with Aizu Medical Center, Fukushima Medical University.

Prof. Hisada's research relates of health care application and system for monitoring wandering. The self-management support system for diabetic patient and positioning system for wandering person using sensor network are focused. And he studies also the remote sensing field. The environmental monitoring of wetland and the crustal deformation such as volcano and earthquake, landslide using SAR(Synthetic Aperture Radar) data are focused. Moreover, in order to observe ground, he studies the wireless snow weight measurement system and the reconstructing method of 3D model for wetland using UAV video.

Summary of Achievement

Refereed academic journal

[wenxi-306-014-01:2017] Zunyi Tang Wenxi Chen Shigehiko Kanaya Ming Huang, Toshiyo Tamura. A Wearable Thermometry for Core Body Temperature Measurement and Its Experimental Verification. *IEEE JOURNAL OF BIOMEDICAL AND HEALTH INFORMATICS*, Vol. 21(No. 3), May 2017.

pp.708-714

[wenxi-306-014-02:2017] Chen W. Kobayashi T, Ishii Y. A Simple and Quantitative Neuropsychological Test of Face Perception: The Effects of Age and Gender on Perceiving Young Faces. *J Hosp Health Care Admin*, 1:1–9, 1 2018.

Background and Objectives: Developing a new method of easily measure the images discrimination ability of subjects within a few minutes for medical and educational applications. Methods: A touch-screen display panel (DP) of a personal computer was divided into nine cells, three columns and three rows, showing a different photograph of faces of early twenties. The central image was the target and the surrounding eight images were the references. A test participant was required to sit in front of the DP and to touch one of the references images that he/she considered to be the target within 10 secs, which were repeated for 30-times. The correct answer rate and average response time (sec) were obtained according to the 234-participants, 6-85 years old. Results: Participants in their early 20s showed peak capability of discrimination. Results were obtained when comparing participants' responses to images of the same and the opposite gender. Female faces were always better identified than male faces by participants of both genders for aged under 40 years. For participants aged over 40 years, the capabilities were reversed: male faces were a little better identified than female faces by both genders. Discrimination capabilities for different facial imaging angles were also clarified. Limitations: Most of the composition of tested participants were young, under 24 years old. Conclusions: The results suggest that these phenomena represent the age-related neuropsychological characteristics for perceiving the same and the opposite gender. An easy and quantitative method for images perception was developed applicable to medical and education purposes.

[wenxi-306-014-03:2017] Masaki Sekine Ming Huang Wenxi Chen Masaki Yoshida Kaoru Sakatani Hiroshi Kobayashi Zunyi Tang, Toshiyo Tamura and

Shigehiko Kanaya. A Chair-Based Unobtrusive Cuffless Blood Pressure Monitoring System Based on Pulse Arrival Time. *IEEE JOURNAL OF BIOMEDICAL AND HEALTH INFORMATICS*, 21(5):1194–1205, 2017.

In this paper, we present an unobtrusive cuffless blood pressure (BP) monitoring system based on pulse arrival time (PAT) for facilitating long-term home BP monitoring. The proposed system consists of an electrocardiograph (ECG), a photoplethysmograph (PPG), and a control circuit with a Bluetooth module, all of which are mounted on a common armchair to measure ECG and PPG signals from users while sitting on the armchair in order to calculate continuous PAT. Considering the good linear correlation of systolic BP (SBP) and the nonlinear correlation of diastolic BP (DBP) with PAT, a new BP estimation method was proposed.Ten subjects underwent BP monitoring experiments involving stationary sitting on a chair, lying on a bed, and pedaling using an ergometer in order to assess the accuracy of the estimated BP. A cuff-type BP monitor was used as reference in the experiments. Results showed that the mean difference of the estimated SBP and DBP was within 0.2+-5.8 mmHg (p smaller than 0.00001) and 0.4+-5.7 mmHg (p smaller than 0.00001), respectively, and the mean absolute difference of the estimated SBP and DBP were 4.4 and 4.6 mmHg, respectively, compared to references. Additionally, five subjects participated in data collections consisting of sitting on a chair twice a day for one month. Compared to the reference, the difference did not obviously increase along with time, even though individualized calibration was executed only once at the beginning. These results suggest that the proposed system has quite the potential for long-term home BP monitoring.

Unrefereed academic journal

[wenxi-306-014-04:2017] Shuxue Ding Abderazek Ben Abdallah Wenxi Chen Zixue Cheng, Qiangfu Zhao. Distinguished University Focusing on Computer Science and Engineering Education for Cultivation of Global IT Innovators. *Computer Education*, 269(5):8–12, May 2017.

[wenxi-306-014-05:2017] Wenxi Chen. Full automatic measurement of electrocardiogram signal during daily bathing and construction of wellness management system. *Automatic Recognition*, pages 42–51, 12 2017.

JAPAN INDUSTRIAL PUBLISHING CO., LTD

Summary of Achievement

Refereed proceedings of an academic conference

[wenxi-306-014-06:2017] Toshiyo Tamura Wenxi Chen. Measurement and Analysis of Daily Blood Pressure Over a Two-Year Period. In *EMBC2017 Minisymposium -Emerging Technologies for Cuffless Unobtrusive Blood Pressure Monitoring: Celebration of 200th Birth Anniversary of Carl Ludwig*, July 2017.

[wenxi-306-014-07:2017] Wenxi Chen. A Bathtub System for Automatic Monitoring of Multiple Leads ECG and Wellness Management. In *uHealthcare 2017*, Dec. 2017.

[wenxi-306-014-08:2017] Xin Zhu Ying Chen, Tianhui Li and Wenxi Chen. Daily Stress Assessment Using Heart Rate Variability of Bathtub ECG Signals. In *uHealthcare 2017*, Dec. 2017.

[wenxi-306-014-09:2017] Xin Zhu Tianhui Li, Ying Chen and Wenxi Chen. Long Term Analysis of Heart Rate Variability during Daily Bathing. In *uHealthcare 2017*, 2017.

[wenxi-306-014-10:2017] Wenxi Chen Ying Chen. Finger ECG-based Authentication for Healthcare Data Security Using Artificial Neural Network. In *2017 IEEE 19th International Conference on e-Health Networking, Applications and Services (Healthcom)*, pages 1–6, 10 2017.

Wearable and mobile medical devices provide efficient, comfortable, and economic health monitoring, having a wide range of applications from daily to clinical scenarios.Health data security becomes a critically important issue. Electrocardiogram (ECG) has proven to be a potential biometric in human recognition over the past decade. Unlike conventional authentication methods using passwords, fingerprints, face, etc., ECG signal can not be simply intercepted, duplicated, and enables continuous identification. However, in many of the studies, algorithms developed are not suitable for practical application, which usually require long ECG data for authentication. In this work, we introduce a two-phase authentication using artificial neural network (NN) models. This algorithm enables fast authentication within only 3 seconds, meanwhile achieves reasonable performance in recognition. We test the proposed method in a controlled laboratory experiment with 50 subjects. Finger ECG signals are collected using a mobile device at different times and physical statues. At the first stage, a General NN model is constructed based on data from the

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cohort and used for preliminary screening, while at the second stage Personal NN models constructed from single individuals data are applied as fine-grained identification. The algorithm is tested on the whole data set, and on different sizes of subsets (5, 10, 20, 30, and 40). Results proved that the proposed method is feasible and reliable for individual authentication, having obtained average FAR and FRR below 10 percent for the whole data set.

[zhuxin-306-014-01:2017] Yanghua Shen Xin Zhu Daiki Nemoto Daisuke Takayanagi Masato Aizawa Noriyuki Isohata Kenichi Utano Kensuke Iwamoto Shungo Endo Zhe Guo, Yu Wang and Kazutomo Togashi. Automatic Polyp Recognition from Colonoscopy Images Based on Bag of Visual Words. In *Proc. 8th International Conference on Awareness Science and Technology*, November 2017.

Colorectal cancer (CRC) is a leading cause of cancer. The incidence and mortality rates of CRC are expected to steadily increase in the future. Colonoscopy is the most popular and effect method for curing and screening CRC. However, 25 polyps were reported to be missed during colonoscopy examinations. In this study, we proposed a method to classify polyps from background based on bag-of-visual-words (BoW) from colonoscopy images. This method generates a histogram of visual word occurrences to represent an image. The histograms of a dataset were used to train an image category classifier. Validation was performed on 35 subjects' data with an average specificity of 97.01, an average sensitivity of 99.43, and an average accuracy of 97.8.

[zhuxin-306-014-02:2017] Lin-Hai Kurahara Jun Ichikawa Tomohiro Numata Xin Zhu Ryuji Inoue Yaopeng Hu, Keizo Hiraishi. Numerical model-based investigation on the role of transient receptor potential melastatin subfamily member 4 (TRPM4) channel in cardiac arrhythmogenicity. In *Program IEEE EMBC 2017*, July 2017.

TRPM4 channel is a Ca2+-activated monovalent cation channel involved in a variety of biological functions. The present study aims at elucidating its role in cardiac arrhythmogenicity during cardiac remodeling by electrophysiological experiments and numerical simulations. To obtain quantitative data valid for mathematical formulation of TRPM4 gating kinetics, we developed an ionomycin-permeabilized cell-attached recording technique. The obtained gating parameters were incorporated into the action potential model previously created for an immortalized atrial myocyte cell line HL-1. The results ofnumerical simulations using this model precisely reproduced the observed electrophysiological changes recorded from HL-1 cells, where upregulation of TRPM4

activity caused prolongation of action potential (AP) and EAD-like prema-
ture excitations. We next investigated the impact of cardiomyocyte-fibroblast
interaction on atrial excitation/propagation by co-culturing HL-1 cells and car-
diac fibroblasts to form monolayer clusters, from which electrophysiological
recordings were made by escin-perforated patch clamp technique. At conflu-
ency, the clusters generated spontaneous beatings and action potentials (APs)
which were synchronized with intracellular Ca2+ elevations. Increasing the fi-
broblast/myocyte ratio resulted in prolonged APs with decreased frequency
and upstroke velocity. These changes were abrogated by a gap junction blocker
carbenoxolone, and similar extents of AP prolongation and depolarization of
diastolic potential were induced in single HL-1 myocytes treated with an in-
flammatory cytokine TGF;. These changes were almost completely inhibited by
9-phenathrol at its concentration to selectively inhibit TRPM4 channel. These
results suggest that fibroblasts modify the frequency, morphology and propa-
gation pattern of atrial cardiomyocyte APs through both direct electrical cou-
pling and indirect biochemical modification which may involve the activation
of TRPM

[zhuxin-306-014-03:2017] Xin Zhu Tianhui Li, Ying Chen and Wenxi Chen. Long
Term Analysis of Heart Rate Variability during Daily Bathing. In *Proc
of uHealthcare 2017*, 2017.

Long Term Analysis of Heart Rate Variability during Daily Bathing

[zhuxin-306-014-04:2017] Keizo Hiraishi Lin-Hai Kurahara Jun Ichikawa Tomo-
hiro Numata Feng Qiu Wenfeng Shen Xin Zhu Ryuji Inoue Yaopeng Hu,
Yanghua Shen. Multi-hierarchical analysis of TRPM4 arrhythmogenic-
ity by experimental and numerical approaches. In *Proc. of Annual Con-
ference of Physiological Society of Japan 2018*. Physiological Society of
Japan, 2018.

Multi-hierarchical analysis of TRPM4 arrhythmogenicity by experimental and
numerical approaches

[zhuxin-306-014-05:2017] Xin Zhu Ying Chen, Tianhui Li and Wenxi Chen. Daily
Stress Assessment Using Heart Rate Variability of Bathtub ECG Signals.
In *Proc. of uHealthcare 2017*, December 2017.

Daily Stress Assessment Using Heart Rate Variability of Bathtub ECG Signals

[zhuxin-306-014-06:2017] Xin Zhu Yaopeng Hu Feng Qiu Yanghua Shen, Wen-

feng Shen. A Cardiac Reaction-Diffusion model based on TRPM4 channel. In *Proc. of IEEE EMC 2017*, July 2017.

We proposed a 2D cardiac model based on an anisotropic monodomain system. This model was integrated with a new cardiac action potential (AP) model involving a TRPM4 channel. This model may serve as a platform for studying TRPM4 pro-arrhythmic and anti-arrhythmic effects.

[zhuxin-306-014-07:2017] Xin Zhu Yaopeng Hu Ryuji Inoue Feng Qiu, Wenfeng Shen and Yanghua Shen. An Energy Efficient Parallelization for Computer Simulation of Electrocardiograms Based on TK1 Board. In *Proc. of IEEE EMBC 2017*. IEEE, July 2017.

We employ a Tegra K1(TK1) System on Chip(SoC) board to achieve an energy efficient parallelization for simulation computation of electrocardiograms(ECGs) based on a whole-heart model. Our experiments evaluate the performance and energy consumption in different situations. Finally, we indicate that the energy efficiency of TK1 board notably high than that of the ordinary personal computer(PC), the performance is also close to that of PC.

Unrefeered proceedings of an academic conference

[zhuxin-306-014-08:2017] Xue Zhou Mahito Noro Xin Zhu, Keijiro Nakamura. Preliminary Report on the Study of ECG Automatic Interpretation Program Using Deep Learning. In *Proc. 32th annual conference of Japanese Society of Computed Electrocardiology*. Japanese Society of Computed Electrocardiology, June 2017.

[zhuxin-306-014-09:2017] Xin Zhu Shenyang Hua. Study on a 2D Cardiac Model Incorporating a TRPM4 Ion Channel. In *Proc of Toin International Symposium 2017*, November 2017.

[zhuxin-306-014-10:2017] Keizo Hiraishi Lin-Hai Kurahara Jun Ichikawa Tomohiro Numata Feng Qiu Wenfeng Shen Xin Zhu Ryuji Inoue Yaopeng Hu, Yanghua Shen. TRPM4 channel and its significant implications in arrhythmogenicity. In *Proc. of 32th Annual Conference of Japanese Society of Computed Electrocardiology*, June 2017.

[zhuxin-306-014-11:2017] Xin Zhu Yu Wang. Computer-assisted Diagnosis for The Detection of Polyps from Endoscopy Images. In *Proc. of Toin International Symposium 2017*, November 2017.

Summary of Achievement

[zhuxin-306-014-12:2017] Xue Zhou and Xin Zhu. Detect the Premature Ventricular Contraction Using 1D Convolutional Neural Network. In *Proc. of Toin International Symposium 2017*, June 2017.

Writing a part of textbook or technical book

[wenxi-306-014-11:2017] Wenxi Chen (Eds.) Toshiyo Tamura. *Seamless Healthcare Monitoring-Advancements in Wearable, Attachable, and Invisible Devices.* Springer, 2017.

Research grants from scientific research funds and public organizations

[zhuxin-306-014-13:2017] Xin Zhu Ryuichi Inoue, Tomohiro Numata. Multihierarchial analysis of TRPM family mechanism in the induction of atrial fibrillation, 2017.

Academic society activities

[zhuxin-306-014-14:2017] Xin Zhu, June 2017.

Chair of the 32th Annual Conference of Japanese Society of Computed Electrocardiology

[zhuxin-306-014-15:2017] Xin Zhu, November 2017.

Program chair of International Conference on Awareness Science and Technology (iCAST) 2017

[zhuxin-306-014-16:2017] Xin Zhu, July 2017.

Organizer of IEEE EMBC 2017 Minisymposium TITLE: TRP channels: multihierarchical measurement and modeling

Patent

[wenxi-306-014-12:2017] Yuji Hamada Wenxi Chen, Ying Chen. Authentication device, method, and computer program, 2017.

Advisor for undergraduate research and graduate research

[wenxi-306-014-13:2017] Bingjie Shi. Master, University of Aizu, September 2017.

    Supervisor

[wenxi-306-014-14:2017] Kento Asatsuma. Master, University of Aizu, March 2017.

    co-referee

[wenxi-306-014-15:2017] Tsukasa Aketagawa. Master, University of Aizu, March 2017.

    co-referee

[wenxi-306-014-16:2017] Yanghua Shen. Master, University of Aizu, March 2017.

    co-referee

[wenxi-306-014-17:2017] Kai Shimoyama. Graduation thesis, University of Aizu, March 2017.

    Supervisor

[wenxi-306-014-18:2017] Yoko Ota. Graduation thesis, University of Aizu, March 2017.

    Supervisor

[wenxi-306-014-19:2017] Ai Sakuma. Graduation thesis, University of Aizu, March 2017.

    Supervisor

[wenxi-306-014-20:2017] Shohei Matsumoto. Graduation thesis, University of Aizu, March 2017.

    Supervisor

[wenxi-306-014-21:2017] Hikari Tamura. Graduation thesis, University of Aizu, March 2017.

    Supervisor

[wenxi-306-014-22:2017] Haruto Minezumi. Graduation thesis, University of Aizu, March 2017.

    Referee

Summary of Achievement

[wenxi-306-014-23:2017] Nagisa Ito. Graduation thesis, University of Aizu, March 2017.

　　Referee

[wenxi-306-014-24:2017] Yuki Suzuki. Graduation thesis, University of Aizu, March 2017.

　　Referee

[zhuxin-306-014-17:2017] Kento Asatsuma. Master thesis, Graduate School of Computer Science and Engineering, March 2018.

[zhuxin-306-014-18:2017] Tsukasa Aketakawa. Master thesis, Graduate School of Computer Science and Engineering, March 2018.

[zhuxin-306-014-19:2017] Yanghua Shen. Master thesis, Graduate School of Computer Science and Engineering, March 2018.

[zhuxin-306-014-20:2017] Takaya Mizuno. Bachelor thesis, School of Computer Science and Engineering, March 2018.

[zhuxin-306-014-21:2017] Toshihiro Kusanagi. Bachelor thesis, School of Computer Science and Engineering, March 2018.

[zhuxin-306-014-22:2017] Nagisa Ito. Bachelor thesis, School of Computer Science and Engineering, March 2018.

[zhuxin-306-014-23:2017] Yuki Suzuki. Bachelor thesis, School of Computer Science and Engineering, March 2018.

[zhuxin-306-014-24:2017] Haruto Minezumi. Lie Detection Using Photoplethysmograms and Electrocardiograms, School of Computer Science and Engineering, March 2018.

Others

[wenxi-306-014-25:2017] Wenxi Chen. Umemory. trademark registered, 6 2017.

　　Trademark 2016-132009

[zhuxin-306-014-25:2017] Yanghua Shen Xin Zhu Zhe Guo, Yu Wang. Automatic Polyp Recognition from Colonoscopy Images Based on Bag of Visual Words, November 2017.

Best paper award, iCAST 2017

[zhuxin-306-014-26:2017] Xin Zhu Yu Wang. Computer-assisted diagnosis for the detection of polyps from endoscopy images, November 2017.

Gold Prize, Poster session award, Toin International Symposium

Contribution related to educational planning management

[wenxi-306-014-26:2017] Graduate School of Computer Science and Engineering Graduate Program Instructor Qualification Examination

Other significant contribution toward university planning, management, or administration

[wenxi-306-014-27:2017] Faculty Assembly of Meeting Member, Graduate School Faculty Assembly Meeting Member, Meeting of the Deans Directors Council Member, The Information Systems Division Meeting Member, Competitive Research Funding Evaluation Committee, Cooperative Research, Etc. Acceptance Deliberation committee Member, Employment Duty Related Invention Deliberation council Member, Curriculum Member, Research ethics committee Member,

Contributions related to regional education

[wenxi-306-014-28:2017] Member of Committee for Promotion of Advanced Human Resources Development Business of Medical-related Industry

Did you participate in Public Lectures, and/or Open Campus? (Yes or No) If yes, please describe what you did.

[wenxi-306-014-29:2017] Open Labs 2017(Summer session)(Autumn session) Research Theme/Title:Seamless Monitoring and Comprehensive Interpretation of Physiological Information for Daily Healthcare

Summary of Achievement

[zhuxin-306-014-27:2017] Open campus participation in August and October 2017

[zhuxin-306-014-28:2017] JST New Technology Seminar, March 2018

[zhuxin-306-014-29:2017] Medical Creation Fukushima 2017, Exhibition

[zhuxin-306-014-30:2017] Keynote speech, Toin International Symposium 2017

Database Systems Laboratory

Subhash Bhalla
Professor

Yutaka Watanobe
Senior Associate Professor

Wanming Chu
Assistant Professor

Information systems in scientific data archives, transportation, welfare, health-care and public utility services depend on large scale data management systems. Research activity in Database Systems is focused on broadening their range of applicability. It is also focused on improving the performance of domain specific applications. Large applications for e-governance and services use database systems as a basic part for web data resources. This year the laboratory organized an International Symposium with many invited distinguished researchers during 27 Nov. - 29 Nov. 2017. The delivered lecture and manuscripts are being utilized to develop the state-of-the-art lectures on current research problems. These created a focused view on new research problems. Many current aspects of web related research activity were discussed at the symposium. The delivered lecture provided recent views on research problems. Most of the advances in techniques concentrate on capturing more meaning within data. A number of researchers are actively developing improved data management strategies using Business Intelligence and data. This provides a challenging area for study. The domains of activity include: a) developing new user interfaces and query languages for skilled and semi- skilled users in health-care; b) developing infrastructures for computing facilities for cloud computing; c) supporting mobile computing applications, d) designing new data models and asynchronous computation models for trans- action and services, and e) Study of Poly-store Data Management Systems. In addition to complexity in features such as multiple attributed data, many new types of raw data are emerging that need to be captured by DBMSs for information extraction. Many research efforts are being made to make suitable Object-Relational architectures for spatial databases. The Database Systems Laboratory has research activity concentrating on data modeling as well as transaction processing activity. Data Modeling for Spatial Objects Information Processing Systems of future will be a combination of

integrated components. There will be components for intelligent problem solving, or decision making, components for specialized data processing and components for shared in- formation management. The applications will utilize a shared base of information. Some examples are - business automation, industrial automation, computer-aided design and manufacture, and cartography. Workflow and Web Services Traditional approaches to transaction management introduce elements of unpredictable delays during transaction processing. Thus, making these not suitable for adoption in new application environments. The techniques for time-critical transactions are applicable to Mobile databases and multimedia databases. Healthcare Studies The goal of this research is to study the Standardized Electronic Health Records (EHRs) databases. It is a temporal computational system with the ability to process large volume of information. Such system will prove useful in various areas of information technology such as online healthcare agencies. The modeling considers the complementary points of view: 1. EHRs data mining approach to address the epidemic studies, 2. An approach that involves the user in the modeling process. 3. Query Language with reference to user skills Prototype systems to access dynamic contents through web based information systems are in progress. These emulate mobile e-commerce activity in banking and Geographic Information Systems, for test and studies. The test prototypes have been evolved based on research on new easy-to-use search and also new query language interfaces.

Refereed academic journal

[bhalla-307-008-01:2017] Subhash Bhalla Shelly Sachdeva, Shivani Batra. Evolving large scale healthcare applications using open standards. *Health Policy and Technology*, 6(4):410–425, December 2017.

Electronic Health Records (EHRs) are becoming more prevalent in health care. Worldwide exchange of healthcare data demands adherence to semantic interoperable standards to overcome the language and platform barriers. Various healthcare organizations in developing countries such as, India adopt their own independent information systems without adhering to standard guidelines. Thus, this tends to sacrifice interoperability. This affects permanent persistence of longitudinal health records for future reference and research purpose. Current research implements a standard based clinical application to be used for healthcare domain in India. The study has been done for enhancing the data quality through standardization. It aims at providing a generic permanent persistence to track life-long interoperable health records of patients. This is the first effort for exploring its adoption for various regional languages in India. The user interfaces have been generated for various Indian languages for testing on a sample set of archetypes. The clinical application deployed in Hindi language can be easily deployed for other people in Tamil language, while maintaining semantic interoperability. The persistence will also be maintained, with the same meaning (of data) for both the regions. Implementing these standard based healthcare applications helps in reducing the costs while enhancing patient care. Thus, this study aims to build a standard based, and platform independent healthcare application to provide support for interoperability, usability and generic persistence.

[bhalla-307-008-02:2017] Subhash Bhalla Shivani Batra, Shelly Sachdeva. Entity Attribute Value Style Modeling Approach for Archetype Based Data. *Information*, 9(1):1–30, April 2018.

Entity Attribute Value (EAV) storage model is extensively used to manage healthcare data in existing systems, however it lacks search efficiency. This study examines an entity attribute value style modeling approach for standardized Electronic Health Records (EHRs) database. It sustains qualities of EAV (i.e., handling sparseness and frequent schema evolution) and provides better performance for queries in comparison to EAV. It is termed as the Two Dimensional Entity Attribute Value (2D EAV) model. Support for ad-hoc queries is provided through a user interface for better user-interaction. 2D EAV focuses on

how to handle template-centric queries as well as other health query scenarios. 2D EAV is analyzed (in terms of minimum non-null density) to make a judgment about the adoption of 2D EAV over n-ary storage model of RDBMS. The primary aim of current research is to handle sparseness, frequent schema evolution, and efficient query support altogether for standardized EHRs. 2D EAV will benefit data administrators to handle standardized heterogeneous data that demands high search efficiency. It will also benefit both skilled and semi-skilled database users (such as, doctors, nurses, and patients) by providing a global semantic interoperable mechanism of data retrieval.

[yutaka-307-008-01:2017] W. Chen, Y. Yaguchi, K. Naruse, Y. Watanobe, and K. Nakamura. QoS-aware Robotic Streaming Workflow Allocation in Cloud Robotics Systems. *IEEE Transactions on Services Computing*, PP(99):1–1, 2017.

Current solutions of computation offloading for cloud robotics face challenges: 1) traditional approaches do not consider the characteristics of networked cloud robotics (NCR)(e.g., heterogeneity and robotic cooperation); 2) they fail to capture the characteristics of tasks in a robotic streaming workflow (RSW) (e.g., strict latency requirements and different task semantics); and 3) they do not consider quality-of-service (QoS) issues for cloud robotics. In this paper, we address these issues by proposing a QoS-aware RSW allocation algorithm for NCR with joint optimization of latency, energy efficiency, and cost, while considering the characteristics of RSW and NCR. We first propose a novel framework that combines robot individuals, robot clusters, and a remote cloud for computation offloading. We then formulate the joint QoS optimization problem for RSW allocation in NCR while considering latency, energy consumption, and operating cost, and show that the problem is NP-hard. Next, we construct a data flow graph based on the characteristics of RSW and NCR, and transform the RSW allocation problem into a mixed-integer linear programming problem. To obtain an optimal solution in reasonable time, we also develop a heuristic-based algorithm. Experiments demonstrate significant performance gains, with improved QoS and reduced execution times.

Refereed proceedings of an academic conference

[bhalla-307-008-03:2017] Shivani Batra Subhash Bhalla, Shelly Sachdeva. Semantic Interoperability in Electronic Health Record Databases: Standards, Architecture and e-Health Systems. In *Proceedings of 5th International*

Conference on Big Data Analytics, volume 10721 of *Lecture Notes in Computer Science*, pages 235–242. Springer, December 2017.

Information systems have been deployed in different clinics and hospitals to preserve patient data. In order to promote the exchange of data among systems (and organizations), standards are being adopted for data exchange. Further, the clinics and hospitals aim to manage a patient's life-time history of records. A piece of the individual patients medical record can be captured, stored, queried, and shared over a network through enrichment in information technology. Thus, electronic health records (EHRs) are being standardized for incorporating semantic interoperability. In addition, a generic storage structure is required to capture distinguished data requirements of various organizations. The generic structure must be capable of dealing with sparseness and frequent evolution behavior of EHRs. A subsequent step requires that healthcare professionals and patients get to use the EHRs, with the help of technological developments, such as workflow toolkits and new (easy) query languages. The goal is to present an overview of different approaches in understanding some current and challenging concepts in e-health informatics. Successful handling of these challenges will lead to improved quality in healthcare by reducing medical errors, decreasing costs, and enhancing patient care. The report is focused on the following objectives: (1) understanding the role of EHRs Databases; (2) understanding the need for standardization to enhance quality; (3) establishing interoperability in maintaining EHRs; (4) explicating a framework for standardization and interoperability (the openEHR architecture); (5) exploring various data models for managing EHRs; and (6) understanding the difficulties in querying data in EHR and e-health systems.

[bhalla-307-008-04:2017] Subhash Bhalla Mittapally Kumara Swamy, P. Krishna Reddy. Association Rule Based Approach to Improve Diversity of Query Recommendations. In *International Conference on Database and Expert Systems Applications (DEXA 2017)*, volume 10439 of *Lecture Notes in Computer Science*, pages 340–350. Springer, August 2017.

Query recommendation (QR) support search engine to provide alternative queries as a recommendation using similarity-based approaches. In the literature, orthogonal query recommendation (OQR) has been proposed to compute the diversity of QR when the user does not formulate proper queries. The OQR uses dissimilarity measure in QR to recommend completely different queries. In this paper, we propose an approach in QR by extending association rules, diverse patterns, and unbalanced concept hierarchy of search terms. We concep-

tualize association rules based QR, and order the rules based on confidence and diversity. Subsequently, the high ranked rules based on confidence and diversity are provided in QRs. The experimental results on real world AOL click-through dataset show that the diverse QRs improve the performance significantly.

[bhalla-307-008-05:2017] Alexander Vazhenin Ruth Cortez Subhash Bhalla Shashank Shrestha Absalom Shu, Konstantin Markov. Unified User-Interface and Protocol for Managing Heterogeneous Deep Learning Services. In *New Trends in Intelligent Software Methodologies, Tools and Techniques*, volume 297 of *Frontiers in Artificial Intelligence and Applications*, pages 563–575. IOS Press, September 2017.

n the last decade, cheaper and more powerful computations have favored a sufficient surge in research and development of applications in the fields of machine and deep learning. Though often varying in approach, these activities aim mostly at solving similar tasks such as speech synthesis, emotion detection, image recognition, mathematical computations etc. Usually, the typical scenario of using designed algorithms/applications includes inputting data represented in some predefined formats and launching a corresponding program tool that produces expected output data as well as analyzing obtained results. These applications are numerous, and are created by different research teams and laboratories using different techniques and environments including locations, interfaces and procedures to access, query and use them. In a collaborative working environment, developing independent user interfaces for each deep learning application could entail a lot of additional development efforts. In the presented paper, we propose a standardized and flexible interface to reduce design efforts, based on integration of various Deep Learning services (DL services). We also demonstrate a protocol for communication between the user interface and the heterogeneous services. This platform will enable developers of deep learning models to be concerned solely with developing and tuning their models, which can be easily plugged into the central user interface, conveniently exposing their services to users who will have homogeneous central access to a wide-range of DL services, from a unified interface.

[bhalla-307-008-06:2017] Yilang Wu Ruth Cortez Alexander Vazhenin Absalom Shu Subhash Bhalla Shashank Shrestha, Wanming Chu. Workflow Based Query Management System for Astronomical Data Repository. In *New Trends in Intelligent Software Methodologies, Tools and Techniques*, volume 297, pages 719–730. Frontiers in Artificial Intelligence and Applications, IOS Publisher, September 2017.

Astronomy is a data-intensive science. The large amount of data available in the astronomical domain needs query languages to gain valuable astronomical information. The paper has two goals. First, it presents the challenges for domain-specific query language for managing astronomical data. Second, it proposes a solution of managing such large amount of data through incorporating a multi-stage query language with Workflow Management technique. The paper demonstrates a web based query management system able to handle user queries in single or multi-stage.

[bhalla-307-008-07:2017] Naman Jain Shelly Sachdeva Shivani Batra Subhash Bhalla Prateek Jain, Sagar Bhargava. Healthsurance - Mobile App for Standardized Electronic Health Records Database. In *VLDB 2017 Workshop on Data Management and Analytics for Medicine and Healthcare*, Lecture Notes in Computer Science, pages 136–153. Springer, 2017.

With the increasing popularity of Electronic Health Records (EHRs), there arises a need to understand its importance in terms of clinical contexts for a standard based health application. Standards for semantic interoperability propose the use of archetypes for building a health application. A usual practice followed for storing of EHRs is through graphical user interfaces. Generally, user interface is static corresponding to the underlying medical concept, often made manually and are prone to errors. However, evolution in knowledge demands for dynamically generated user interfaces to reduce time, minimize cost and enhance reliability. Current research implements mobile app for standardized Electronic Health Records Database termed as HEALTHSURANCE. The application maintains its dynamic behavior through creation of graphical user interfaces at runtime by gaining knowledge from the artefacts (known as archetypes) available from standard clinical repositories (such as Clinical Knowledge Manager). This provides easy and hassle-free user operability without any need of mobile developer. A standardized format and content helps to uplift the credibility of data and maintains a uniform and specific set of constraints used to evaluate the user's health. A generic centralized database is chosen for data storage to support evolution in clinical knowledge and to handle heterogeneity of EHRs data. Implementing mobile app based on archetype paradigm avoids reimplementation of systems, migrating databases and allows the creation of future-proof systems.

[w-chu-307-008-01:2017] Yamin Li and Wanming Chu. KMS-Cube - A general alternative to hypercubes for reducing the node degree. In *International*

Conference on Computer, Information and Telecommunication Systems, CITS2017, pages 316–320, Dalian, China, July 2017. IEEE.

As the scale of parallel computer systems becomes larger year by year, interconnection networks with low node degree and short diameter are required for achieving high communication performance at low cost. This paper presents a general alternative to hypercubes, named KMS-Cube, that keeps interesting topological properties of the hypercube but has a low node degree. A KMS-Cube, denoted by KMSC(k, m, s$)$, is configured with three parameters k, m, and s. The node address has $m2^{(k - s)} + k$ bits and the node degree is $k + m$, much less than that of hypercubes. Comparing to other alternatives to hypercubes, KMS-Cube has advantages such as the ease of routing and the flexibility of changing network size. We describe the KMS-Cube's structure and its topological properties, compare it with other networks on the measures of node degree, diameter, and cost ratio, and present an efficient routing algorithm for the KMS-Cube.

[yutaka-307-008-02:2017] T. Yamashita and Y. Watanobe. Consensus Building Algorithm with BFT for Permissioned Blockchain. In *World Congress 2018*, February 2018.

In the blockchain technology, distributed consensus building algorithms are employed so that multiple peers can keep the same states. Generally, the consensus building algorithm in the blockchain must have a feature of Byzantine Fault Tolerance (BFT) which guarantees proper operations even if some peers with Byzantine obstacles are involved in the ledger. Although, for permissioned blockchain, the consensus building algorithms can be applied to the blockchain with a basis of PBFT, another mechanism called OrderingService for constructing a block of transactions is required. Besides, algorithms with BFT which consider all phases from transactions provided by clients to storing data into the blockchain, have not been published. In this paper, a novel algorithm with strict BFT for the blockchain which has a basis of PBFT, is presented.

[yutaka-307-008-03:2017] C.M. Intisar and Y. Watanobe. Fuzzy Rule Mining by Clustering Approach to Estimate the Difficulty of Programming Problems. In *World Congress 2018*, February 2018.

Programming is one of the vital skill for the next generation. Currently there exists many online platforms where programmers compete and solves programming problem. Those platforms are composed of problems with varying degree of difficulty. For expert programmer the difficulty level is not a concern, but it

is very important for novice programmers to approach programming problems based on their experience and level. Thus there rises a need for an expert system which can categorize the programming problems based on their difficulty. In our research we have proposed a knowledge based system which is implemented based on fuzzy rules derivation. These fuzzy rules have been derived from cluster analysis of programming problems. Later, inference system has been build based on these rules and knowledge to estimate the difficulty of the programming problems.

Unrefeered proceedings of an academic conference

[yutaka-307-008-04:2017] D. Yoshino, Y. Watanobe, Y. Yaguchi, K. Nakamura, J. Ogawa, and K. Naruse. Proposal of MQTT and MQTT-SN Communication Interfaces on RT Middleware for IoR System Construction. In *The 18th Meeting of SICE System Integration Department, SI2018*, 2017.

[yutaka-307-008-05:2017] D. Yoshino, Y. Watanobe, Y. Yaguchi, K. Nakamura, and K. Naruse. Application possibility of OpenRTM-aist-based integrated robot systems using CORBA interfaces and brokered Pub/Sub messaging interfaces. In *2017 JSME Conference on Robotics and Mechatronics, ROBOMECH2017*, 2017.

[yutaka-307-008-06:2017] K. Amma, Y. Yaguchi, Y. Watanobe, and K. Naruse. Constructing Cloud base RTM and automatic deploy to Raspberry Pi. In *2017 JSME Conference on Robotics and Mechatronics, ROBOMECH2017*, 2017.

Writing a textbook or technical book

[bhalla-307-008-08:2017] Sharma Chakravarthy Subhash Bhalla P. Krishna Reddy, Ashish Sureka. *Big Data Analytics - 5th International Conference, BDA 2017, Hyderabad, India, December 12-15, 2017, Proceedings*, volume 10721. Springer, December 2017.

[bhalla-307-008-09:2017] Bhateja V. Chandavale A. Hiwale A.S. Satapathy S.C. Bhalla, S. *Intelligent Computing and Information and Communication*. Advances in Intelligent Systems and Computing. Springer, August 2017.

Summary of Achievement

The volume presents high quality research papers presented at Second International Conference on Information and Communication Technology for Intelligent Systems (ICICC 2017). The conference was held during 2 - 4 August 2017, Pune, India and organized communally by Dr. Vishwanath Karad MIT World Peace University, Pune, India at MIT College of Engineering, Pune and supported by All India Council for Technical Education (AICTE) and Council of Scientific and Industrial Research (CSIR). The volume contains research papers focused on ICT for intelligent computation, communications and audio, and video data processing.

Research grants from scientific research funds and public organizations

[bhalla-307-008-10:2017] Subhash Bhalla. SCAT research subsidies 2017-2018, 2017.

Academic society activities

[yutaka-307-008-07:2017] Y. Watanobe, August 2017.

Program Committee, The International Conference on Big data, IoT, and Cloud computing.

[yutaka-307-008-08:2017] Y. Watanobe, December 2017.

Program Committee, The 9th International Conference on Computer Science and its Applications

[yutaka-307-008-09:2017] Y. Watanobe, December 2017.

Organizing Committee Member, ACM-ICPC Asia Regional 2018 Tsukuba

Advisor for undergraduate research and graduate research

[w-chu-307-008-02:2017] Masashi Baba. Graduation Thesis: Improvement of Advanced Bus Route Search System using Google Maps API, University of Aizu, 2017.

Thesis Advisor: Wanming Chu

[yutaka-307-008-10:2017] Takumi Yamashita. Graduation Thesis: Consensus Building Algorithm with BFT for Permissioned Blockchain, University of Aizu, 2018.

>Thesis Advisor: Y. Watanobe

[yutaka-307-008-11:2017] Motohiko Abe. Graduation Thesis: Rose: New Byzantine Consensus on Hashgraph based Data Structure, University of Aizu, 2018.

>Thesis Advisor: Y. Watanobe

[yutaka-307-008-12:2017] Keigo Ebihara. Graduation Thesis: Evaluation of Language Network System, University of Aizu, 2018.

>Thesis Advisor: Y. Watanobe

[yutaka-307-008-13:2017] Yunosuke Teshima. Graduation Thesis: Bug Detection based on Deep Learning and Solution Source Codes, University of Aizu, 2018.

>Thesis Advisor: Y. Watanobe

[yutaka-307-008-14:2017] Ryoya Komatsu. Graduation Thesis: Online Text Editor with Logical Error Correction, University of Aizu, 2018.

>Thesis Advisor: Y. Watanobe

[yutaka-307-008-15:2017] Kazuya Watanabe. Master Thesis: Grading Algorithm using Difficulty Level Estimation of Problem Sets, University of Aizu, 2018.

>Thesis Advisor: Y. Watanobe

Others

[yutaka-307-008-16:2017] Y. Watanobe, Feburary 2018.

>Programming Challenge on New Aizu Online Judge

Contributions related to syllabus preparation

[yutaka-307-008-17:2017] A undergraduate school course syllabus constructed: [F01] Algorithms and Data Structures

Summary of Achievement

[yutaka-307-008-18:2017] A undergraduate school course syllabus constructed: [IE03] Integrated Exercise for Software I

[yutaka-307-008-19:2017] A undergraduate school course syllabus constructed: [OT04] Courses for the Information Technology Examination

[yutaka-307-008-20:2017] A graduate school course syllabus constructed: [CSC11F] Advanced Data Structures and Algorithms

[yutaka-307-008-21:2017] A graduate school course syllabus constructed: [SEC04A] Programming Strategies and Software Development Tools

Preparation of course examination to measure comprehension

[yutaka-307-008-22:2017] Problem Setter for Entrance Exam Questions of Mathematics

Advisor of a student club or circle

[yutaka-307-008-23:2017] Circle Advisor: Competitive Programming Club (ICPC), ACM-ICPC World Finals 2017, ACM-ICPC Asia Regional 2017 Tsukuba, ACM-ICPC Asia Regional 2017 Hualien, ACM-ICPC Asia Regional 2017 Daejeon, ACM-ICPC Asia Regional 2017 Ho Chi Minh

Other significant contribution toward university planning, management, or administration

[yutaka-307-008-24:2017] A member of Judge for Programming Division of PC Koshien

[yutaka-307-008-25:2017] A member of entrance examination committee

Contributions related to regional education

[yutaka-307-008-26:2017] Special Lecture: Programming Education for Elementary Schools, Koriyama Central Public Hall, 2017, July

Contribution toward education for employees of regional industries

[yutaka-307-008-27:2017] Lecture for RT Middleware in Minamisoma-City, Minami-soma, 2017, August

[yutaka-307-008-28:2017] Software for Robot, Koriyama, 2017, August

[yutaka-307-008-29:2017] Fukushima Human Resource Development Curriculum, Ko-riyama, 2018, Feburary

Did you participate in Public Lectures, and/or Open Campus? (Yes or No) If yes, please describe what you did.

[yutaka-307-008-30:2017] Trial Lesson of Programming, Gakuho High School, 2017, July

[yutaka-307-008-31:2017] Sports Programming and Online Judge System, Lecture for Computer Science Summer Camp, 2017, August

[yutaka-307-008-32:2017] Introduction to Programming, Kitakata High School, 2017, October

[yutaka-307-008-33:2017] Introduction to Programming, Yamagata Institute High School, 2017, November

[yutaka-307-008-34:2017]

[yutaka-307-008-35:2017]

[yutaka-307-008-36:2017]

Research achievement that can be used for University-Industry collaboration and its characteristics.(for UBIC's information)

[yutaka-307-008-37:2017] Online Judge System (Aizu Online Judge): https://onlinejudge.u-aizu.ac.jp/

[yutaka-307-008-38:2017] Visual Programming Language and Environment (*AIDA): http://aida.u-aizu.ac.jp/

Active Knowledge Engineering Laboratory

Alexander P. Vazhenin
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The Active Knowledge Engineering Lab activities include investigations that are about discovering, externalizing, expressing, representing, sharing, exploring, configuring, activating, growing and managing enterprise knowledge as well as designing new programming platforms based on mentioned above principles focusing on the following topics.

1. Filmfications of Methods and Data

Existing systems of symbols and notations are usually very abstract and there is a great gap between the form and meaning of data/knowledge. Our long-term education, in an essential part, is reduced to training our brain for being 'encoding-decoding' machine bridging this gap. The abstractness mentioned and bridging operations are sources of serious mental and physical problems for a great variety of people and, especially for disabled and elderly. Our aging society is also becoming information society. So, the above-mentioned aspect of our environment is becoming crucial. That is why, our research is to develop a new environment with lesser level of abstraction and with the better quality of people life. Our general program is cyber-infrastructure including high-performance computing. We are also thinking about active knowledge being developed by humanity and undertaking research efforts in visual (multimedia) languages and tools, parallel and distributed systems. In a great part, our research and development are based on an idea of self-explanatory components in a cyberFilm format. A cyberFilm is a set of color stills supported, if necessary, by text, voice/sound and special links. Each still is to represent a view (some features) of objects or processes. A cyberFilm is a set of color stills supported, if necessary, by text, voice/sound and special links. Each still is to represent a view (some features) of objects or processes. Each cyberFilm is to represent a multiple view (an extended set of dynamic and/or static features) of objects or processes. The more accurate and relevant views are used,

the greater adequacy is reached. The idea of cyberFilms is used for the specification of information resources and programming operations with the resources, as well as for the representation of multimedia messages and implementation of human-computer interfaces. The idea of equal opportunities to all individuals in the use of information resources is used to create a right set of cyberFilms and methods of their adaptation.We lead four clusters of projects related to filmification of methods and data: 1. Active Knowledge Studio for teachers, students, and programmers, 2. Semantic Surfaces in Ambient Living Environments for elderly, 3. Virtual objects, haptic interface and 3D printers for people doing fast prototyping, and 4. WWW-based software for users involved in multimedia programming and distance learning.

2. Human-Computer Interaction in Games and Education

Experimenting with human behavior via human-computer interaction is a challenging and interesting topic with many open problems. Primarily we are focused on understanding and modeling human behavior via the development of artificial intelligence (AI) systems for computer games and simulations. In particular, we are using annotated recordings of soccer and tennis matches to model the behavior of opponents. Other projects include the analysis of human language polarity and grammar by using methods of corpus linguistics and visualizing text structure. Our goal is to simplify understanding of human language properties and thus assist language education.

3. Human-centric Software Design Patterns

The main goal of the project is in research and development of the multi- purposed Methodology allowing creation of service-oriented systems via integration of software and information components designed by different groups of developers. The set of applications is developing based on the original Virtual-Model-View-Controller (V-MVC) design pattern that is an integration of two well-known approaches: Service-Oriented Architecture (SOA) and the Model-View-Controller (MVC).

We are designing a system allowing numerical computer Tsunami simulations for crucial coastal areas. It supports so-called hybrid bathymetry that combines natural and artificial underwater objects. It also should include the tools allowing the user to manipulate with these objects. Research is in designing a public server client/server infrastructure as well as a structure of tsunami data to be stored and assembled. We are designing high-resolution digital Bathymetry of Fukushima Coast and Modeling Scenarios based on sources of the Japanese Great Earthquake. It includes computational experiments with the program modules, modify them as well as design visualizations of tsunami wave propagation. Service-

Division of Information and Systems

Oriented LEGO-Robot Programming Components allow developing WEB-based applications for Robot Control System, visualization of robot activities and data. It includes designing a prototype for the LEGO Robot Control scanning system including possibilities to specify operations for the internal robot program and data exchange. Hardware and software should be created using familiar LEGO parts and blueprints for faster assembly.

Refereed academic journal

[mozgovoy-308-004-01:2017] V. Khaustov and M. Mozgovoy. Teaching Automated Software Testing with Appium and Soccer Simulator. *North Ossetian State University Bulletin*, 4:124–127, 2017.

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[vazhenin-308-004-01:2017] Alexander P Vazhenin Kensaku Hayashi, Andrey G Marchuk. Numerical Modeling of Tsunami Propagation on a Sequence of Refining Grids. *AIP Conference Proceedings*, 1907(1):1–11, November 2017.

The multi-grid algorithm for the tsunami propagation computation from the initial source to the coastline that uses scale switching has been developed. Computations are carried out on a sequence of grids with various resolutions where one is embedded into another. Tsunami wave parameters are transferred from a larger domain to the embedded smaller one by means of the boundary conditions. Using the method proposed, the numerical simulation of tsunami generated by a model ellipsoidal source located in the middle of the Pacific was carried out.

Refereed proceedings of an academic conference

[rentaro-308-004-01:2017] R. Yoshioka and T. Kawaguchi. How to Foster Creativity? Curriculum of Creativity Development Program for Computer Science Students. In *The 49th ACM Technical Symposium on Computer Science Education*, pages 1074–1074, Baltimore, 2018. ACM, ACM.

The importance of problem solving skills in addition to computational skills for computer science graduates is increasing. The authors present a curriculum of a creativity development program for undergraduate computer science students that aims at exposing them to problem solving and software development through a series of three courses spanning a period of six months. The focus of this initiative is to teach problem solving skills and software development skills as an integrated skill-set and take advantage of the combined effect to address the challenge for students to connect computer science knowledge to real-world problems, an issue apparent in our current curriculum. The curriculum starts with the first course on creativity development in which students propose solutions to a real-world problem through field-work and information gathering/analysis spanning five days. The second course introduces project

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management and software development through another five-day software development team project. In the final course, student teams work on a software development request from customers during a period of 4 months. All three courses use the same problem. The program is in its first year of offering with a relatively small group of students. The presentation will display our findings from program assessment including student scores on individual performance tests and student perception. Details of the project can be found at: https://www.u-aizu.ac.jp/enpit/

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[rentaro-308-004-02:2017] T. Hoshino, R. Yoshioka, and M. Arai. An Impression Based Recording of Art Viewing Experience: Preliminary Implementation and Analysis. 2018.

An implementation of a previously proposed method for expressing impressions of artwork is presented. The method employs sets of object-feeling pairs to describe impressions of artwork without relying on professional knowledge. The method is especially targeted for education of children as well as casual art fans. This work presents a practical implementation of the method with realistic format and symbol designs. Tests carried out with the implementation provide assuring results of the approach as well as insights into necessary improvements. Details of the implementation decisions and analysis of obtained results are reported.

[vazhenin-308-004-02:2017] Kensaku Hayashi Alexander Vazhenin Stanislav G Sedukhin Fumiya Kono, Naohito Nakasato. Performance Evaluation of Tsunami Simulation using OpenCL on GPU and FPGA. In *2017 IEEE 11th International Symposium on Embedded Multicore/Many-core Systems-on-Chip (MCSoC)*, pages 106–113, Seoul, South Korea, September 2017. Korea University, IEEE.

Prediction of the arrival time of tsunami is critical for evacuating people from coastal area. Solving many related to tsunami problems is important in order to decrease negative effects of this serious disaster. Numerical modeling of tsunami wave propagation is a computational intensive problem that requiresacceleration of calculations by means of parallel processing. The Method of Splitting Tsunami (MOST) is one of the well-known numerical solvers for modeling tsunami waves in the ocean. This paper focuses on design and evaluation of tsunami simulation code using OpenCL. We have developed a tsunami propagation code based on MOST, and implemented its different parallel optimizations for GPU and FPGA.

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[vazhenin-308-004-03:2017] Andrey G Marchuk Kensaku Hayashi, Alexander P Vazhenin. Investigation of the Artificial Underwater Object's Protection Properties Using Numerical Modeling. In *The 27th International Ocean and Polar Engineering Conference, 25-30 June, San Francisco, California, USA*, pages 981–988, San Francisco, California, USA, June 2017. International Society of Offshore and Polar Engineer (ISOPE), International Society of Offshore and Polar Engineer (ISOPE).

The important part of the tsunami research is focused on studying the considerable influence of natural geographical objects, like islands and near-coastal bathymetry, on tsunami waves. Complementing the physical modeling, we are designing a system for computer simulations of crucial coastal areas. The Bathymetry and Tsunami Source Data Editor is a basic system tool for editing bathymetric and tsunami source data by including/removing artificial seawalls and submerged barriers having different shapes and sizes. Results of numerical experiments are presented for the gridded hybrid bathymetry for several coastal areas of Japan. This system can help to issue recommendations for better protection of some crucial objects on a coastline.

[vazhenin-308-004-04:2017] Petr Dyadkov Andrey Marchuk Alexander Vazhenin, Anna Mikheeva. The Software using Digital Databases and GIS Interface for Detecting Geodynamic Structures. In Sigeru Omatu Hamido Fujita, Ali Selamat, editor, *New Trends in Intelligent Software Methodologies, Tools and Techniques - Proceedings of the 16th International Conference (SoMeT-17)*, volume 297 of *Frontiers in Artificial Intelligence and Applications*, pages 576–592. IOS Press, 2017.

This paper presents a tool for studying a seismic, volcanic and impact natural disasters of GIS-ENDDB (the Earth's natural disasters Databases). The algorithms implemented in GIS-ENDDB allow visualizing a selected part of a current catalog of events in a pseudo-3D background map, to plot frequency dependences of magnitudes or sizes (crater diameters) and other parameters relationships of events from various samples. This high-tech expert system allows solving a wide range of seismological and geodynamic research tasks updated by including successively various mathematical methods for natural disasters data processing, characteristics of seismogeodynamic regime (b, A, EO, KAVG), and advanced representation tools. The paper shows examples of mapping these characteristics and studying their anomalies (slope of magnitude-recurrence curves, seismic quiescence, energy stability) and of revealing the grouping events (aftershocks, clusters, etc.). The detailed study on seismogeo-

dynamic regime of the linear and ring structures revealed by seismic grouping methods and in the anomalies of geophysical fields can give a lot of prognostic information to seismologists

[vazhenin-308-004-05:2017] Dmitry E. Kuzakov Alexander P. Vazhenin Mikhail M. Lavrentiev, Alexey A. Romanenko. Determination of Initial Tsunami Wave Shape at Sea Surface. In *Proceedings of the IEEE OCEANS 2017 ABERDEEN Conference*, pages 1–7, Aberdeen, UK, June 2017. IEEE.

Any Tsunami Early Warning System (TEWS) should provide reliable prediction of the wave parameters as early as possible. Numerical calculation of the tsunami wave propagation over the particular part of the ocean can be implemented rather efficiently using modern high-performance system. It is possible when the initial wave shape at tsunami source is given. In this paper we discuss and show the fast algorithm for reconstructing the initial sea surface displacement at tsunami source. Based on the Fourier approximation theory, the presented algorithm treats the measured wave profile as a linear combination of synthetic (calculated) waves from the so-called unit sources. Using an artificial bathymetry, we evaluate the algorithm parameters focusing on its precision and performance. Moreover, a large tsunami sources (several hundred kilometers long) are also simulated.

[vazhenin-308-004-06:2017] Alexander Vazhenin Ruth Cortez Subhash Bhalla Shashank Shrestha Absalom Shu, Konstantin Markov. Unified User-Interface and Protocol for Managing Heterogeneous Deep Learning Services. In *New Trends in Intelligent Software Methodologies, Tools and Techniques - Proceedings of the 16th International Conference (SoMeT-17)*, volume 297 of *Frontiers in Artificial Intelligence and Applications*, pages 563–575. IOS Press, September 2017.

In the last decade, cheaper and more powerful computations have favored a sufficient surge in research and development of applications in the fields of machine and deep learning. Though often varying in approach, these activities aim mostly at solving similar tasks such as speech synthesis, emotion detection, image recognition, mathematical computations etc. Usually, the typical scenario of using designed algorithms/applications includes inputting data represented in some predefined formats and launching a corresponding program tool that produces expected output data as well as analyzing obtained results. These applications are numerous, and are created by different research teams and laboratories using different techniques and environments including

locations, interfaces and procedures to access, query and use them. In a collaborative working environment, developing independent user interfaces for each deep learning application could entail a lot of additional development efforts. In the presented paper, we propose a standardized and flexible interface to reduce design efforts, based on integration of various Deep Learning services (DL services). We also demonstrate a protocol for communication between the user interface and the heterogeneous services. This platform will enable developers of deep learning models to be concerned solely with developing and tuning their models, which can be easily plugged into the central user interface, conveniently exposing their services to users who will have homogeneous central access to a wide-range of DL services, from a unified interface.

[vazhenin-308-004-07:2017] Yilang Wu Ruth Cortez Alexander Vazhenin Absalom Shu Subhash Bhalla Shashank Shrestha, Wanming Chu. Workflow Based Query Management System for Astronomical Data Repository. In *New Trends in Intelligent Software Methodologies, Tools and Techniques - Proceedings of the 16th International Conference (SoMeT-17)*, volume 297 of *Frontiers in Artificial Intelligence and Applications*, pages 719–730. IOS Press, September 2017.

Astronomy is a data-intensive science. The large amount of data available in the astronomical domain needs query languages to gain valuable astronomical information. The paper has two goals. First, it presents the challenges for domain-specific query language for managing astronomical data. Second, it proposes a solution of managing such large amount of data through incorporating a multi-stage query language with Workflow Management technique. The paper demonstrates a web based query management system able to handle user queries in single or multi-stage.

Research grants from scientific research funds and public organizations

[vazhenin-308-004-08:2017] Alexander Vazhenin. Service-oriented Infrastructure for Tsunami Education and Digital Badges support for English Learning Management System, 2017.

Academic society activities

Summary of Achievement

[vazhenin-308-004-09:2017] Alexander Vazhenin, 2017.

    member

[vazhenin-308-004-10:2017] Alexander Vazhenin, 2017.

    Member

[vazhenin-308-004-11:2017] Alexander Vazhenin, 2017.

    Member

[vazhenin-308-004-12:2017] Alexander Vazhenin, 2017.

    Member

[vazhenin-308-004-13:2017] Alexander Vazhenin, 2017.

    Member

[vazhenin-308-004-14:2017] Alexander Vazhenin, 2017.

    Program Committee Member of the Federated Conference on Computer Science and Information Systems, FedCSIS 2017

[vazhenin-308-004-15:2017] Alexander Vazhenin, 2017.

    Program Committee Member of the 9th IEEE International Conference on Ubi-Media Computing

Advisor for undergraduate research and graduate research

[rentaro-308-004-03:2017] Toshihiro Endo. Graduation Thesis: Self-Theories based Feedbacks for a Programming Learning System, University of Aizu, 2017.

    Thesis Advisor: Yoshioka, R.

[rentaro-308-004-04:2017] Mamoru Kondo. Graduation Thesis: Migrating a Program Learning System to a Reactive Micro-Service Architecture: A Case-Study, University of Aizu, 2017.

    Thesis Advisor: Yoshioka, R.

[rentaro-308-004-05:2017] Koyo Fushimi. Graduation Thesis: A Knowledge Model and Algorithm for Event-based Automatic Commentary, University of Aizu, 2017.

Thesis Advisor: Yoshioka, R.

[vazhenin-308-004-16:2017] Tatsuya Hirose.   Graduation thesis, undergraduate, University Of Aizu, March 2017.

The important part of the tsunami research is focused on studying the considerable influence of natural geographical objects, like islands and near-coastal bathymetry, on tsunami waves. We are designing a system for computer simulations of crucial coastal areas based on hybrid bathymetry including Artificial Underwater Objects (AUO). The Bathymetry and Tsunami Source Data Editor (TSB-editor) is a basic system tool for editing bathymetric and tsunami source data by including artificial seawalls and submerged barriers with different shapes and sizes. The presented work is devoted to extend possibilities of TSB-editor in order to prepare a set of bathymetry data allowing providing multiple experiments. This supports a generation of a set of AUOs with parametrical ordering of their parameters. Paper describes these group functions as well as examples of the corresponding AUOs.

[vazhenin-308-004-17:2017] Ryuki Ito. Graduation thesis, Undergraduate, University of Aizu, March 2017.

The aim of this study is to create a system allowing investigating the influence of natural geographical objects such as island and coastal seabed topography through modeling of the tsunami. Dependences between modeling zones are changeable and complex. This requires having effective and management environment with convenient web-based end-user interface allowing to input and validate modeling data as well as to control modeling process via WWW-browser.

[vazhenin-308-004-18:2017] Georges Meguro. Graduation thesis, Graduate, University of aizu, March 2017.

LEGO Education EV3 robotics is the third generation of LEGO Educational robotics. It can be considered as a good solution allowing teaching students how to program, build and test their robot models. Based on a human-centered approach, the presented paper is devoted to design extension of the current EV3 system. It includes visual programming as one of important human-centered programming approach as well as end-user application extending possibilities of the on-line users control via the World Wide Web (WWW)-based interface. The visual tool is presented for studying how to program internal LEGO-programs. The special attention is focused on data exchange mechanism design between a LEGO robot and server. Based on this approach, the WWW-based remote EV3

controller is described providing the ability of simple remote operations of EV3 by web page.

Contributions related to syllabus preparation

[rentaro-308-004-06:2017] Software Engineering I

[rentaro-308-004-07:2017] Venture Startup Factory 6 Introductory PBL

[rentaro-308-004-08:2017] Software Studio

[rentaro-308-004-09:2017] Creativity Studio

[rentaro-308-004-10:2017] Creativity Development

[vazhenin-308-004-19:2017] Undergraduate Course: Operating Systems

[vazhenin-308-004-20:2017] Undergraduate Course: Advanced Software Engineering

[vazhenin-308-004-21:2017] SCCP Project: Practical application and network defence

[vazhenin-308-004-22:2017] Graduate Core Course: Software Engineering

[vazhenin-308-004-23:2017] Graduate Course: Theory and Practice of Software Engineering

[vazhenin-308-004-24:2017] Graduate Course: Parallel, Distributed and Interenet Computations

Scholarly paper prepared by undergraduate/graduate student(s) you advised

[rentaro-308-004-11:2017] T. Hoshino, R. Yoshioka, and M. Arai. An Impression Based Recording of Art Viewing Experience: Preliminary Implementation and Analysis. *Proceedings of 7th International Conference on Educational and Information Technology*, 2018.

Employment guidance

[vazhenin-308-004-25:2017] Member of the Selection Committee

Advisor of a student club or circle

[rentaro-308-004-12:2017] Adviser of the University of Aizu Orchestra Dolce

Contribution related to on-campus/off-campus publicity work

[rentaro-308-004-13:2017] Presented PBL activities of UoA at enPiT workshops and symposium

[vazhenin-308-004-26:2017] Public Lecture about the University of Aizu at the Novosibirsk State University, March 2017.

Contribution related to planning administration for research, research conferences, or international research

[vazhenin-308-004-27:2017] Collaboration agreement with Novosibirsk State University (Russia), Tallinn University of Thechnology (Estonia), and Systems Research Institute Polish Academy of Sciences(Poland).

Other significant contribution toward university planning, management, or administration

[rentaro-308-004-14:2017] Preparation and organization of programming contest as an organizing committee member of PC Koshien 2017

[rentaro-308-004-15:2017] Preparation of course material and management of an online programming learning system for students admitted by recommendation

[rentaro-308-004-16:2017] Student recruiting activities for the Graduate Department of Information Technologies and Project Management

[vazhenin-308-004-28:2017] Chair of the Graduate School Department on Information Technology and Project Management Member of the Graduate School Academic Affairs Committee Member of the CAIST evaluation Committee

Summary of Achievement

Contributions related to regional education

[rentaro-308-004-17:2017] Offered lecture on Information Science at the Takeda Nurses School

Did you participate in Faculty Development? (Yes or No) If yes, please describe what you did.

[rentaro-308-004-18:2017] Organized a PBL workshop for local faculty on June 22, 2017

Did you participate in Public Lectures, and/or Open Campus? (Yes or No) If yes, please describe what you did.

[rentaro-308-004-19:2017] Organization of open-lab during Open Campus event

[rentaro-308-004-20:2017] Organization of open-lab during University Festival

[rentaro-308-004-21:2017] Preparation and organization of open-online course 'Algorithms and Programming' for PC Koshien participants.

[vazhenin-308-004-29:2017] OpenLab and OpenCampus: 1. Presentation of research on Tsunami Modeling and Lego Robot Programming 2. Presentation of WWW-server on Deep Learning Applications (with Prof. Markov)

Research achievement that can be used for University-Industry collaboration and its characteristics.(for UBIC's information)

[vazhenin-308-004-30:2017] Our investigations are focused on studying the considerable influence of natural geographical objects, like islands and coast bathymetry, on the tsunami waves. The original editor allows tuning/editing bathymetric and tsunami source data by including/removing artificial barriers as well as specifying their placement, shapes and sizes. It is also oriented to support modeling experiments with the bathymetry data of the Fukushima prefecture coast and tsunami sources including data obtained from the Great Japanese earthquake. The result of investigations can be used to control the tsunami wave height by underwater artificial objects, study features of the natural bathymetry as well as make design a set of digital artificial objects (islands) that can be used to protect the coastal areas.

Do you have experience of University-Industry collaboration? If yes, please describe your experience. (for UBIC's information)

[rentaro-308-004-22:2017] Developed a Injection Drug Prescription Support software for doctors in cooperation with the Aizu Medical Center

[rentaro-308-004-23:2017] Developed a Pain Relief Prescription Analysis software for doctors in cooperation with the Aizu Medical Center

[rentaro-308-004-24:2017] Organized a workshop for reducing vacant houses in Minami-Aizu Town in cooperation with town office

[rentaro-308-004-25:2017] Developed a social network service to raise awareness of vacant houses in cooperation with Minami-Aizu town

[rentaro-308-004-26:2017] Developed a real-estate matching system in cooperation with Minami-Aizu town

[rentaro-308-004-27:2017] Developed a real-estate ranking system to activate circulation in cooperation with Minami-Aizu town

Division of Information and Systems

Intelligent Data Analytics Laboratory

Incheon Paik
Professor

Kenta Ofuji
Associate Professor

Refereed academic journal

[o-fu-309-038-01:2017] Yu Nagai KenIchiro Nishio, Toshihiro Mukai and Kenta Ofuji. Interpretive Issues on Decoupling between Economic Growth and Environmental Burden. *Denryoku Keizai Kenkyu (Power and Economics Studies)*, 65(1):45–54, 4 2018.

> There is growing interest in the concept of 'decoupling' where environmental burdens are separated from economic growth. Decoupling is a fair aim, but it is beneficial to deepen the understanding of incentives that bring about its realization and to consider measures to be taken in the future. Therefore, in this paper, we discussed the issues surrounding the interpretation of decoupling. In recent years, there are an increasing number of indications of signs of decoupling in other countries, but as a result of reviewing the past literature, starting with the definition of indicators, points of caution in analyzing methods, understanding the results, and further policy considerations are the issues. Since the signs of decoupling first depend on the unique circumstances of the country or region, it also relates to how to handle the data, and macro level analysis that rationalizes its interpretation. Inevitable side effects have also to be considered. In order to properly interpret the decoupling, in addition to the macro level observation, it is necessary to focus on a case analysis, or a targeted analysis of the actual situation.

[o-fu-309-038-02:2017] Kenta Ofuji and Naomi Ogasawara. Verbal disaster warnings and perceived intelligibility, reliability, and urgency: the effects of voice gender, fundamental frequency, and speaking rate. *Acoustical Science and Technology*, 39(2):56–65, TBD 2018.

> In this paper, we study the effects of acoustic characteristics of spoken disaster warnings in Japanese on listeners' perceived intelligibility, reliability, and urgency. Our findings are threefold: (a) For both speaking speed and fo, setting them to normal (compared from slow/fast (+/-20 percent) for speed, and from low/high (+/- up to 36 Hz) for fo) improved the average evaluations for Intelligibility and Reliability. (b) For Urgency only, setting speed to faster (both slow to normal and normal to fast) or setting fo to higher (both low to normal and normal to high) resulted in an improved average evaluation. (c) For all of intelligibility, reliability, and urgency, the main effect of speaking speed was the most dominant. In particular, urgency can be influenced by the speed factor alone by up to 39 percent. By setting speed to fast (+20 percent), all other things being equal, the average perceived urgency raised to 4.0 on the

1.5 scale from 3.2 when the speed is normal. Based on these results, we argue that the speech rate may effectively be varied depending on the purpose of an evacuation call, whether it prioritizes urgency, or intelligibility and reliability. Care should be taken to the possibility that the respondent-specific variation and experimental conditions may interplay these results.

[paikic-309-038-01:2017] Wuhui Chen, Incheon Paik, and Neil Y. Yen. Discovering internal social relationship for influence-aware service recommendation. *Multimedia Tools and Applications, Springer*, 76(18):18193–18220, September 2017.

Existing approaches, such as semantic content-based or Collaborative Filtering-based recommendations, fail to exploit social aspects of services because services lack social relationships and do not consider social influence. In this paper, we propose a methodology for connecting distributed services in a global social service network (GSSN) to facilitate discovering internal social relationship for social influence-aware service recommendation. First, we propose a novel platform for constructing a GSSN by linking distributed services with social links based on quality of social link. We then propose a flexible model of the effective awareness of social influence, which provides a quantitative measure of the strength of influence between services. Next, a novel social influence-aware service recommendation approach is proposed based on GSSN using internal social relationship among services. The experimental results demonstrated that our new approach can solve the service recommendation problem with a low usage threshold and high accuracy, where the user preferences are exploited by a recommend-as-you-go method.

Refereed proceedings of an academic conference

[paikic-309-038-02:2017] Incheon Paik, Younghyon Heo, and Jeremy Perkins. Classification of Machine-Translated Text Using Deep Learning. In ICEIC Comittee, editor, *Proceedings of International Conference on Electronics, Information, and Communication*, Honolulu, Hawaii, January 2018.

In this paper, we investigate automatic detection of machine-translated text using multi-layered perceptron network (MPN). There have been researches on the classification of machine-translated text using shallow learning such as SVM, NB, KNN, etc. For the approaches, it needs to extract higher quality of

features for the documents. The approaches showed good performance for the statistical machine translation. Google started to provide a translation service using neural machine translation approach that is difficult to classify using the existing approaches. We tried deep learning approach, which consists of more than 4 hidden layers of perceptron network. The architecture learns order of words in a sentence internally. We could get very high classification accuracy (99.8%) with large training data set.

[paikic-309-038-03:2017] Chungho Lee and Incheon Paik. Stock Market Analysis from Twitter and News Based on Streaming Big Data Infrastructure. In IEEE, editor, *Proceedings of IEEE International Conference on Awareness Science and Technology (iCAST 2017)*, Taichung, Taiwan, November 2017. IEIE, IEEE.

[paikic-309-038-04:2017] Sheng Zhang and Incheon Paik. An Efficient Algorithm For Web Service Selection Based On Local Selection In Large Scale. In IEEE, editor, *Proceedings of IEEE International Conference on Awareness Science and Technology (iCAST 2017)*, Taichung, Taiwan, November 2017. IEIE, IEEE.

[paikic-309-038-05:2017] Incheon Paik, Yutaka Koshiba, and Thenuwara Hannadige Akila Sanjaya Siriweera. Efficient Service Discovery Using Social Service Network Based on Big Data Infrastructure. In IEEE, editor, *Proceedings of IEEE 11th International Symposium on Embedded Multicore/Many-core Systems-on-Chip (MCSOC 2017)*, Seoul, Korea, September 2017. IEEE, IEEE CPS.

[paikic-309-038-06:2017] Yujie Li, Benying Tan, Shuxue Ding, Incheon Paik, and Atsunori Kanemura. Key Frame Extraction from Video Based On Determinant-Type of Spare Measure And DC Programming. In IEEE, editor, *Proceedings of IEEE 11th International Symposium on Embedded Multicore/Many-core Systems-on-Chip (MCSOC 2017)*, Seoul, Korea, September 2017. IEEE, IEEE CPS.

[paikic-309-038-07:2017] Kazuki Sasaki and Incheon Paik. Analysis of Data Distribution to Classify Documents on Taxonomy Hierarchy. In IEIE, editor, *Proceedings of The 32nd International Technical Conference on Circuits/Systems, Computers and Communications*, Busan, Korea, July 2017. IEIE, IEIE.

[paikic-309-038-08:2017] Kento Hayasaka and Incheon Paik. Improving Taxonomical Document Classification Using Explicit Semantic Analysis and Convolutional Neural Network. In IEIE, editor, *Proceedings of The 32nd International Technical Conference on Circuits/Systems, Computers and Communications*, Busan, Korea, July 2017. IEIE, IEIE.

[paikic-309-038-09:2017] Rupasingha A. H. M. Rupasingha, Incheon Paik, and B. T. G. S. Kumara. Improving Web Service Clustering through a Novel Ontology Generation. In IEEE, editor, *Proceedings on IEEE International Conference on Web Service 2017*, Hawaii, U.S.A, September 2017. IEEE, IEEE CPS.

[paikic-309-038-10:2017] T. H. Akila S. Siriweera and Incheon Paik. QoS and Customizable Transaction?aware Selection for Big Data Analytics. In IEEE, editor, *Proceedings on IEEE International Conference on Service Computing 2017*, Hawaii, U.S.A, September 2017. IEEE, IEEE CPS.

[paikic-309-038-11:2017] Banage T.G.S. Kumara, Incheon Paik, T. H. Akila S. Siriweera, and Koswatte R. C. Koswatte. QoS Aware Service Clustering to Bootstrap the Web Service Selection. In IEEE, editor, *Proceedings on IEEE International Conference on Service Computing 2017*, Hawaii, U.S.A, September 2017. IEEE, IEEE CPS.

[paikic-309-038-12:2017] T. H. Akila S. Siriweera and Incheon Paik. Constraint?Driven Dynamic Workflow for Automation of Big Data Analytics based on GraphPlan. In IEEE, editor, *Proceedings on IEEE International Conference on Web Service 2017*, Hawaii, U.S.A, September 2017. IEEE, IEEE CPS.

Unrefeered proceedings of an academic conference

[o-fu-309-038-03:2017] Naomi Ogasawara and Kenta Ofuji. Status and a linguistic analysis of natural disaster evacuation calls. In *Proceedings of the Noize and Vibration Conference, Japan Acoustic Society*, page 5. Japan Acoustic Society, Japan Acoustic Society, March 2018.

[o-fu-309-038-04:2017] KenIchiro Nishio and Kenta Ofuji. CO2 mitigation and lock-in issues: with focus on residential heat pumps. In *Proceedings of the 34th Energy Systems, Economy and Environment Conference.* Japan Society of Energy and Resources, January 2018.

[o-fu-309-038-05:2017] Kenta Ofuji and Osamu Kimura. Do organizational behaviours actually promote energy efficiency? Evidence from Japanese commercial and industrial sector data. In *Proceedings of the 34th Energy Systems, Economy and Environment Conference.* Japan Society of Energy and Resources, January 2018.

[o-fu-309-038-06:2017] Naomi Ogasawara and Kenta Ofuji. Linguistic analysis of natural disaster evacuation calls. In *Autumn conference, Japan Acoustic Society*, pages 1–5–12. Japan Acoustic Society, September 2017.

[o-fu-309-038-07:2017] Makiko Nemoto Junko Sekiguchi Kenta Ofuji, Masahiro Sagara and Hideko Suzuki. An attempt to insinuate a dietary habit story behind questionnaire data - a path analysis of Fukushima dietary habit survey -. In *Fukushima-ken Hoken Eisei Gakkai(Fukushima Society of Health and Hygene) 2017 Annual Conference.* Fukushima-ken Hoken Eisei Gakkai(Fukushima Society of Health and Hygene), September 2017.

[o-fu-309-038-08:2017] Makiko Nemoto Junko Sekiguchi Kenta Ofuji, Masahiro Sagara and Hideko Suzuki. How many respondents were necessary? - a power analysis of Fukushima dietary habit survey -. In *Fukushima-ken Hoken Eisei Gakkai(Fukushima Society of Health and Hygene) 2017 Annual Conference.* Fukushima-ken Hoken Eisei Gakkai(Fukushima Society of Health and Hygene), September 2017.

[o-fu-309-038-09:2017] Kenta Ofuji. A statistical analysis of commercial sector building electricity usage - Change before and after subsidized BEMS installation -. In *Japan Society of Public Utilities Economics, Hokkaido and Tohoku Branch Annual Meeting.* Japan Society of Public Utilities Economics, September 2017.

Writing a part of textbook or technical book

[paikic-309-038-13:2017] B. T. Kumara, I. Paik, and K. R Koswatte. *Hybrid Term-Similarity-Based Clustering Approach and Its Applications*, chapter 18, pages 397–423. In Handbook of Research on Investigations in Artificial Life Research and Development. IGI Global, 2018.

Summary of Achievement

Research grants from scientific research funds and public organizations

[paikic-309-038-14:2017] Incheon Paik. Japan Society for the Prompostion of Science, Kakenhi, 2016-2018.

Academic society activities

[paikic-309-038-15:2017] Incheon Paik, September 2017.

Special Session Chair, IEEE MCSOC 2017.

[paikic-309-038-16:2017] Incheon Paik, 2017.

Chair of IEICE Service Computing Technical Committee.

[paikic-309-038-17:2017] Incheon Paik, 2017.

Program Committee Member, IEEE ICWS 2017.

Advisor for undergraduate research and graduate research

[o-fu-309-038-10:2017] Narumi Araki. Graduation Thesis: Analysis of disaster evacuation calls from word usage - a statistical analysis verified by an impression survey -, University of Aizu, 3 2018.

Thesis Advisor: K. Ofuji

[o-fu-309-038-11:2017] Ayaka Shiraishi. Graduation Thesis: Dietary Differences of Local Health Activists: A Statistical Analysis, University of Aizu, 3 2018.

Thesis Advisor: K. Ofuji

[o-fu-309-038-12:2017] Haruki Kadohira. Graduation Thesis: Classify food intake group by using factor analysis - An example of Aizu-Wakamatsu city -, University of Aizu, 3 2018.

Thesis Advisor: K. Ofuji

[o-fu-309-038-13:2017] Tomoya Haruta. Graduation Thesis: Do energy management practices in enterprises lead to actual efficiency actions?, University of Aizu, 3 2018.

Thesis Advisor: K. Ofuji

[paikic-309-038-18:2017] Sheng Zhang. An Efficient Algorithm for Web Service Selection Based on Genetic Local Selection in Large Scale, University of Aizu, 2018.

Master Thesis Advisor: Incheon Paik

[paikic-309-038-19:2017] Yui Takeda. Readability Categorization of Eiken Documents Using Machine Learning, University of Aizu, 2018.

Master Thesis Advisor: Incheon Paik

[paikic-309-038-20:2017] Yuji Ishizuka. On-line Cost-aware Workflow Allocation in Heterogeneous Computing Environments, University of Aizu, 2018.

Master Thesis Advisor: Incheon Paik

[paikic-309-038-21:2017] Hiromi Hamaguchi. Classification of Machine-Translated Sentence Using Machine Learning, University of Aizu, 2018.

Graduation Thesis Advisor: Incheon Paik

[paikic-309-038-22:2017] Ryo Ataka. Taxonomy classification with clustered ESA and Machine learning, University of Aizu, 2018.

Graduation Thesis Advisor: Incheon Paik

[paikic-309-038-23:2017] Kazuki Omine. Classification of taxonomical relationships between words by word embedding and machine learning, University of Aizu, 2018.

Graduation Thesis Advisor: Incheon Paik

[paikic-309-038-24:2017] Takeyuki Miyagi. Social Service Network Construction using Word Embedding for Efficient Service Discovery, University of Aizu, 2018.

Graduation Thesis Advisor: Incheon Paik

Others

[paikic-309-038-25:2017] Akila Siriweera and Incheon Paik. QoS aware Traffic Efficient Web Service Selection in BigData Space. 22nd IEICE Service Computing Branch Meeting Technical Report, 2017.

Summary of Achievement

[paikic-309-038-26:2017] Incheon Paik and Kazuki Sasaki. Correlation Between Taxonomy Data Distribution and Classification Performance. 22nd IEICE Service Computing Branch Meeting Technical Report, 2017.

[paikic-309-038-27:2017] Kento Hayasaka and Incheon Paik. Taxonomy Classification By Explicit Semantic Analysis & Deep Machine Learning. 22nd IEICE Service Computing Branch Meeting Technical Report, 2017.

[paikic-309-038-28:2017] Rupasingha Arachchilage Hiruni Madhusha Rupasingha and Incheon Paik. Domain Information Measure with Novel Ontology Generation for Web Service Clustering. 22nd IEICE Service Computing Branch Meeting Technical Report, 2017.

[paikic-309-038-29:2017] Akila Siriweera and Incheon Paik. Customizable Transaction and QoS-aware Selection Approach for Big Data Analytics Automation on the Automatic Service Composition. 22nd IEICE Service Computing Branch Meeting Technical Report, 2017.

[paikic-309-038-30:2017] Takeyuki Miyagi and Incheon Paik. Service Discovery on Service Network Constructed by Word Embedding. 22nd IEICE Service Computing Branch Meeting Technical Report, 2017.

[paikic-309-038-31:2017] Chungho Lee and Incheon Paik. Real-time Trend Analysis of Streaming Twitter and News Based on Big Data Infrastructure. 23rd IEICE Service Computing Branch Meeting Technical Report, 2017.

[paikic-309-038-32:2017] Incheon Paik. Tutorial: Toward Semantic Deep Learning Service - Automating Deep Learning Generation. 25th IEICE Service Computing Branch Meeting Technical Report, 2018.

[paikic-309-038-33:2017] Akila Siriweera and Incheon Paik. Constraint-aware Workflow for Automation of Big Data Analytics based on GraphPlan. 25th IEICE Service Computing Branch Meeting Technical Report, 2018.

Contributions related to syllabus preparation

[o-fu-309-038-14:2017] Syllabus: Graduate School, Univ. of Aizu: PMC01A Managerial Economics

Scholarly paper prepared by undergraduate/graduate student(s) you advised

[paikic-309-038-34:2017] Wuhui Chen, Incheon Paik, and Neil Y. Yen. Discovering internal social relationship for influence-aware service recommendation. *Multimedia Tools and Applications, Springer*, 76(18):18193–18220, September 2017.

Contribution related to the selection of library or textbook materials

[paikic-309-038-35:2017] Library committee member

Contribution related to the building or operation of the university computer system

[paikic-309-038-36:2017] Member of several working groups such as new system replacement, operation management, etc managed by ISTC

Contribution related to planning administration for research, research conferences, or international research

[paikic-309-038-37:2017] Program committee member of several international conferences such IEEE ICWS, IEEE SCC, IEEE iCAST, IEEE MCSOC, etc

[paikic-309-038-38:2017] Director of IEIE Japan Society

Other significant contribution toward university planning, management, or administration

[paikic-309-038-39:2017] Vice Director of ISTC

[paikic-309-038-40:2017] Member of AAC

[paikic-309-038-41:2017] Chair of the UoA Community Affairs Planning Committee

Summary of Achievement

[paikic-309-038-42:2017] Member of the University of Aizu Employment Duty Related
Invention Deliberation Council

**Did you participate in Public Lectures, and/or Open Campus?
(Yes or No) If yes, please describe what you did.**

[paikic-309-038-43:2017] Attended Open Lab

Software Engineering Laboratory

Vitaly V. Klyuev
Professor

Mohamed Hamada
Senior Associate Professor

Evgeny Pyshkin
Senior Associate Professor

The main directions in research conducted by the Software Engineering Lab members in 2017 were

- Semantic Methods for Information Retrieval,

- Technologies for Internet Applications

- Computer Security

- Intelligent Systems and Learning Technologies

- Human-Centric Computing

- Software Engineering and Software Development Education

Prof. Klyuev leads the Semantic Methods for Information Retrieval, Technologies for Internet Applications, and Computer Security directions. The focus of the research by Prof. Hamada is on Intelligent Systems and Learning Technologies. Main scientific interest by Prof. Pyshkin is in Software Engineering, Human-Centric Computing, and Software Development Education Methodology.

Semantic Methods for Information Retrieval

In 2016, the attention to the fake news phenomenon drastically increased. Mobile devices such as cellular phones and sources of information such as social networks are instruments that enable individuals to receive news, publish posts, communicate with peers, watch videos, listen to music, etc. In todays highly mobile society, this is a current trend. The uncontrolled freedom and simplicity in publications on the Internet result in overwhelming users receiving news that are fake and hoaxes. Detecting and filtering such information is a challenging problem. The focus of this year study was on different approaches to combat fake news.

They are used to a) determine text features utilizing linguistic natural language processing methods (it is necessary to create a profile of the text document), b) detect spam bots in social networks to isolate those using machine-learning methods (it is crucial to reduce the number of analyzed documents), and c) confirm the facts in online documents by applying techniques used in search engines (it is very much important to select trusted documents). Opinion mining methods for Japanese were investigated and a prototype to analyze and classify opinions on Amazon.co.jp was developed. Our students were involved in this research. Results were presented at the IDAACS-17 and CPS-18 international forum.

Technologies for Internet Applications

The dynamic nature of the current society demands the business to be very much flexible. The best way to find new customers is to use the power of the Internet for any companies. Web applications nowadays are very important for any company. Intelligent applications are crucial for the users.

The main goal of our research was to study modern Web technologies to design intelligent Web applications. We focused on developing methods to enhance the Lab Website. Lab students played key role in these projects. Results of the investigations conducted together with the students were presented at the ICEEL 2018 and CPS ' 18 international conferences.

Computer Security

A big problem for security is detection of vulnerabilities on the networks Mobile devices such as tablet PCs and mobile phones are gained popularity across the globe. Modern mobile phones are small computers called smartphones. Practically information of any kind about every person can be obtained if one knows his/her phone number: routes to move, places to eat, time to weak up and go to bed, friends, and even habits. There is no place to hide for the users. Recently, it was discovered that mobile devices from several manufactures have factory-preinstall malware. Defending the user data become more complicated. Semantic analysis of large volumes of Internet packages to detect and classify the potential attacks on the servers on the Internet was in the focus of our study. We utilized the modern technologies to carry out the research. Hadoop environment was among them. Hard work of the lab students resulted in successful presentation of the obtained results at the DSC-17 and CPS-18 international forums.

Intelligent Systems and Learning Technologies

Prof. Hamada continued his research on intelligent systems and learning technologies. This year he leads three main projects described as follows.

1. Recommender Systems Recommender systems are useful in many real life applications in e-business and e-learning. In our recommender systems project

we apply machine-learning algorithms, neural networks, and genetic algorithms. We focus on multi-criteria recommender systems. Students are deeply involved in this project. Results also published in in the proceedings of several international conferences.

2. Intelligent Interactive Multimedia Learning Framework This project focuses on the development of an intelligent interactive multimedia learning framework. The framework consists of several modules such as: a multimedia content module, a simulation module, etc. The purpose of the project was to support active and collaborative learning. The framework was successfully applied on the topic of information and communication theory. Our framework proves to enhance the learning process and support for self and life-long learning. Students are deeply involved in this project.

3. Cloud-based Java Compiler for Smart Devices Smart devices such as iOS-based devices (e.g: iPhone and iPad) and Android-based devices (e.g.: Smart-phones and Tablets) become popular among many learners. In this project we utilize such smart powerful devices in the learning process of Java programming. Java is a popular programming language in many computer science educational institutes. Because of some hardware and software limitations of the smart devices, users cannot compile and run Java programs on such devices. The purpose of the project was to build a cloud-based Java compiler that can overcome such limitations and allows the users to run Java programs on the smart devices using the cloud technologies.

Human-Centric Computing Human-centric technology develops as a substantial part of digital transformation changing the ways people use and advance computer technology. Our current research is focusing on going towards building the systems assuring better user collaboration and leveraging user skills and practices in the areas of developing information systems for travelers, learning systems, as well as advancing our understanding of software construction as a product of human creativity. A particularly interesting aspect of human-centric technology is its transdisciplinarity, which is twofold: first, it means a cooperation among algorithms, methodologies and approaches from different knowledge areas struggling with a certain societal problem or applied to a certain technology; second, it is a transition of the successful solutions or applications to a distinct application domain. We presented our ongoing projects in some international conferences including FedCSIS-2017 (Prague, Czech Republic) and CYBCONF 2017 (Exeter, United Kingdom).

Software Engineering and Software Development Education In the domain of software engineering, our particular interests are in advancing approaches

for software testing and learning interdisciplinary connections in software design, usage and teaching. A number of projects in this field is a product of our cooperation with Active Knowledge Engineering Lab and with our international partners. Among the scope of our particular interests, there are project on software testing automation (including mobile software testing) and software development learning and teaching methodology, which is a non-trivial topic for IT research. A digitally transformed society requires further transformation of practices and techniques used in teaching and learning organization, including an approach to use metaphors reflecting multi-faceted software concepts. Software development education is a natural convergence of many interdisciplinary efforts. Teaching and learning software development requires creating a context, where a software-related expertise interacts with and even penetrates a wide range of technical and non-technical academic disciplines. Particularly, some our recent projects and research works were presented at the international conferences including ACENS-2017 (Sapporo, Japan), SECR 2017, UBICOMM 2017 (Barcelona, Spain). The presentation made at SECR 2017 by Prof. Pyshkin was awarded as the best paper in the educational field. The paper (in co-authorship with Prof. Mozgovoy) for UBICOMM 2017 presented by Prof. Pyshkin received the best paper award.

International Relations Our international contacts helps us to organize the international workshops and conferences, to share our research and education expertise, and to involve excellent experts to join our ongoing projects. List of our international partners includes professionals from many authoritative institutions including the University of Luxembourg (Luxembourg), Universitat Politecnica de Valencia (Spain), Ulm University of Applied Sciences (Germany), Meiji University (Japan), St. Petersburg State University (Russia), Peter the Great St. Petersburg Polytechnic University (Russia), Belarussian Russian University (Belarus), T-Systems Rus (Russia), and Cognizant Consulting (Switzerland). Opportunities to participate in international academic projects significantly extends the possibilities to approve the ideas and teaching models, to get feedback from the international community, and therefore, to improve the courses developed for the University of Aizu students.

Invited lectures and grants

Prof. Pyshkin was invited for a keynote presentation *Software through the Perspective of Human-Centric Computing Paradigm* the NexTech 2017 conference series (November 12 – 16, 2017, Barcelona, Spain). In September 2017, Prof. Pyshkin delivered a series of guest lectures *Software Engineering for the Digitally Transformed World* in Belarussian Russian University, Mogilev, Belarus. In November 2017 and in March 2018 Prof. Pyshkin gave an open lecture *Human-*

Centric Computing in a Transdisciplinary Research Discourse and a number of seminars for master-degree students and faculty *Software Engineering for the Digitally Transformed World: Improve Your Learning Abilities*, *The University of Aizu: No. 1 Japanese University in International Outlook*, *Quality Assurance: Software Evaluation vs. Quality Methods Evaluation*.

International conferences and workshops

Our lab in cooperation with the Active Knowledge Lab organized the 7th International Workshop on Advances in Semantic Information Retrieval as an event of the 2017 Federated Conference on Computer Science and Information Systems (Prague, Czech Republic, 2017). We involved in this activity since 2011. This workshop is gained popularity among researchers from Europe, Asia, and America. The Website is available at: https://fedcsis.org/2017/asir/.

Our proposal for a special session on Information Management in Human-Centric Systems (IMHCS-2017) was accepted to be organized as an event of CYBCONF 2017 conference (Exeter, United Kingdom). Prof. Pyshkin and Prof. Klyuev were co-chairs of this session. The event was successfully implemented in June 2017 and attracted the research works discussing current trends in information acquisition, representation and processing in human-centric systems and applications. Experts from the universities and IT companies from 8 countries (including Japan, Russia, Luxembourg, Germany, Spain, Norway, Switzerland and Italy) joined the program committee of this event. The workshop materials including selected works on human-centered applications were published in the conference proceedings published by IEEE Computer Society Press and subsequently indexed by Web of Knowledge and Scopus.

We have started work to organize The 3nd International Conference on Applications in Information Technology. The conference is organized in cooperation with the Active Knowledge Lab and our partner university Peter the Great Saint-Petersburg State Polytechnic University, Russia. In the end of Spring 2018, this conference received the status: ICPS published by ACM.

This event is a place for the first scientific presentations of the best students of the University of Aizu and our partner universities. This conference is a good school for Japanese and foreign students on their way to become scientists. The Conference on Applications in Information Technology discovers new names of the next generation of scientists. This event creates the necessary conditions to keep international scientific contacts at the student level. We do hope, some of students participating in this conference will work in tight cooperation in the future. The conference Website is available at: http://icait-aizu.org/

Exchange of Undergraduate Students

For the first time in the history of our lab, submissions of four undergraduate university students: Mr. Kamia, Mr. Nemoto, Mr. Kito, and Mr. Qiu Chen, were accepted for presentation at the XLIX Conference on Control Processes and Stability (http://cpsconf.ru). Our Russian partners are in charge for local expenses during students stay in Saint-Petersburg. Russian students will attend ICAIT-2018 in Aizu in November 2018.

Foreign Students Undergraduate student Mr. Qiu Chen from China, enrolled in the SGU program, should be graduated in Autumn 2018.

Achievements

It is become a good tradition that results of the research done by lab students are presented at the high rank conferences. Mr. Saito successfully presented results of his research at IDAACS 2017 in September 2017. Submissions by undergraduate students Mr. Kamia, Mr. Nemoto, Mr. Kito, and Mr. Qiu Chen were accepted for CPS ' 18 international forum. A paper by master student Mr. Kato was presented at DSC 2017 (Taiwan, August, 2017). Conference organizers recommended its extended version for publication in the Special Issue on Multidisciplinary Sciences and Engineering organized by Advances in Science, Technology and Engineering Systems Journal (ASTESJ).

Other activities Prof. Hamada and other students of our lab was involved in developing many iOS and Android based Apps. Among such applications is the university of Aizu application, which is now available in Apple App store for free download. The app is an effort to introduce the university of Aizu domestically and internationally as a top global university. Another app is the iAizu app which is an effort to collaborate with Aizuwakamatsu city to promote local community collaboration and introduce Aizu city to the world as a historical Japanese city.

In April 2017 we started the project *Advancing interfaces, ontologies and algorithms for traveler-centric information systems supporting geographical, cultural and historical perspectives* supported by the JSPS Kakenhi grant. This 3 years project involves researchers and students from Software Engineering Lab, Active Knowledge Engineering Lab, as well as our academic and industrial international partners from Peter the Great St. Petersburg Polytechnic University and T-Systems Rus. The project follows a process of evolution of models and technology for developing software for personalized travel information services. This research will produce a number of models and software prototypes for interfaces and algorithms used in travel-centric information systems.

One more interlab project running because of collaboration with Active Knowledge Engineering Lab (Prof. Maxim Mozgovoy) is developing a conceptual architecture and a framework for mobile software automated testing, which is one of

the most cost-efficient quality assurance procedures. Our goal is to create an open source framework for small-scale mobile farms. The aim of this framework is to let anyone to quickly connect own iOS or Android devices into a fully functional mobile farm, and integrate it into existing continuous integration pipeline.

Summary of Achievement

Refereed academic journal

[hamada-310-010-01:2017] Mohamed Hamada and Mohamed Hassan. An Enhanced Learning Style Index: Implementation and Integration into an Intelligent and Adaptive e-Learning System. *Eurasia Journal of Mathematics, Science and Technology Education*, 13(8):4449–4470, 2017.

Advances and accessibility of Internet services around the world have transformed the traditional classroom learning into web-based e-learning systems. In recent years, designing adaptive e-learning systems has become one of striking topic of discussions in the literature. Additionally, integrating such systems with intelligent and adaptive systems that can measure the learning preferences of the user can enable learners to obtain the most suitable learning objects that might be matched with their learning styles. Moreover, even in the classroom teaching, knowing the learning styles of students can also help teachers to adopt appropriate learning materials for efficient learning. This paper is concerned with the study, implementation, and application of a web-based learning style index. The paper also described a case study on the integration of the learning style index into an adaptive and intelligent e-learning system.

[hamada-310-010-02:2017] Hamada M. Hassan, M. A neural networks approach for improving the accuracy of multi-criteria recommender systems. *Applied Sciences*, 7(9):1–18, 2017.

Accuracy improvement has been one of the most outstanding issues in the recommender systems research community. Recently, multi-criteria recommender systems that use multiple criteria ratings to estimate overall rating have been receiving considerable attention within the recommender systems research domain. This paper proposes a neural network model for improving the prediction accuracy of multi-criteria recommender systems. The neural network was trained using simulated annealing algorithms and integrated with two samples of single-rating recommender systems. The paper presents the experimental results for each of the two single-rating techniques together with their corresponding neural network-based models. To analyze the performance of the approach, we carried out a comparative analysis of the performance of each single rating-based technique and the proposed multi-criteria model. The experimental findings revealed that the proposed models have by far outperformed the existing techniques.

[hamada-310-010-03:2017] Hamada M. Hassan, M. Performance comparison of

feed-forward neural networks trained with different learning algorithms for recommender systems. *Computation*, 5(3):40–58, 2017.

Accuracy improvement is among the primary key research focuses in the area of recommender systems. Traditionally, recommender systems work on two sets of entities, Users and Items, to estimate a single rating that represents a users acceptance of an item. This technique was later extended to multi-criteria recommender systems that use an overall rating from multi-criteria ratings to estimate the degree of acceptance by users for items. The primary concern that is still open to the recommender systems community is to find suitable optimization algorithms that can explore the relationships between multiple ratings to compute an overall rating. One of the approaches for doing this is to assume that the overall rating as an aggregation of multiple criteria ratings. Given this assumption, this paper proposed using feed-forward neural networks to predict the overall rating. Five powerful training algorithms have been tested, and the results of their performance are analyzed and presented in this paper.

Refereed proceedings of an academic conference

[hamada-310-010-04:2017] Hamada M. Hassan, M. Smart media-based context-aware recommender systems for learning: A conceptual framework. In *IEEE 16th International Conference on Information Technology Based Higher Education and Training, ITHET 2017*. IEEE, 2017.

Modern technologies have been greatly employed to support both teachers and learners for facilitating teaching and learning processes. Recommender systems for technology- enhanced learning (TEL) are among those new technologies that have been researched extensively within the past few years. This is because, recommender systems are intelligent decision support systems that assist users in finding suitable learning objects that might match their preferences on the kinds of materials they require to enhance their learning process. However, most of the existing recommender systems for learning used traditional techniques to recommend items without considering the context for which the recommendation should be made. Those contexts could be their geographical locations, their level of education, the time of the day or week, their learning preferences and so on. This paper proposed a smart media-based context-aware recommender system that considers learning preferences of a user as a context for making accurate and usable recommendations. The proposed system is designed to run on smart devices for learners to test and know their learning styles and receive

learning object recommendations according to their learning preferences. The paper contains the conceptualization of the framework and the details of the design and implementation procedure.

[hamada-310-010-05:2017] Hamada M. Hassan, M. Performance analysis of neural networks-based multi-criteria recommender systems. In *IEEE International Conferences on Information Technology, Information Systems and Electrical Engineering, ICITISEE 2017*. IEEE, 2017.

Frequent use of Internet applications and rapid growth of volumes of online resources have made it difficult for users to effectively make decisions on the kinds of information or items to select. Recommender systems (RSs) are intelligent decision-support tools that exploit users preferences and suggest items that might be interesting to them. They are one of the various solutions used by online users to overcome the problem of information overload. Traditionally, RSs use single ratings to predict and represent preferences of users for items that are not yet seen. Multi-criteria RSs use multiple ratings to various items' attributes for improving prediction and recommendation accuracy of the systems. However, one major challenge of multi-criteria RSs is the choice of an efficient approach for modelling the criteria ratings. Therefore, this paper aimed at employing artificial neural networks to model the criteria ratings and determine the predictive performance of the systems based on aggregation function approach. Seven evaluation metrics have been used to evaluate and the accuracy of the systems. The empirical results of the study have shown that the proposed technique has the highest prediction and recommendation than the corresponding traditional technique.

[hamada-310-010-06:2017] Hamada M. Hassan, M. Improving prediction accuracy of multi-criteria recommender systems using adaptive genetic algorithms. In *IEEE Intelligent Systems Conference, IntelliSys 2017*. IEEE, 2017.

Recommender systems are powerful intelligent sys- tems that are considered as solutions to the problems of informa- tion overload. They provide personalized lists of recommended items to users using some machine learning techniques. Tradi- tionally, the existing recommender systems used single rating techniques to estimate users opinions on items. However, as preferences of the users might depend on several items attributes, the efficiency of the traditional single rating recommender sys- tems are considered to be limited since it can not account for the various items attributes. A multi-criteria recommendation is a new technique that uses ratings to various items attributes to make more efficient predictions. Nevertheless, despite the proven accuracy improvements

of multi-criteria recommendation technique, research needs to be done continuously to establish an efficient way of modelling the criteria ratings. Therefore, this paper proposed to use an adaptive genetic algorithm to model multi-criteria recommendation problems using an aggregation function approach. The empirical results presented in this paper have shown that the multi-criteria recommendation technique using adaptive genetic algorithm has by far provides more accurate predictions than traditional recommendation approach.

[hamada-310-010-07:2017] Hamada M. Hassan, M. A computational model for improving the accuracy of multi-criteria recommender systemsIEEE 11th International Symposium on Embedded Multicore/Many-Core Systems-on-Chip, MCSoC 2017. In *IEEE 11th International Symposium on Embedded Multicore/Many-Core Systems-on-Chip, MCSoC 2017*, page 2017. IEEE, 2017.

Artificial neural networks are complex biologically inspired algorithms made up of highly distributed, adaptive and self-organizing structures that make them suitable for optimization problems. They are made up of a group of interconnected nodes, similar to the great networks of neurons in the human brain. So far, artificial neural networks have not been applied to user modeling in multi-criteria recom- mender systems. This paper presents neural networks-based user modeling technique that exploits some of the charac- teristics of biological neurons for improving the accuracy of multi-criteria recommendations. The study was based upon the aggregation function approach that computes the overall rating as a function of the criteria ratings. The proposed technique was evaluated using different evaluation metrics, and the empirical results of the experiments were compared with that of the single rating-based collaborative filtering and two other similarity-based modeling approaches. The two similarity-based techniques used are: the worst-case and the average similarity techniques. The results of the comparative analysis have shown that the proposed technique is more efficient than the two similarity-based techniques and the single rating collaborative filtering technique.

[hamada-310-010-08:2017] Hamada M. Adeshina S.A. Enegi, I.L. Adaptive multimedia learning framework with facial recognition system. In *13th IEEE International Conference on Electronics, Computer and Computation, ICECCO 2017*. IEEE, 2017.

Recent breakthrough in mobile technology, wireless commu- nication and sensing ability of smart devices promote the ease to detect real-world learning status of students as well as the context aware for learning. Targeted information can

be provided to individual students in the right place and at the right time. This work is one of the three major components of our Smart Learning Framework, others include Multimedia Module Contents (MMC) and Learning Style Index (LSI). However, this module of our work aimed to perfect efforts to correctly make decision during and educational learning process. This was based on the fact that adaptive decisions can only be made to protect learner enthusiasm, promote learning grid and enhances general understanding of an adaptive learning environment if users immediate behavior and concern is well considered. This approach implements facial expres- sion recognition on a smart phone (android) using effectiva SDK. This enables correct detection of facial expression for further understanding of the meaning in a learning environment. The output of this module is used for Learners Behavior Analysis which then provide result of general evaluation of individual learner.

[pyshe-310-010-01:2017] Mozgovoy M. and Pyshkin E. Unity application testing automation with Appium and image recognition. In Itsykson V., Scedrov A., and Zakharov V., editors, *Tools and Methods of Program Analysis. TMPA 2017.*, volume 779 of *Communications in Computer and Information Science*, pages 139–150. Springer, Cham, 2017.

The paper was presented at the TMPA-2017, an authoritative conference in the domain of software verification and analysis.

[pyshe-310-010-02:2017] Pyshkin E. Designing Human-Centric Applications: Transdisciplinary Connections with Examples. In *Proc. of 2017 3rd IEEE International Conference on Cybernetics (CYBCONF), Exeter, UK, Jun 21-23*, pages 455–460. IEEE, IEEE, 2017.

This presentation was delivered at the special session on Information Management in Human-Centric Systems, organized in conjunction with the 3rd IEEE CybConf 2017 conference.

[pyshe-310-010-03:2017] Pyshkin E. and Korobenin P. Just Walk: Rethinking Use Cases in Mobile Audio Travel Guides. In Ganzha M., Maciaszek L., and Paprzycki M., editors, *Proceedings of the 2017 Federated Conference on Computer Science and Information. ACSIS*, volume 11, pages 281–287. IEEE, 2017.

Presented at the Advances in Semantic Information Retrieval workshop, organized in conjunction with FedCSIS 2017.

[pyshe-310-010-04:2017] Lezhenin I., Zhuikov A., Bogach N., Boitsova E., and

Pyshkin E. PitchKeywordExtractor: Prosody-based Automatic Keyword Extraction for Speech Content. In Ganzha M., Maciaszek L., and Paprzycki M., editors, *Proceedings of the 2017 Federated Conference on Computer Science and Information Systems. ACSIS*, volume 11, pages 265–269. IEEE, 2017.

The paper was presented at the FedCSIS 2017 as the joint project of th Univbersity of Aizu and Peter the Great St. Petersburg Polytechnic University supervised by Evgeny Pyshkin.

[pyshe-310-010-05:2017] Pyshkin E. Liberal arts in a digitally transformed world: A case of software development education. In *Proceedings of the 13th Central and Eastern European Software Engineering Conference in Russia (CEE-SECR '17)*. ACM, 2017.

Awarded as SECR 2017 Best Paper in the educational field.

[pyshe-310-010-06:2017] Mozgovoy M. and Pyshkin E. Using Image Recognition for Testing Hand-drawn Graphic User Interfaces. In *11th International Conference on Mobile Ubiquitous Computing, Systems, Services and Technologies (UBICOMM 2017), November 12-16, Barcelona, Spain*, pages 25–28. IARIA, 2017.

Awarded as UBICOMM-2017 Best Paper.

[vkluev-310-010-01:2017] Keisuke Kato and Vitaly Klyuev. Development of a Network Intrusion Detection System Using Apache Hadoop and Spark. In *Proceedings of the 2017 IEEE Conference on Dependable and Secure Computing (DSC-17)*, pages 416–423. IEEE, IEEE, August 2017.

Cyber attacks on network communication are executed against companies, governments, and even individuals. A number of these attacks is drastically increased over the last decade. Nowadays, protecting private data, latest research data, etc. is a crucial problem. Therefore, developing an intelligent system to detect the attacks is required. In this paper, we propose an anomaly based network intrusion detection system. The system is capable to analyze huge datasets in a short period of time. We utilized 90.9 GB of a real network packet dataset provided by the Information Security Centre of Excellence at the University of New Brunswick. The system analyzes the packet capture files of this dataset in the environment by using Apache Hadoop and Spark. An approach to implement the system is based on Hive SQL and unsupervised learning algorithms. The accuracy of the proposed detection system is 86.2 persent with 13 persent of the false positive rate. These results are promising to detect attacks in real-time.

[vkluev-310-010-02:2017] Yoichi Saito and Vitaly Klyuev. Opinion Mining: Book-Ranking Application. In *the 2017 IEEE 9th International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS)*, volume 2, pages 767–770. IEEE, IEEE, September 2017.

A lot of products are sold on electronic commerce websites. There are many customer reviews available on the Internet. Users read them to select a product to purchase. However, going through the reviews is timeconsuming because the number of reviews is large for each product. It is important to reflect reviews in a ranking to make a decision easily. The aim of this research is ranking products based on opinions of customers by proposing a new ranking method. We focused on the customer reviews on books. In this research, we collected all reviews on each book and classified them as positive or negative. After that, we calculated the rates of positive sentences and negative ones and made a ranking of books based on them. As a result from the experiment, we got a book ranking list. This ranking strongly depends on the number of customer reviews and their contents. This approach was illustrated reviews on books on Ruby on rails. In the future, we are planning to apply a machine learning algorithm to classify reviews more accurately.

[vkluev-310-010-03:2017] Vitaly Klyuev. TEAM-BASED LEARNING IN COMPUTER SCIENCE: A JAPANESE CASE STUDY. In *International Conference on Education and E-Learning (ICEEL)*, pages 20–22. ISERD, March 2018.

This paper discusses the specifics of team-based learning in computer science at the university in Japan.

Research grants from scientific research funds and public organizations

[pyshe-310-010-07:2017] Pyshkin E. and Mozgovoy M. Advancing interfaces and algorithms used in traveler-centric information systems supporting geographical, cultural and historical perspectives, 2017-2019.

Academic society activities

[hamada-310-010-09:2017] Mohamed Hamada, 2017.

IEEE Senior member

[hamada-310-010-10:2017] Mohamed Hamada, 2017.

ACM Senior member

[vkluev-310-010-04:2017] Vitaly Klyuev, 2017.

member

Advisor for undergraduate research and graduate research

[hamada-310-010-11:2017] Ryo Kuribayashi. Developing mobile application for learning Shannon code algorithm, UoA, 2017.

[hamada-310-010-12:2017] Yuichi Takase. Design and implementation of Huffman code using Android OS, UoA, 2017.

[hamada-310-010-13:2017] Hitoshi Ikuta. Recognition of facial expressions using smartphones, UoA, 2017.

[hamada-310-010-14:2017] Yoshiki Miyazawa. A cloud-based implementation of data compression techniques, UoA, 2017.

[vkluev-310-010-05:2017] Cristian Kamia. Removing pre-installed malware applications from firmware of Android-based smartphones, Undergraduate School, March 2017.

[vkluev-310-010-06:2017] Naoto Sugawara. Principal Component Analysis: Matching Skin Patterns of Fish, Undergraduate School, March 2017.

Contributions related to syllabus preparation

[hamada-310-010-15:2017] Preparation for Automata Theory course syllabus

[hamada-310-010-16:2017] Preparation for Language Processing Systems course Syllabus

[hamada-310-010-17:2017] Preparation for Information Theory course Syllabus

[hamada-310-010-18:2017] Preparation for Computational models course Syllabus

Summary of Achievement

[hamada-310-010-19:2017] Preparation for Automata and Languages Theory course Syllabus

[pyshe-310-010-08:2017] Preparation of the syllabi for the connected undergraduate courses "Introduction to Programming" and "C programming" within the framework of ICTG program.

[pyshe-310-010-09:2017] Praparation of the syllabus of the undergraduate course "Introduction to Data Management" (launched in AY2018).

Preparation of course examination to measure comprehension

[hamada-310-010-20:2017] Preparation for course examination for Information Theory course

[hamada-310-010-21:2017] Preparation for course examination of Automata Theory course

[hamada-310-010-22:2017] Preparation for course examination of Automata and languages theory course

[hamada-310-010-23:2017] Participated in Preparation for course examination of Java programming 1 course

Scholarly paper prepared by undergraduate/graduate student(s) you advised

[hamada-310-010-24:2017] Hassan M. Hamada, M. An enhanced learning style index: Implementation and integration into an intelligent and adaptive e-Learning system. *Eurasia Journal of Mathematics, Science and Technology Education*, 13(8), 2017.

[hamada-310-010-25:2017] Hamada M. Hassan, M. A neural networks approach for improving the accuracy of multi-criteria recommender systems. *Applied Sciences*, 7(9), 2017.

[hamada-310-010-26:2017] Hamada M. Hassan, M. Performance comparison of feed-forward neural networks trained with different learning algorithms for recommender systems. *Computation*, 5(3), 2017.

[hamada-310-010-27:2017] Hamada M. Hassan, M. Smart media-based context-aware recommender systems for learning: A conceptual framework. *16th IEEE International Conference on Information Technology Based Higher Education and Training, ITHET 2017*, 2017.

[hamada-310-010-28:2017] Hamada M. Hassan, M. Performance analysis of neural networks-based multi-criteria recommender systems. *IEEE International Conferences on Information Technology, Information Systems and Electrical Engineering, ICITISEE 2017*, 2017.

[hamada-310-010-29:2017] Hamada M. Hassan, M. Improving prediction accuracy of multi-criteria recommender systems using adaptive genetic algorithms. *IEEE Intelligent Systems Conference, IntelliSys 2017*, 2017.

[hamada-310-010-30:2017] Hamada M. Hassan, M. A computational model for improving the accuracy of multi-criteria recommender systems. *IEEE 11th International Symposium on Embedded Multicore/Many-Core Systems-on-Chip, MCSoC 2017*, 2017.

[vkluev-310-010-07:2017] Keisuke Kato and Vitaly Klyuev. Development of a Network Intrusion Detection System Using Apache Hadoop and Spark. *The 2017 IEEE Conference on Dependable and Secure Computing (DSC-17)*, pages 416–423, August 2017.

[vkluev-310-010-08:2017] Vitaly Klyuev Yoichi Saito. Opinion Mining: Book-Ranking Application. *the 2017 IEEE 9th International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS)*, 2:767–770, September 2017.

Contribution related to on-campus/off-campus publicity work

[hamada-310-010-31:2017] Public lecture on iOS Program Development as a try-series

[hamada-310-010-32:2017] Developing iOS-based App for the University of Aizu as an effort to promote the university of Aizu both nationally and internationally

Contribution related to planning administration for research, research conferences, or international research

Summary of Achievement

[hamada-310-010-33:2017] Guest Researcher at the University of Tsukuba, Alliance for Research on North African, ARENA Center, Tsukuba Science City, Japan

[hamada-310-010-34:2017] Advisor Committee Member for the IEEE IndiaCOM International Conference

[hamada-310-010-35:2017] Associate Editor for AI and New Generation Learning Technologies, The International Journal of Information Technology (Springer).

[hamada-310-010-36:2017] Editorial Board of the International Journal of Computer Science and Artificial Intelligence (IJCSAI).

[hamada-310-010-37:2017] Reviewer of: the IEEE Trans. On Learning Technologies, the ACM Trans. On Computing Education, the IEICE transactions, the Journal of Advances in Modeling and Analysis, the ACM SIGCSE and ITiCSE, IEEE Trans. On Education, Computer Applications in Eng. Education, and others.

[pyshe-310-010-10:2017] As a program committee chair, I was involved to the preparation activities for organizing the ICAIT-2018 conference (to be held in the University of Aizu) include the ACM ICPS conference application procedure (ACM ICPS status has been approved), deploying the conference submission system at EasyChair, designing and administering the conference web page available at http://icait-aizu.org, inviting the PC members and keynote speakers.

[pyshe-310-010-11:2017] I led a special session on Information Managements in Human-Centric Systems organized as an event of 3rd IEEE CybConf 2017 in Exeter, UK, June 2017 (session co-chair). Workshop materials including selected works on human-centered applications were published in the conference proceedings published by IEEE Computer Society Press and subsequently indexed by Web of Knowledge and Scopus. As a program committee co-chair (together with Prof. Vitaly Klyuev), I was responsible for managing the workshop submission system and for coordinating the event in Exeter.

Other significant contribution toward university planning, management, or administration

[hamada-310-010-38:2017] Creating programming problems for the PC-Koshien

Did you participate in Faculty Development? (Yes or No) If yes, please describe what you did.

[hamada-310-010-39:2017] Actively participated in faculty development invited lectures.

Did you participate in Public Lectures, and/or Open Campus? (Yes or No) If yes, please describe what you did.

[hamada-310-010-40:2017] Giving public lectures on smartphone application development

[pyshe-310-010-12:2017] I coordinated the OpenCampus activities in the Software Engineering Lab during October 2017 Open Campus event. The presentation on ongoling lab projects were delivered to the lab guests.

Division of Information and Systems

Space and Planetary Informatics Laboratory

Hirohide Demura
Professor
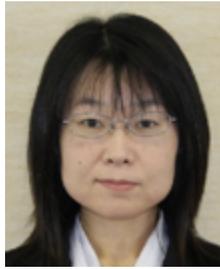
Yoshiko Ogawa
Associate Professor

Kohei Kitazato
Associate Professor

Chikatoshi Honda
Associate Professor

Refereed academic journal

[chonda-311-017-01:2017] M.; Kouyama T.; Tatsumi E.; Kameda S.; Honda R.; Sawada H.; Ogawa N.; Morota T.; Honda C.; Sakatani N.; Hayakawa M.; Yokota Y.; Yamamoto Y.; Sugita S. Suzuki, H.; Yamada. Initial inflight calibration for Hayabusa2 optical navigation camera (ONC) for science observations of asteroid Ryugu. *Icarus*, 2018.

Hayabusa2, the first sample return mission to a C-type asteroid was launched by the Japan Aerospace Exploration Agency (JAXA) on December 3, 2014 and will arrive at the asteroid in the middle of 2018 to collect samples from its surface, which may contain both hydrated minerals and organics. The optical navigation camera (ONC) system on board the Hayabusa2 consists of three individual framing CCD cameras, ONC-T for a telescopic nadir view, ONC-W1 for a wide-angle nadir view, and ONC-W2 for a wide-angle slant view will be used to observe the surface of Ryugu. The cameras will be used to measure the global asteroid shape, local morphologies, and visible spectroscopic properties. Thus, image data obtained by ONC will provide essential information to select landing (sampling) sites on the asteroid. This study reports the results of initial inflight calibration based on observations of Earth, Mars, Moon, and stars to verify and characterize the optical performance of the ONC, such as flat-field sensitivity, spectral sensitivity, point-spread function (PSF), distortion, and stray light of ONC-T, and distortion for ONC-W1 and W2. We found some potential problems that may influence our science observations. This includes changes in sensitivity of flat fields for all bands from those that were measured in the pre-flight calibration and existence of a stray light that arises under certain conditions of spacecraft attitude with respect to the sun. The countermeasures for these problems were evaluated by using data obtained during initial in-flight calibration.

[chonda-311-017-02:2017] H.; Takamatsu T.; Cho Y.; Yasuda T.; Yamada M.; Sawada H.; Honda R.; Morota T.; Honda C.; Sato M.; Okumura Y.; Shibasaki K.; Ikezawa S.; Sugita S. Kameda, S.; Suzuki. Preflight Calibration Test Results for Optical Navigation Camera Telescope (ONC-T) Onboard the Hayabusa2 Spacecraft. *Space Science Reviews*, 2017.

The optical navigation camera telescope (ONC-T) is a telescopic framing camera with seven colors onboard the Hayabusa2 spacecraft launched on December 3, 2014. The main objectives of this instrument are to optically navigate the spacecraft to asteroid Ryugu and to conduct multi-band mapping the asteroid.

We conducted performance tests of the instrument before its installation on the spacecraft. We evaluated the dark current and bias level, obtained data on the dependency of the dark current on the temperature of the charge-coupled device (CCD). The bias level depends strongly on the temperature of the electronics package but only weakly on the CCD temperature. The dark-reference data, which is obtained simultaneously with observation data, can be used for estimation of the dark current and bias level. A long front hood is used for ONC-T to reduce the stray light at the expense of flatness in the peripheral area of the field of view (FOV). The central area in FOV has a flat sensitivity, and the limb darkening has been measured with an integrating sphere. The ONC-T has a wheel with seven bandpass filters and a panchromatic glass window. We measured the spectral sensitivity using an integrating sphere and obtained the sensitivity of all the pixels. We also measured the point-spread function using a star simulator. Measurement results indicate that the full width at half maximum is less than two pixels for all the bandpass filters and in the temperature range expected in the mission phase except for short periods of time during touchdowns.

[chonda-311-017-03:2017] Kohei; Abe Masanao; Ohtake Makiko; Arai Takehiko; Arai Tomoko; Hirata Naru; Hiroi Takahiro; Honda Chikatoshi; Imae Naoya; Komatsu Mutsumi; Matsunaga Tsuneo; Matsuoka Moe; Matsuura Shuji; Nakamura Tomoki; Nakato Aiko; Nakauchi Yusuke; Osawa Takahito; Senshu Hiroki; Takagi Yasuhiko; Tsumura Kohji; Takato Naruhisa; Watanabe Sei-ichiro; Barucci Maria Antonietta; Palomba Ernesto; Ozaki Masanobu Iwata, Takahiro; Kitazato. NIRS3: The Near Infrared Spectrometer on Hayabusa2. *Space Science Reviews*, 2017.

NIRS3: The Near Infrared Spectrometer is installed on the Hayabusa2 spacecraft to observe the target C-type asteroid 162173 Ryugu at near infrared wavelengths of 1.8 to 3.2 um. It aims to obtain reflectance spectra in order to detect absorption bands of hydrated and hydroxide minerals in the 3 um-band. We adopted a linear-image sensor with indium arsenide (InAs) photo diodes and a cooling system with a passive radiator to achieve an optics temperature of 188 K (-85degC), which enables to retaining sufficient sensitivity and noise level in the 3 um wavelength region. We conducted ground performance tests for the NIRS3 flight model (FM) to confirm its baseline specifications. The results imply that the properties such as the signal-to-noise ratio (SNR) conform to scientific requirements to determine the degree of aqueous alteration, such as CM or CI chondrite, and the stage of thermal metamorphism on the asteroid

surface.

[kitazato-311-017-01:2017] T. Okada, T. Fukuhara, S. Tanaka, M. Taguchi, T. Imamura, T. Arai, H. Senshu, Y. Ogawa, H. Demura, K. Kitazato, R. Nakamura, T. Kouyama, T. Sekiguchi, S. Hasegawa, T. Matsunaga, T. Wada, J. Takita, N. Sakatani, Y. Horikawa, K. Endo, J. Helbert, T. G. Mueller, and A. Hagermann. Thermal Infrared Imaging Experiments of C-Type Asteroid 162173 Ryugu on Hayabusa2. *Space Science Reviews*, 208(1-4):255–286, 2017.

[kitazato-311-017-02:2017] T. Iwata, K. Kitazato, M. Abe, M. Ohtake, T. Arai, T. Arai, N. Hirata, T. Hiroi, C. Honda, N. Imae, M. Komatsu, T. Matsunaga, M. Matsuoka, S. Matsuura, T. Nakamura, A. Nakato, Y. Nakauchi, T. Osawa, H. Senshu, Y. Takagi, K. Tsumura, N. Takato, S. Watanabe, M. A. Barucci, E. Palomba, and M. Ozaki. NIRS3: The Near Infrared Spectrometer on Hayabusa2. *Space Science Reviews*, 208(1-4):317–337, 2017.

[kitazato-311-017-03:2017] M. Matsuoka, T. Nakamura, T. Osawa, T. Iwata, K. Kitazato, M. Abe, Y. Nakauchi, T. Arai, M. Komatsu, T. Hiroi, N. Imae, A. Yamaguchi, and H. Kojima. An evaluation method of reflectance spectra to be obtained by Hayabusa2 Near-Infrared Spectrometer (NIRS3) based on laboratory measurements of carbonaceous chondrites. *Earth, Planets and Space*, 69(1):1–12, 2017.

[yoshiko-311-017-01:2017] T. Nakamura S. Tanaka H. Demura Y. Ogawa N. Sakatani Y. Horikawa H. Senshu T. Fukuhara T. Okada Arai, T. Thermal Imaging Performance of TIR Onboard the Hayabusa2 Spacecraft. *Space Science Reviews*, 208:239–254, July 2017.

The thermal infrared imager (TIR) is a thermal infrared camera onboard the Hayabusa2 spacecraft. TIR will perform thermography of a C-type asteroid, 162173 Ryugu (1999 JU3), and estimate its surface physical properties, through remote in-situ observations in 2018 and 2019.

[yoshiko-311-017-02:2017] T. Fukuhara S. Tanaka M. Taguchi T. Imamura T. Arai H. Senshu Y. Ogawa H. Demura K. Kitazato R. Nakamura T. Kouyama T. Sekiguchi S. Hasegawa T. Matsunaga T. Wada J. Takita N. Sakatani Y. Horikawa K. Endo J. Helbert T. G. Muller A. Hagermann Okada, T. Thermal Infrared Imaging Experiments of C-Type Asteroid 162173 Ryugu on Hayabusa2. *Space Science Reviews*, 208:255–286, July 2017.

The thermal infrared imager TIR onboard Hayabusa2 has been developed to investigate thermo-physical properties of C-type, near-Earth asteroid 162173 Ryugu. TIR is one of the remote science instruments on Hayabusa2 designed to understand the nature of a volatile-rich solar system small body, but it also has significant mission objectives to provide information on surface physical properties and conditions for sampling site selection as well as the assessment of safe landing operations.

Refereed proceedings of an academic conference

[chonda-311-017-04:2017] T. Kouyama S. Kameda Y. Yokota S. Sakatani H. Suzuki M. Yamada H. Sawada R. Honda C. Honda T. Morota K. Ogawa M. Hayakawa K. Yoshioka N. Ogawa N. Tanabe H. Kamiyoshihara Y. Iijima ONC Team S. Sugita, E. Tatsumi. Pre-Arrival Scientific Calibration of the Hayabusa2 Multi-Band Visible Camera. In *49th Lunar and Planetary Science Conference*, 2018.

Introduction: JAXAs Hayabusa2 is planned to bring back samples to Earth from one of the C-type asteroids, which are widely believed to contain water and organics, important ingredients for life. When the spacecraft arrives at the target asteroid Ryugu, it will start detailed observations on its surface for both understanding its geologic history and selecting sampling sites.

[chonda-311-017-05:2017] C. Honda M. Ohtake M. Hareyama, Y. Ishihara. Preliminary Unsupervised Classification of the Mercurys Surface Using Multiband Reflectance Data Obtained by MESSENGER/MDIS. In *49th Lunar and Planetary Science Conference*, 2018.

Introduction: The final goal of our study is to create a global geologic map of Mercury to approach Mercurian crustal evolution. For that purpose, we decide geological unit of Mercury's surface by using automatic classification methods for different physical quantities such as reflectance spectrum, element concentration, and elevation acquired by US Mercury Explorer MESSENGER.

[yoshiko-311-017-03:2017] Ogawa Y. Hirata N. Demura H. Narusawa M. Hayashi Y. Kato, H. Application of Deep Learning for Automatic Detection of Lunar Swirls by Combining Data from Multi-Band Imager and DEM. In *49th Lunar and Planetary Science Conference*, page 1869, March 2018.

This study challenges automatic identification of lunar swirls by deep learning. We conducted evaluations.

[yoshiko-311-017-04:2017] Fukuhara T. Tanaka S. Taguchi M. Arai T. Senshu H. Sakatani N. Ogawa Y. Demura H. Kitazato K. Kouyama T. Sekiguchi T. Hasegawa S. Matsunaga T. Wada T. Imamura T. Takita J. Shimaki Y. Kyoda H. Aoki Y. Helbert J. Mueller T. G. Hagermann A. Okada, T. Thermal Infrared Imager TIR on Hayabusa2 and Its Preparation for Asteroid Proximity Phase Operations Around 162173 Ryugu. In *48th Lunar and Planetary Science Conference*, page 1403, March 2018.

Thermal infrared imager on Hayabusa2 is to investigate thermo-physical properties of 162173 Ryugu. Its in-flight performance and observation plan are presented.

Unrefeered proceedings of an academic conference

[chonda-311-017-06:2017] M. Yamada S. Kameda H. Suzuki T. Kouyama R. Honda H. Sawada N. Ogawa K. Ogawa T. Morota C. Honda N. Sakatani M. Hayakawa Y. Yokota Y. Yamamoto S. Sugita N. Tanabe, E. Tatsumi. Multi-band image analysis of Itokawa and optical properties analysis of Hayabusa2/ONC-T. In *JpGU-AGU Joint Meeting 2017*, 2017.

Aerospace Exploration Agency, 8. Kobe Univ., 9. Nagoya Univ., 10. Univ. of Aizu Hayabusa2 is planned to bring samples from Ryugu back to the earth. Choosing sampling sites on Ryugu is very important. Sampling fresh materials not affected by space weathering very much is important for obtaining information on early evolution of the Solar System, because space weathering may overwrite record from the long past. In order to understand where on small asteroid we can find fresh materials, we analyzed the data taken by AMICA/Hayabusa. In addition, we analyzed optical characteristic, especially the point spread function (PSF), of the multi-band visible camera (ONC-T) of Hayabusa2 in order to carry out the same spectral analysis of space weathering.

[chonda-311-017-07:2017] H. Demura N. Hirata C. Honda S. Kamata Y. Karouji J. Kimura M. Morota H. Nagaoka R. Nakamura S. Yamamoto Y. Yokota M. Ohtake M. Hareyama, Y. Ishihara. Global classification map of lunar absorption spectra and new impression of lunar crust formation. In *JpGU-AGU Joint Meeting 2017*, 2017.

This report presents the global classification map of lunar absorption spectra by unsupervised classification methods and new impression of lunar crust formation based on the map.

[chonda-311-017-08:2017] C. Honda M. Ohtake SLIM MBC team K. Saiki, H. Shiraishi. Design and development of Multi-band Camera proposed for SLIM mission. In *JpGU-AGU Joint Meeting 2017*, 2017.

Smart Lander for Investigating Moon (SLIM) is being planned by Japan Aerospace Exploration Agency (JAXA). SLIM aims to research and demonstrate the engineering key issues related to the smart landing on the gravitational planets.

[chonda-311-017-09:2017] C. Honda Y. Yasuda. Improvement of the extraction method of lunar secondary crater using the Voronoi tessellation. In *JpGU-AGU Joint Meeting 2017*, 2017.

One of the estimation methods of formation age of planet surface is the crater chronology. Generally, craters are increasingly formed on the planet surface at random over time. From this perspective, the crater chronology utilizes the crater number density to estimate the formation age of planet surface. When we utilize the crater chronology, we should exclude secondary craters. Secondary craters are formed by ejecta thrown out from primary crater produced by the impact object from interplanetary space.

[chonda-311-017-10:2017] C. Honda T. Sato. Positive openness map for visual inspection of fault scarp associated with lunar wrinkle ridges. In *JpGU-AGU Joint Meeting 2017*, 2017.

Wrinkle ridges are topographic features observed often in plains of the moon. Both edges of wrinkle ridge have scarps related to the fault slip in the subsurface. According to a hypothesis of the origin of wrinkle ridges (e.g., Suppe et al., 1983), the scarps are defined as fore-limb and back-limb, and the fore-limb which has abrupt slope compared with back-limb corresponds to a fault scarp. These fault scarps are formed by horizontal pressure related to tectonic deformation of subsurface of the moon. The spatial distribution and their scale of fault scarps with wrinkle ridges lead us to understand the evolution of the lunar subsurface.

[chonda-311-017-11:2017] C. Honda R. Ito, R. Nakamura. Automatic detection of lunar sub-km craters via deep learning. In *JpGU-AGU Joint Meeting 2017*, 2017.

Crater chronology is a method that estimates generated age on surface of a body from size-frequency distribution (SFD) of impact craters. Coordinates and diameter are needed for computing SFD, and measurement accuracy of crater information is factored into the estimation accuracy of crater chronology. So, highly accurate crater information is important for discussing evolution process of the lunar surface.

[kitazato-311-017-04:2017] T. Inasawa, K. Kitazato, N. Hirata, and H. Demura. Cluster analysis of near-infrared reflectance spectra of asteroid Itokawa. In *American Astronomical Society, DPS meeting 49*, number 110.03. AAS, October 2017.

[kitazato-311-017-05:2017] K. Kitazato, N. Hirata, H. Demura, T. Inasawa, M. Abe, Y. Yamamoto, A. Miura, and J. Kawaguchi. Thermally induced rock breakdown on asteroid Itokawa. In *American Astronomical Society, DPS meeting 49*, number 204.10. AAS, October 2017.

[kitazato-311-017-06:2017] D. Takir, C. A. Hibbitts, L. Le Corre, J. P. Emery, K. Kitazato, S. Sugita, and Y. Nakauchi. Hayabusa2 NIRS3 Investigation to Characterize and Select Sampling and Landing Sites on Asteroid (25143) Ryugu. In *American Astronomical Society, DPS meeting 49*, number 219.07. AAS, October 2017.

[kitazato-311-017-07:2017] K. Kitazato, S. Nasu, T. Iwata, M. Abe, M. Ohtake, and Hayabusa2 NIRS3 Team. Near-Infrared Spectroscopy of Mars and Jupiter from the NIRS3 Instrument on Hayabusa2. In *48th Lunar and Planetary Science Conference*, number 1964, page 1508. LPI, March 2017.

[yoshiko-311-017-05:2017] Y. Ogawa Y. Hayashi N. Hirata H. Demura T. Matsunaga S. Yamamoto Y. Yokota M. Ohtake Iimura, S. Extension of the lunar Web-GIS GEKKO: Toward statistical analyses of the lunar spectral data. In *JpGU-AGU Joint Meeting 2017*, pages PPS08–P02, May 2017.

[yoshiko-311-017-06:2017] Y. Ogawa M. Ohtake Y. Hayashi N. Hirata H. Demura T. Matsunaga S. Yamamoto Matsubara, Y. Implementation of assortment algorithm for excluding noisy data in the lunar web-GIS: GEKKO. In *JpGU-AGU Joint Meeting 2017*, pages PPS08–P03, May 2017.

Summary of Achievement

[yoshiko-311-017-07:2017] Y. Ogawa Y. Hisada H. Demura S. Miura T. Ozawa Abe, K. Crustal deformation around Azumayama volcano : InSAR analysis compared with GNSS data. In *JpGU-AGU Joint Meeting 2017*, pages STT57–07, May 2017.

[yoshiko-311-017-08:2017] Y. Ogawa H. Demura Nakamura, Y. Detection of phyllosilicates around ouflow channels in the northeast of the Hellas basin, Mars. In *JpGU-AGU Joint Meeting 2017*, pages PPS05–P05, May 2017.

[yoshiko-311-017-09:2017] Y. Ogawa H. Demura Oya, N. Distribution of phyllosilicates in relation with topographic features on Utopia Region, Mars. In *JpGU-AGU Joint Meeting 2017*, pages PPS05–P06, May 2017.

[yoshiko-311-017-10:2017] T. Dairaku K. Suko T. Takahashi H. Demura Y. Ogawa T. Arai T. Fukuhara T. Okada S. Tanaka Endo, K. HEAT: Image and database browser for the thermal imager on Hayabusa2. In *JpGU-AGU Joint Meeting 2017*, pages PPS02–P22, May 2017.

[yoshiko-311-017-11:2017] T. Fukuhara S. Tanaka M. Taguchi T. Arai H. Senshu Y. Ogawa H. Demura K. Kitazato R. Nakamura T. Kouyama T. Sekiguchi S. Hasegawa T. Matsunaga T. Wada T. Imamura J. Takita N. Sakatani Y. Horikawa K. Endo J. Helbert T. G. Mueller A. Hagermann Okada, T. Detectability Performance of Thermal Infrared Imager TIR on Hayabusa2. In *JpGU-AGU Joint Meeting 2017*, pages PPS02–P20, May 2017.

Academic society activities

[yoshiko-311-017-12:2017] Y. Ogawa, 2016.

Member of Diversity Promotion Committee

[yoshiko-311-017-13:2017] Y. Ogawa, 2016.

Member of Foreign Cooperation and Collaboration Technical Committee

[yoshiko-311-017-14:2017] Y. Ogawa, 2016.

Member of Planning Committee

Advisor for undergraduate research and graduate research

[kitazato-311-017-08:2017] Tomoki Inasawa. Master Thesis: Near-infrared reflectance spectral analysis of asteroid Itokawa based on re-estimating trajectory data of Hayabusa spacecraft, University of Aizu, 2018.

    Thesis Advisor: K. Kitazato

[kitazato-311-017-09:2017] Yasuhiro Takahashi. Graduation Thesis: Pseudo-fieldwork on asteroids using virtual reality, University of Aizu, 2018.

    Thesis Advisor: K. Kitazato

[kitazato-311-017-10:2017] Takefumi Onodera. Graduation Thesis: Investigation of doublet craters on the Moon using spatial statistics, University of Aizu, 2018.

    Thesis Advisor: K. Kitazato

[kitazato-311-017-11:2017] Ryuta Nozaki. Graduation Thesis: Search for doublet craters on Mare Moscovience of the Moon, University of Aizu, 2018.

    Thesis Advisor: K. Kitazato

[kitazato-311-017-12:2017] Natsuko Mori. Graduation Thesis: Development of space educational VR content on Hayabusa touchdown operation, University of Aizu, 2018.

    Thesis Advisor: K. Kitazato

[yoshiko-311-017-15:2017] m5201113 Hiroaki Kato. Master Thesis: Application of Deep Learning for Automatic Detection of Lunar Swirls by Combining Data from Multi-Band Imager and DEM, University of Aizu, March 2018.

    Thesis Advisor: Y. Ogawa

[yoshiko-311-017-16:2017] s1220031 Koji Sato. Graduation Thesis: Development of a GIS tool for viewing volcanic and tectonic data in Japan, University of Aizu, March 2018.

    Thesis Advisor: Y. Ogawa

[yoshiko-311-017-17:2017] s1220015 Masaki Narusawa. Graduation Thesis: Evaluation of deep learning for identifying lunar swirls, University of Aizu, March 2018.

    Thesis Advisor: Y. Ogawa

Summary of Achievement

[yoshiko-311-017-18:2017] s1220163 Kazuya Matsumoto. Graduation Thesis: Seasonal change of water environment in Oze marsh indicated by ALOS/PALSAR data, University of Aizu, March 2018.

Thesis Advisor: Y. Ogawa

Others

[yoshiko-311-017-19:2017] Y. Ogawa. Reviewer of Grants-in-Aid for Scientific Research ¡KAKENHI¿ Research Activity Start-up, 2017.

[yoshiko-311-017-20:2017] Y. Ogawa. Member of satellite data analysis group in Coordinating Committee for Prediction of Volcanic Eruptions created by Japan Meteorological Agency, April 2017.

[yoshiko-311-017-21:2017] Y. Ogawa. Co-I of the Special Collaborative Research (B) funded by Earthquake Institute, the University of Tokyo, Research for crustal deformation by using synthetic aperture radar of new generation, PI: Taku Ozawa (NIED), 2017.

[yoshiko-311-017-22:2017] Y. Ogawa. Cooperation member of the MEXT project: Integrated project of developing the human resources for volcano researches in the Next generation: Development of the new observation technology, 2017.

[yoshiko-311-017-23:2017] Y. Ogawa. The 4th Oze academic research team member, 2017.

[yoshiko-311-017-24:2017] Y. Ogawa. JAXA/ISAS science team members.

[yoshiko-311-017-25:2017] Y. Ogawa. Hayabusa 2 project members.

[yoshiko-311-017-26:2017] Y. Ogawa. Part-time Lecturer at Shibaura Institute of Technology, 2017.

Applied physics: Thermodynamics

Contributions related to syllabus preparation

[chonda-311-017-12:2017] Computational geometry for visual computing 1 Course outline Computational geometry is one of important field of computer science to solve geometric problems. In recent, to solve geometric problem with large data and handle with high-speed processing is required for such as geographic information system (GIS), computational graphics (CG), computer-aided design (CAD), and pattern recognition, robotics, and others. In the class, students learn about computational geometric concepts in the first half section (Chap.1-7), and learn about information visualization on the premise of various concepts / algorithms in the latter part (Chap.8-14). ...

Contribution related to the selection of library or textbook materials

[chonda-311-017-13:2017] Library committee member

Contribution related to toward equipment management, classroom management, building management, and crime or fire prevention.

[yoshiko-311-017-27:2017] Fire prevention manager of 223B and 245

Contribution related to on-campus/off-campus publicity work

[yoshiko-311-017-28:2017] Exhibition of UoA at University Information Fair (Astrology and planetary science major), August 27, 2017 at Tokyo University of Science, Shinjuku-ku, Tokyo

Contribution related to planning administration for research, research conferences, or international research

[yoshiko-311-017-29:2017] LOC of 10th Practical training seminar on the data analysis in planetary missions at UoA, March 5-7, 2018

Other significant contribution toward university planning, management, or administration

Summary of Achievement

[yoshiko-311-017-30:2017] Member of committee for Claim Management

[yoshiko-311-017-31:2017] Member of Harassment Prevention Committee

[yoshiko-311-017-32:2017] Member of committee for Harassment management

Contributions related to regional education

[yoshiko-311-017-33:2017] Committee member of Aizu-Wakamatsu city Disaster Control Council

[yoshiko-311-017-34:2017] On-campus lecture for Sukagawa municipal Nida junior high school students, 1st grade students + teachers, 53 attendees, May, 18, 2017

[yoshiko-311-017-35:2017] Open lecture for public at Aizu IT Aki Forum, October 20, 2017

[yoshiko-311-017-36:2017] Dispatched off-campus lectures at Shizuoka City high school, October 26, 2017, 2nd grade students, 40 attendee

[yoshiko-311-017-37:2017] Preparation for Exhibition of UoA at Fukushima Aerospace Fair, November 23, 2017 Fukushima City

Did you participate in Public Lectures, and/or Open Campus? (Yes or No) If yes, please describe what you did.

[chonda-311-017-14:2017] Off-campus Lectures: 2 Off-Campus Public Lectures by Dispatched Faculty Members: 2 Open Campus (summer / autumn): both

[yoshiko-311-017-38:2017] Preparation of posters for open campus

Center for Cultural Research and Studies

Noriyuki Kikuchi
Professor

Koichi Hasegawa
Professor

Ken Nakazawa
Senior Associate Professor

Masaya Seino
Senior Associate Professor

Shigeyuki Aoki
Senior Associate Professor

Hayato Karimazawa
Senior Associate Professor

Yosuke Kira
Associate Professor

Summary of Achievement

Refereed academic journal

[karima-401-072-01:2017] Hayato Karimazawa Etsuko Inoue, Kaho Kimura. Case of health consultation activity by coordination of school nurse teacher - Assistance for female high school students seeking psychological independence from parents. *The Japanese Journal of Educational counseling*, (8):53–60, 12 2017.

Support for resolving anxiety during high school entrance - With reference to efforts at high school with many issues -

[nakazawa-401-072-01:2017] Y. Nakazawa, K. Nishihara. Improvement of physical education class practice by applying a combination of the ongoing cognitive and teaching diary methods. *Japan journal for health, physical education, recreation, and dance in universityies*, 15:12–21, 2017.

Reflective practice is a skill that experts learn through their own practical experiences. To improve class practice and reflective education, it is necessary to conduct a review of classes, based on teachers' experiences, and clearly identify problems and solutions. The ongoing cognitive method and teaching diary method are two effective methods for reviewing reflection-oriented practical skills. The ongoing cognitive method records the class recognition perceived during class practice. The teaching diary method reflects on class practice after class to express implicit class recognition through description. This study aimed to improve class practice and reflection-oriented practical skills by applying a combination of the ongoing cognitive and teaching diary methods. The utterance record used in the ongoing cognitive method was divided into Cognition, Task, Prospect/Improvement plan, Positive perception, and Realizations, and the frequency with which these occurred was quantitatively evaluated. Entries in the teaching diary description were divided into Fact (F), Skill (S), Judge (J), Reason(R), and Prospect (P), to organize and analyze the cognitive process after class practice. The findings of this study are as follows. [1] Analysis of the utterance record using the ongoing method and that of the diary description summarized by the teaching diary method revealed the teacher's class recognition process. [2] Applying the ongoing method clarified that the teacher's perception of the students' state and the perception of his own teaching skills were accompanied by metacognition during teaching practice. [3] Implicit recognition during class was explicated through the diary description, and the framework of cognition and judgment in the next lesson was modified. [4] Based on the teacher's cognition and judgment framework that was modified through the teaching di-

ary method, the teacher's perception of the students' state and the perception of his own teaching skills were recognized during teaching practice. [5] Based on the analysis using the two methods, the class interactions generating negative feedback were extracted, because the class did not proceed smoothly according to the cyclical process of reflection involved in [3] and [4]. The pattern in the teacher's perception of the students' state was extracted. [6] The teacher's emotional process was meta-recognized by using the ongoing cognitive method, following which it was reconsidered by the teaching diary method. This resulted in the modification of the framework of teacher's perceptions of students and his own teaching skills.

[nakazawa-401-072-02:2017] Hideaki Murakami Ken Nakazawa Yoshihiro Shimizu Hiromitu Yano, Yuji Maruyama. Transient psychological changes of middle-aged and older participants in a walking event -A practice of continuous health promotion in a suppe-aging community-. *Japan welness journal*, 13(1):13–22, 2017.

The purpose of this study was to evaluate the changes in mood and emotions of middle-aged and older participants in walking. Negative emotions of participants was decreased after walking. on the other hand, their fatigue was unchanged.

Refereed proceedings of an academic conference

[nakazawa-401-072-03:2017] Y. Nakazawa, K. Nishihara. Placement of volleyball unit as a teaching material through action research. In *22th annual Congress of the European College of Sports Science Proceeding*, pages 92–93, 2017.

Lesson plans and reflective teaching and learning are what help achieve the effects of physical education. For formative evaluation of teaching, it is essential to consider students' perception of teaching. Based on the previous action research, we pointed out that the volleyball unit, which was taught second in the course, indicated that students' communication was activated and group cohesiveness was promoted through engagement with the unit. In this research, we planned a lesson in which the volleyball unit was placed first in the course based on reflection, and investigated the effect from the viewpoint of students' learning. The results from the volleyball unit, which was taught first in the course, indicated that students' communication was activated and group cohesiveness was promoted through engagement with the unit. By arranging volleyball units first, the adaptation of students to classes was accelerated. Along with students' adaptation,

a new problem also arose; for instance, other challenges, such as competence of sports skills and individual differences in motivation, occurred. These results showed that the order and characteristics of units affected students' perceptions of the overall course. However, other factors could also influence students' perceptions. In conclusion, an appropriate teaching approach based on reflection can foster a favorable perception of education among students.

Unrefeered proceedings of an academic conference

[hasegawa-401-072-01:2017] Kousuke Umetsu Koichi Hasegawa. Tradition and Culture in Kendo -introduction-. In *Center for Cultural Research and Studies Annual Review*, number 25. Center for Cultural Research and Studies, March 2018.

We have considered and organyzed the historical factors of tradition and culture in KENDO thatis oneof Japanese Martial arts.

[hasegawa-401-072-02:2017] Kousuke Umetsu Koichi Hasegawa. Tradition and Culture in Kendo -introduction-. In *Center for Cultural Research and Studies Annual Review*, number 25. Center for Cultural Research and Studies, March 2018.

We have considered and organyzed the historical factors of tradition and culture in KENDO thatis oneof Japanese Martial arts.

[hasegawa-401-072-03:2017] Kousuke Umetsu Koichi Hasegawa. Tradition and Culture in Kendo -introduction-. In *Center for Cultural Research and Studies Annual Review*, number 25. Center for Cultural Research and Studies, March 2018.

We have considered and organyzed the historical factors of tradition and culture in KENDO thatis oneof Japanese Martial arts.

[karima-401-072-02:2017] Hayato KARIMAZAWA. Promote school management well - How to help the classroom teacher -. In *The Japanese Society of Educational Counseling Research Presentation Conference (2017.8, Ootemae University)*, pages 38–45, 8 2017.

The Japanese Society of Educational Counseling Research Presentation Conference (2017.8, Ootemae University), Oral presentation of research, autonomous symposium commentator (designated debateor) (Adoption decision).

[karima-401-072-03:2017] Hayato KARIMAZAWA. Support for resolving anxiety during high school entrance - With reference to efforts at high school with many issues -. In *The Japanese Society of Educational Counseling Research Presentation Conference (2017.8, Ootemae University)*, pages 62–63, 8 2017.

[seino-401-072-01:2017]   . 1 AI
    2 AI   AI   3 AI   AI
                4 AI   4   . In
         , 2018.6.

Academic society activities

[karima-401-072-04:2017] Hayato KARIMAZAWA, 2017.

Permanent Director of The Japanese Association of Classroom Management Psychology (Public Relations Committee Chairperson, Review Officer) (Current)

[karima-401-072-05:2017] Hayato KARIMAZAWA, 2017.

Permanent Director of The Japanese Society of Educational Counseling (Executive Director, Review Officer), (Current)

[karima-401-072-06:2017] Hayato KARIMAZAWA, 2017.

Review Officer of The Japan Association for School psychology society, (Current)

[karima-401-072-07:2017] Hayato KARIMAZAWA, 2017.

Delegate committee member of The Japanese Association of Educational Psychology, (Current)

[karima-401-072-08:2017] Hayato KARIMAZAWA, 2017.

Japanese Association of Educational Psychology The staff (The trustee)

Patent

[seino-401-072-02:2017]   .

Summary of Achievement

2011.5.27   , 2011   .5.27

.

Others

[karima-401-072-09:2017] Hayato KARIMAZAWA. Case study on course guid-
    ance: how to respond to students Career guidance,417-421, recruit.
    Quarterly magazine, 2017.

    Case study on course guidance: how to respond to students

Contributions related to syllabus preparation

[hasegawa-401-072-04:2017] Syllabus 1 Pysical Activities1-4 2 Theory of Physical Edu-
    cation

[hasegawa-401-072-05:2017] Syllabus Pysical Activities 1 - 4 Theory of Physical Edu-
    cation

[hasegawa-401-072-06:2017] Physical Activities 1 Physical Activities 2 Physical Activi-
    ties 3 Physical Activities 4 THeory of Physical Education

[hasegawa-401-072-07:2017] Physical Activities1 Physical Activities2 Physical Activi-
    ties3 Physical Activities4 THeory of Physical Education

[hasegawa-401-072-08:2017] Physical Activities1 Physical Activities2 Physical Activi-
    ties3 Physical Activities4 THeory of Physical Education

[nakazawa-401-072-04:2017] Physical Education1

[nakazawa-401-072-05:2017] Physical Education2

[nakazawa-401-072-06:2017] Physical Education3

[nakazawa-401-072-07:2017] Physical Education4

[nakazawa-401-072-08:2017] Theory of health and physical education

[nakazawa-401-072-09:2017] Graduation Thesis

[nakazawa-401-072-10:2017] Health and exercise

Contribution related to toward equipment management, classroom management, building management, and crime or fire prevention.

[hasegawa-401-072-09:2017] Sports facilities,equipment management

[hasegawa-401-072-10:2017] Sports facilities,equipment management

[hasegawa-401-072-11:2017] Sports facilities,equipment management

[hasegawa-401-072-12:2017] Sports facilities,equipment management

[hasegawa-401-072-13:2017] Sports facilities,equipment management

[nakazawa-401-072-11:2017] Squad Responsible for gymasium Conduct initial fire fighting before arrival of the fire department

[nakazawa-401-072-12:2017] Management of use of the Athletic Facilities

Employment guidance

[seino-401-072-03:2017]   (   )

Advisor of a student club or circle

[hasegawa-401-072-14:2017] Kendo club Dance club

[nakazawa-401-072-13:2017] swimming club

Contribution related to student management(for example, solution of a student-related problem)

[seino-401-072-04:2017]

Contribution related to on-campus/off-campus publicity work

[seino-401-072-05:2017]   9   24   11

Summary of Achievement

Contribution related to planning administration for research, research conferences, or international research

[hasegawa-401-072-15:2017] All Japan Kendo Study Group All Japan instructual Commitee

[hasegawa-401-072-16:2017] All Japan Kendo Study Group All Japan instructual Commitee

[hasegawa-401-072-17:2017] All Japan Kendo Study Group All Japan instructual Commitee

[hasegawa-401-072-18:2017] All Japan Kendo Study Group All Japan instructual Commitee

[hasegawa-401-072-19:2017] All Japan Kendo Study Group All Japan instructual Commitee

Contributions related to regional education

[hasegawa-401-072-20:2017] All Japan Kendo Federation Lectural Personal Training Seminer2018.3 Womens Kendo LeadershipSeminer Kendo leaders Centralseminer

[karima-401-072-10:2017] The social activity - Aizu extension courses (1) The group approach to utilize to the class group organization (the Aizu QU learning meeting) with the 7th time - the 11th time (2)lesson syudy The first - second (3)The teacher sending open class The Fukushima Prefecture Aizu technical high school The Aizu-bangemachi Bange Minami elementary school The Aizu-bangemachi Bange Higashi elementary school The Aizu-bangemachi Bange junior high school Aizuwakamatsu City Kawahigashi High school The Kitakata City Siokawa junior High school The Kitakata City yamato junior high school The Shirakawa City school board Shirakawa Daisan elementary high school The Kooriyama City school board The Motomiya City school board Iwate Prefecture Ichinohe-machi school board Aomori Prefecture school board The Sannohe district educational research institute The Yamagata Prefecture education center (The student guidance conference) The Yamagata Prefecture education center (The following workshop of 5 years)

[seino-401-072-06:2017]

11

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Other noteworthy contribution related to regional industries

[karima-401-072-11:2017] The Aizuwakamatsu City school board,The Committee to Protect Aisukuko from Bullying(The chair person), From 2015. The Aizuwakamatsu City school board,The scholastic ability improvement committee (The chair person) , From 2016. The Aizu-bangemachi school board,The bullying problem expert committee (The chair person), From 2017. The Fukushima Prefecture school board, use textbook selection council (The member of the committee)

Did you participate in Faculty Development? (Yes or No) If yes, please describe what you did.

[nakazawa-401-072-14:2017] Exchange information on scientific activities of cardiac rehabilitation especially Phase3 cardiac Rehabilitation heart groups (10TH of July 2017). German Sports Univeresity of Cardiology and Sports Medicine, dep. Preventive and Rehabilitative Sport Medicine and Exercise Physiology.

[nakazawa-401-072-15:2017] Participated in 9th university physical education instructor training workshop. Organizer: Japanese Association of University Physical Education and Sports

Did you participate in Public Lectures, and/or Open Campus? (Yes or No) If yes, please describe what you did.

[seino-401-072-07:2017]

Do you have experience of University-Industry collaboration? If yes, please describe your experience. (for UBIC's information)

[seino-401-072-08:2017]   UBIC

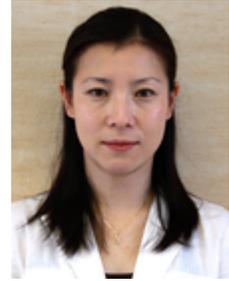Centers

Center for Language Research

John Brine
Professor

Ian Wilson
Professor

Debopriyo Roy
Professor

Emiko Kaneko
Professor

Heo Younghyon
Senior Associate Professor

Jeremy Perkins
Associate Professor

Kim Forrester Rockell
Associate Professor

Takako Yasuta
Associate Professor

Moonyoung Park
Associate Professor

John Blake
Associate Professor

Sender Dovchin
Associate Professor

Allan Nicholas
Associate Professor

Eunjin Bahng
Visiting Researcher

Centers

The Center for Language Research (CLR), in the School of Computer Science and Engineering, was established the same year as the University of Aizu (1993) to contribute to the development of professionals in computer science, computer engineering, and related fields. CLR professors carry out research and teaching of successful language use in academic and workplace contexts – in particular, the use of English for academic and professional purposes. Our research focuses on language theory, use, pedagogy, and acquisition, as well as on supporting educational technologies. Grounded in this research, we provide innovative English language training to University of Aizu students primarily at the undergraduate, but also at the graduate level. All students at the university, both undergraduate and graduate, are computer science majors, but they must write and present their theses in English, so CLR professors teach students the skills that are necessary for writing a research paper and presenting it in English.

At the undergraduate level, along with 1st- and 2nd-year core courses in the 4 skills (reading, writing, speaking, and listening), the CLR provides a variety of interesting elective courses for 3rd- and 4th-year students; some of the offerings in AY2017 included Design of Human Languages, Pronunciation: Comparing English & Japanese Sound Systems, Analysis of English Sentence Structure, Language and Linguistics, Music and Language, English Grammar for Test Preparation, Computer Assisted Ethnomusicology, Advanced English Grammar, Reading Fluency, Writing & Design for E-learning, Presentation Skills, Writing in the Workplace, Language in Manga, Japanese Pop Culture through English, Writing and Design with Lego, Digital Storytelling for Engineering Narratives, Experimental Methods and Statistics for Linguistics, Pronunciation: Acoustic Analysis Using Software, and English through Communicative Media.

At the graduate level, courses offered include Computer-Assisted Language Learning, Technical Writing in Software Engineering, Information Technology Society & Values, Multinational Business Communication, and Speech Articulation & Acoustics.

CLR faculty members are also extremely active in research, as is attested by our high success rate in obtaining national, prefectural, and internal research grants. For details, please see individual professors' websites linked to the University of Aizu homepage. We welcome inquiries from researchers in Japan and overseas regarding opportunities to collaborate with us. Our homepage, which can be found at http://www.u-aizu.ac.jp/labs/clr/ gives more details about our center.

Refereed academic journal

[droy-402-073-01:2017] Debopriyo Roy and Stephen Crabbe. An investigation into the efficacy of technical illustrations depicting physical orientation in sports procedures. *Cogent Education Taylor and Francis*, pages 1–20, September 2017.

> This study on mental imagery set out to investigate the efficacy of technical illustrations depicting physical orientation in sports procedures. The study was carried out by junior level students on an undergraduate degree in computer science at a Japanese technical university with no specialized knowledge of information design or visual communication. The study participants were asked to match body and overhead images shown from different height perspectives (waist and chest height) and camera positions (front, 1/3rd side, side, 1/3rd back, back) of a man holding a bat and a man hitting with a bat. These physical actions were selected by the researchers as they can typically be seen in multiple sports such as baseball, rounders or cricket, thus widening the potential applicability of the study findings. Overall, the study participants achieved relatively high levels of accuracy in matching the body and overhead images and no consistent or clear pattern emerged with regard to preferred height perspectives or camera positions. However, what can be suggested is that the study participants appeared to prefer - and the mean accuracy levels were higher for - viewpoints shown into the display plane. In addition, the study participants self-reported relatively high overall confidence in their matches despite not having any specialised knowledge of visual communication. It is hoped that this study and accompanying literature review could help technical communicators in thinking about how to design 2D technical illustrations and contribute to existing research into information design and visual communication, particularly in a sporting context.

[droy-402-073-02:2017] Debopriyo Roy. Developing a Project-Based CALL Environment with Technical Communication in an Exploratory 3D Printing Context. *IJCALLT International Journal of Computer Assisted Language Learning and Teaching*, April-June 2017.

> Involving EFL students in 3D printing in a language classroom introduces the idea of project-based CALL, where different technology interfaces engage students in complex technical writing activities and social interactions in a fluid language-learning environment. This paper took an instructional approach to explaining how project-based CALL environment could be created with 3D printing based practices, combining technical communication with systems thinking,

online research, 3D scanning, computer-aided design, sketch boarding and concept mapping, prototyping, and digital content management. Class performance in this collaborative, autonomous and social language-learning environment suggested that students were able to produce technical writing, prepare documentation, demonstrated critical thinking and brainstorming, and develop design and implementation strategies while handling 3D printing-enabled processes. Results and patterns of student engagement with technology indicated that project-based learning (PBL) approach in TC classroom is engaging, unique, realistic and feasible.

[kimusik-402-073-01:2017] Rockell K. and Ocampo M. The use of music in English Teaching in the Philippines. *Humanising Language Teaching*, 19(1), 2017.

Although the role of musical approaches within language education is becoming firmly established, few studies have considered music and language education in specific regional contexts. Building on a recent study conducted in Japan (Rockell and Ocampo, 2014), the authors present research on the use of music to teach English in the Philippines. Based on the responses of 37 teachers at high schools and tertiary institutions to a self-assessment questionnaire administered at the end of 2014, the study examines teachers' appraisal of general musical skills and strategies, use of specific musical techniques and specific song repertoire used when teaching English. For readers less familiar with the English language situation in the Philippines, a brief historical summary is provided near the beginning of the paper. In addition to details of music use, the information provided by teachers offers insight into the professional activities of English teachers in the contemporary Philippines. Comparisons with the authors' recent Japan-based study are also discussed in the text.

[yasuta-402-073-01:2017] Takako Yasuta. Use of Comic Panels and Images for an Effective Graphic Organizer in L2 Writing. *Studies in English language and literature*, 39:153–182, 2017.

Using visuals promotes language learning, especially for low-level learners. This study introduces an effective outline organizer with colored comic panels and pictures in order to teach basic English paragraph structure to EFL learners. Without any previous authentic writing experience in high school, many Japanese freshmen struggle with paragraph writing in college-level English courses. They are also influenced by Japanese rhetoric organization, and write inconsistent English paragraphs in wrong formatting, without clear main ideas. This study is conducted in order to help such English learners to learn the basic rules in paragraph writing in English. The study was conducted in a freshman-writing course

at a computer science college in Japan. An outline organizer with colored comic panels was introduced in paragraph writing, in order to visualize the components of paragraph and how they are organized in an English one-paragraph essay. It was hypothesized that colored comic panels would visualize the structure of English paragraphs and help the participants to write their ideas in a coherent sequence. In order to reinforce visual effects, pictures were inserted optionally. The participants' writing samples were analyzed in terms of organization of paragraph components and formatting, and were compared with two control groups that underwent the same class instruction and procedure but without using the comic panel outline organizer. The results showed that the comic panel outline organizer had positive effects in learning paragraph structure. The participants performed significantly better than the control groups in terms of paragraph organization, coherency, and formatting.

Unrefereed academic journal

[kaneko-402-073-01:2017] Kaneko E. Development of the academic survival word list. *The Institute of Statistaical Mathematics Cooperative Research Report*, (397):25–36, 2018.

[yasuta-402-073-02:2017] Takako Yasuta. Teaching paragraph writing effectively with online comic creator Pixton. *Proceedings of the Japan Association for Language Education and Technology 57th National Conference*, 2017.

This paper shows how the comic creator Pixton can be used for effective L2 writing activities.

Refereed proceedings of an academic conference

[anich-402-073-01:2017] A. Nicholas. Developing a Dynamic Assessment of Interactional Competence: The Act of Requesting. In *The 21st Annual Conference of the Japan Language Testing Association*, 2017.

This presentation reports on the development and implementation of a dynamic assessment (DA) of interactional competence among Japanese learners of EFL at a higher education institution in Japan. Specifically, the primary focus of the assessment was to investigate interactional competence with regards to the speech act of requesting in the English L2. The purpose of the report

is to provide an overview of dynamic assessment, its applicability to second language learning, and how a dynamic assessment of interactional competence was developed and implemented. The effectiveness of this approach is also discussed. DA aims to provide a detailed analysis of not only a learner's current stage of development, but also their still developing abilities. Unifying instruction and assessment, the learner and a mediator co-construct a task, with the mediator providing assistance when necessary. By examining both the types of mediation practices and their frequency, insights can be gained as to the learner's still maturing abilities, and future potential. DA also aims to uncover sources of learner difficulty, offering a diagnostic function as part of assessment. Drawing on conversation analysis research, concept-based instruction and dynamic assessment methodology, an assessment was developed in which the speech act of requesting in spoken interaction was examined, assessing the effectiveness with which DA promoted development in the learners. Further, the ability of the DA to uncover specific locations of learner difficulty was investigated. This report focuses on the theoretical foundations and assumptions of dynamic assessment, with dynamic and non-dynamic assessments compared and contrasted. The key characteristics and features of DA are outlined, and the development process of the assessment, including the ways in which the methodology was adapted to the particular requirements of pragmatics assessment, is also discussed. The results of the the DA indicate that, when applied to the speech act of requesting, DA methodology can be an effective way to both promote learner development and assess learner's abilities. Evidence was found of learners co-constructing more complex request-based spoken interactions, with an increased ability to verbally explain their language choices. Evidence was also found of the social context of the spoken interactions informing the learners' language choices to a greater extent.

[anich-402-073-02:2017] A. Nicholas. Dynamic Assessment as a Diagnostic Tool: Investigating Learner Difficulties with Regards to Making Requests-in-Interaction. In *American Association for Applied Linguistics Annual Conference 2018*, 2017.

In recent years, assessments have been developed that focus on various aspects of pragmatics. While these typically assess learners' independent pragmatic competence, few to date have focused on the diagnostic potential of assessment. Dynamic assessment (DA) is put forward as an alternative, allowing the causes of learner problems to be uncovered through interactions with a mediator. This paper reports on a short DA program focusing on the requesting

speech act. The aim was to assess DA methodology's effectiveness in locating specific aspects of making requests that caused difficulty for the participants. Six Japanese EFL learners in a university context co-constructed role-play type language tasks with the researcher. During the tasks, the researcher engaged in mediation with the learners when they encountered difficulty. In informing the mediation, the researcher drew upon conversation analysis (CA) research, describing typical characteristics of request-based talk, and also the key contextual factors of power, social distance and degree of imposition. Analysis of the transcript data took both a quantitative approach, tabulating the occurrence and frequency of objects of researcher mediation, and a qualitative approach, in which mediation sequences of talk between the researcher and learners were analyzed. A number of locations of learner difficulty related to the organization of talk were identified. Specifically, learners struggled with the pre-requesting stage of talk, omitting it entirely, or producing it in a limited form. Learners also had difficulty with the pre-closing stage, with closing implicature environments not frequently initiated by the learners. Further, learners struggled with their level of directness in the request turn of talk, with language choices not clearly related to the social contexts of the role-play scenarios. Overall, findings indicate that DA methodology, when applied to the speech act of requesting, can be an effective way to locate sources of learner difficulty.

[brine-402-073-01:2017] J. W. Brine. Active learning in computer science with student-produced video. In *Paper presented at JALTCALL 2017, Matsuyama University, Matsuyama, Japan.*, 2017.

June 16-18

[brine-402-073-02:2017] J. W. Brine. Thesis Development in a Japanese Computer Science University with Student-Produced Video. In *Paper presented at GLOCALL 2017, University of Technology, Brunei Darussalam.*, 2017.

September 7-9

[droy-402-073-03:2017] Debopriyo Roy. Project-based language learning in a 3D printing context. In *Proceedings of the 6th International Conference on Information and Education Technology.* ICIET2018, January 6-8 2018.

This article highlighted an important project-based language learning case study in a Japanese technical university. The idea of the project was to create a creative factory classroom with computer-aided design (CAD) design and 3D scanning-based activities leading up to the 3D printing of products. The focus of the course was on both technical design and technical writing and

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presentation in a realistic work context. Students not only learned how to use different CAD software and 3D scanning apps, they also had to continuously engage in technical writing, online information management and presentation, working collaboratively both for individual and team-based activities. Data from course-related activities and self-reports indicated reasonable proficiency with the assignments, and reasonable ability to work with strict Schoology-based assignment instructions. Self-reports indicated relatively high levels of motivation and reasonable comfort with course activities. Recommendations for future study highlighted a more integrated and balanced course structure focused on both language learning and information and communication technology (ICT) tools.

[droy-402-073-04:2017] Debopriyo Roy and Stephen Crabbe. 3D printing with critical thinking and systems design: an innovative approach to task-based language teaching in technical communication. In Jozef Colpaert, editor, *CALL 2017 Proceedings*, pages 650–657, Berkeley, United States, 2017.

3D Printing is commonly referred to as a third industrial revolution in manufacturing (Council et al., 2014; Anderson, 2012; Blikstein, 2013), offering a dynamic alternative to traditional manufacturing with its capacity for design innovation, digital fabrication, and data management. Educators who employ 3D Printing initiatives in their language teaching have the opportunity to academically explore new and innovative teaching and learning strategies. This paper discusses 3D Printing as a platform that provides educators with multiple opportunities to explore, invent and implement language teaching ideas while teaching technical communication in an English as a foreign language (EFL) context. The paper takes an instructional approach to explaining how 3D Printing initiatives - including 3D scanning, computer-aided designing, sketchboarding, concept mapping, prototyping with LEGO and maintaining online design feeds - could be successfully included in technical communication pedagogy alongside more traditional genres of document production.

[droy-402-073-05:2017] Debopriyo Roy. Developing entrepreneurial abilities with ICT and technical presentations. In *Proceedings of the 6th International Conference on Information and Education Technology*. ICIET2018, ICIET, 2017.

The paper attempts to make a case for how students' entrepreneurial skills could be improved effectively by improving their ability to put together technical presentations on complex topics, by using a variety of ICT tools. This

paper discussed a graduate-level English language learning course offered in a technical university in Japan where 13 students presented on a variety of technical topics to persuade, demonstrate and explain procedures related to technology or technical matters, including their own skillset in getting job in the technology market. Based on specific guidance including assignment instructions, peer-review, in-class interactions, and instant feedback, students developed skills that could be used in a workplace context to showcase important concepts and data. The course further makes a case for allowing students more formal opportunities for technical presentations and use of ICT, that are likely to increase their confidence levels, think about complex constructs, take decisions, and represent information reasonably well in a text-graphics visual environment.

[droy-402-073-06:2017] Debopriyo Roy. Developing Globalization and Entrepreneurship in the English Language Teaching Context in Japan. In Tomorrow People Organization EDC, editor, *Proceedings of the 13th Annual Education and Development Conference*, pages 32–45. EDC, EDC, March 2018.

Japanese universities are in a difficult situation as they struggle to enroll more foreigners, and internationalize the student body and the campus environment. One important aspect of such internationalization is to prepare students for a global workplace with adequate corporate awareness and exposure. This paper discussed the plan outline for developing a series of undergraduate elective courses in computer science English language research center that addresses the issue of exposure and corporate mindset from the perspective of both product-based knowledge dissemination, and intercultural and organizational communication. The paper discussed how an undergraduate elective track for 4 courses aimed at globalization in a Japanese computer science university have been laid out to teach both business and technical communication, while making students aware of different organizations such as Apple, Tesla, Uber, Airbnb, and the Tokyo start-up ecosystem. The first semester electives have been designed to teach soft communication skills and develop a corporate mindset in a business communication and text-mining environment. Students learnt about the basics of Silicon Valley, and what it means as a Japanese to experience and learn about such a model. The second -semester electives have been developed to teach product design and analysis in a technical writing and usability environment; cultivate how products and ideas take shape in the Silicon Valley companies. Initial student reactions suggest that the Silicon Valley (SV)

impresses upon a relatively positive mindset that should be further pursued and nurtured. Students were seen expanding their imagination as to how Silicon Valley works, and what it means to be working in such an international environment.

[droy-402-073-07:2017] Debopriyo Roy. Monitoring Poverty with Technology: Designing Social Decisions with Language Pedagogy. In Tomorrow People Organization EDC, editor, *Proceedings of the Annual Poverty and Social Protection Conference*, pages 25–29. EDC, EDC, March 2018.

Fundamentals of content and language integrated learning (CLIL) in a technology-based poverty measurement context provide a unique perspective to rediscover language teaching and learning. This article provides a holistic overview of how different technological applications such as Google Maps, Google Earth, Concept Mapping, and other worldwide entrepreneurial, philanthropic and social initiatives makes a difference; how crowdsourcing of spatial and location-specific data could help identify poverty, understand local socioeconomic and lifestyle-oriented problems, and trigger a discussion about community decision-making. Such use of technology could potentially help make a convincing case for the type of poverty; including exact issues in the locations, proximity to resource hubs, lack of basic health and other facilities, employment and so on. The primary focus in this article is to bring to focus how content language integrated learning (CLIL) combines content areas such as mechanism and technology for poverty identification and analysis on the way to learning the target language. Use of such technological applications in a foreign language-learning course for policy decisionmaking and community engagement is rather unique, and has hardly been investigated in a foreign or second language classroom. But such applications help students learn a specific content area; help learn how to document data systematically, and how to design and present policy documents for a social cause. Such language teaching initiatives in this technology-driven context of poverty identification and measurement could potentially cover all 4-skills (reading, listening, speaking, and writing).

[jblake-402-073-01:2017] John Blake. Scientific research abstracts: Commonalities and differences in similarity. In *Faces of English 2*, 2017.

[jblake-402-073-02:2017] John Blake. Error proofing the data flow. In *Doing Research in Applied Linguistics 3*, 2017.

[jblake-402-073-03:2017] John Blake. Annotator (dis)agreement. In *Doing Research in Applied Linguistics 3*, 2017.

[jblake-402-073-04:2017] John Blake. Annotator agreement: Strategic decisions and rhetorical choices. In *Annual Meeting of British Association of Applied Linguists*, 2017.

[jblake-402-073-05:2017] John Blake. Scientific research abstracts: Commonalities and differences in similarity. In *Annual Meeting of British Association of Applied Linguists*, 2017.

[jblake-402-073-06:2017] John Blake. Going global: the pathway from bi-part-lingual to bilingual. In *Seiryo University Global Symposium on Language Education, Tourism, and Culture in a Globalized Society: Issues and Prospects*, 2017.

[jblake-402-073-07:2017] John Blake. Automated presentation script annotation tool: Development and evaluation. In *15th International Conference of AsiaCALL*, 2017.

[jblake-402-073-08:2017] John Blake. Online writing tool: Corpus-based error detection. In *International Conference on ESP, digital technologies and digital learning*, 2017.

[jblake-402-073-09:2017] Hiroki Inoue and John Blake. Script annotator: Design, development and evaluation. In *International Conference on ESP, digital technologies and digital learning*, 2017.

[jblake-402-073-10:2017] John Blake. Genre-specific error detection: Online writing tool. In *ESBB 2018 Conference and Symposium on English Academic Writing in a Global World*, 2018.

[jblake-402-073-11:2017] William Holden and John Blake. English for research purposes: Read, write and speak. In *ESBB 2018 Conference and Symposium on English Academic Writing in a Global World*, 2018.

[kaneko-402-073-02:2017] Kaneko E. Report on Content-based Flipped English Class. In *Proceedings of the Japan Association for Language Education and Technology (LET) 57th National Conference*, 2017.

This paper reports on the trial of flipped classroom in an English-medium instrucion subject matter course. By studying with a lecture video before coming

to class, students can better understand the materials than listening to a live lecture . (This paper is written in Japanese)

[kaneko-402-073-03:2017] Kaneko E. Report on Content-based Flipped English Class. In *Proceedings of the Japan Association for Language Education and Technology (LET) 57th National Conference*, 2017.

This paper reports on the trial of flipped classroom in an English-medium instrucion subject matter course. By studying with a lecture video before coming to class, students can better understand the materials than listening to a live lecture . (This paper is written in Japanese)

[kaneko-402-073-04:2017] Kaneko E. Content-based flipped English for lower-intermediate learners. In *TESOL 2017 International Convention*, 2017.

Oral presentation

[kimusik-402-073-02:2017] Kim Rockell. Creating Noh Theater in English with Japanese University Students. In *Paper presented at the JALT Speech, Drama and Debate SIG Conference. Shonan Institute of Technology, Japan.*, 2018.

Recognizing the value of performing arts activities within EFL education, teachers have experimented with a wide variety of approaches in their teaching. This article draws broadly on one such project, which took place at a prefectural university in Fukushima during late 2016 and early 2017. Here, English was embedded in a traditional Japanese dramatic form and students in a third year elective course developed an English language Noh theatre set in cyberspace. While this work is discussed in detail elsewhere (Rockell, 2019), the current article focuses on some of the practical ways the project was carried out and uses these as a basic for a suggested English Noh Theatre Workshop to be offered to language teachers in Japan in the near future.

[kimusik-402-073-03:2017] Kim Rockell. Creating Noh Theater in English with Japanese University Students. In *Paper presented at the JALT Speech, Drama and Debate SIG Conference. Shonan Institute of Technology, Japan.*, 2018.

Recognizing the value of performing arts activities within EFL education, teachers have experimented with a wide variety of approaches in their teaching. This article draws broadly on one such project, which took place at a prefectural university in Fukushima during late 2016 and early 2017. Here, English was embedded in a traditional Japanese dramatic form and students

in a third year elective course developed an English language Noh theatre set in cyberspace. While this work is discussed in detail elsewhere (Rockell, 2019), the current article focuses on some of the practical ways the project was carried out and uses these as a basic for a suggested English Noh Theatre Workshop to be offered to language teachers in Japan in the near future.

[kimusik-402-073-04:2017] Kim Rockell. Pathways towards authentic communication in English. In *Paper presented at the IEEE Professional Communication Society Japan Chapter. Shibaura Institute of Technology, Toyosu Campus, Japan.*, 2018.

Based on a hermeneutic understanding of professional communication, the presentation offers a sociolinguistic perspective on professional communicative practice in the context of teaching English as a foreign language (EFL). Specifically, an intercultural setting at a higher educational institution in contemporary Japan is the locus of activity considered. Given the constraints and exigencies of this context, the presentation considers ways that can help Japanese students learn to express themselves more effectively by encouraging the reduction self monitoring and aiming towards more honest, open and authentic communication. The importance of heightened speech within the spoken domain of professional communication is also considered in the presentation.

[kimusik-402-073-05:2017] Kim Rockell. Translingualism and Noh in the Japanese Computer Science EFL Classroom. In *Paper presented at the Long Colloquium: The factors of everyday globalization, the relocalization of mediascapes and technoscapes in multilingualism from below, Sociolingustics Symposium SS22 University of Auckland, New Zealand.*, 2018.

The spread and role of English has dramatically accelerated due to globalization, placing Japan in a context where it has to increasingly promote English. The Ministry of Education, Culture, Sports, Science and Technology(MEXT) of Japan has undertaken strenuous efforts aimed at improving Japanese Students Level of English Proficiency in all educational sectors based on the English Education Reform Plan in Response to Globalization announced in December 2013. However, there is still strong support fortraditional grammar-translation and teacher-textbook approaches in the country. This short panel thus seeks to challenge these common trends in Japan, exploring other opportunities for teaching English as a foreign language in the higher education context of Japan.Drawing on varied ethnographic and qualitative studies carried out among Japanese EFL university students, the authors in this panel

will explore the educational and pedagogical implications of their studies, while introducing the possibility of other alternative approaches to English language teaching in Japan. The panel pulls together scholars and language educators who are all based in Japanese universities, with themes such as: How emotional state, the impact of a wide range of stressors and general motivation level strongly influence English learning process for EFL students in Japan and thus, it is important if language educators consider communicative mixed approaches combined with touch of family-like environment in the classroom settings; how the ethnomusicological resources such as the Rondalla of the Philippines and the traditional Japanese play Noh can be usefully appropriated in the context of EFL university classrooms in Japan; How the glocal approach introducing globally controversial and locally challenging themes among EFL Japanese students using English social media such as Facebook - may raise students sociolinguistic and critical awareness.

[kimusik-402-073-06:2017] Kim Rockell. Teaching English through Ethnomusicology. In *Paper presented at the Short Colloquium: English language education, communicative teaching approaches, and EFL university students in the higher education context of Japan, Sociolingustics Symposium SS22 University of Auckland, New Zealand.*, 2018.

The spread and role of English has dramatically accelerated due to globalization, placing Japan in a context where it has to increasingly promote English. The Ministry of Education, Culture, Sports, Science and Technology(MEXT) of Japan has undertaken strenuous efforts aimed at improving Japanese Students Level of English Proficiency in all educational sectors based on the English Education Reform Plan in Response to Globalization announced in December 2013. However, there is still strong support fortraditional grammar-translation and teacher-textbook approaches in the country. This short panel thus seeks to challenge these common trends in Japan, exploring other opportunities for teaching English as a foreign language in the higher education context of Japan.Drawing on varied ethnographic and qualitative studies carried out among Japanese EFL university students, the authors in this panel will explore the educational and pedagogical implications of their studies, while introducing the possibility of other alternative approaches to English language teaching in Japan. The panel pulls together scholars and language educators who are all based in Japanese universities, with themes such as: How emotional state, the impact of a wide range of stressors and general motivation level strongly influence English learning process for EFL students in Japan

and thus, it is important if language educators consider communicative mixed approaches combined with touch of family-like environment in the classroom settings; how the ethnomusicological resources such as the Rondalla of the Philippines and the traditional Japanese play Noh can be usefully appropriated in the context of EFL university classrooms in Japan; How the glocal approach introducing globally controversial and locally challenging themes among EFL Japanese students using English social media such as Facebook - may raise students sociolinguistic and critical awareness.

[wilson-402-073-01:2017] K. Suzuki, I. Wilson, and H. Watanabe. Visual Learning 2: Pronunciation app using ultrasound, video, and MRI. In *Proceedings of Interspeech 2017*, pages 831–832, 2017.

We demonstrate Visual Learning 2, an English pronunciation app for second-language (L2) learners and phonetics students. This iOS app links together audio, front and side video, MRI and ultrasound movies of a native speaker reading a phoneti- cally balanced text. Users can watch and shadow front and side video overlaid with an ultrasound tongue movie. They are able to play the video at three speeds and start the video from any word by tapping on it, with a choice of display in either English or IPA. Users can record their own audio/video and play it back in sync with the model for comparison.

[youngheo-402-073-01:2017] Jeremy Perkins Younghyon Heo and Incheon Paik. Detection of Machine-Translated Academic Texts Using Machine Learning. In *The Role of the Language Science in the Big Data Era*, pages 43–47, 2017.

In this study, we use deep learning for the multi-layered analysis and detection of Japanese academic texts machine-translated into English. Since becoming widely available to the public by Google in 2006, machine translation has constantly evolved along with increasing computation power to meet the need for tools dealing with large data sets. Particularly after the transition from Statistical Machine Translation (SMT) to Neural Machine Translation (NMT) in 2016, translated texts between the world's major languages are of far better quality than ever before. NMT is based on a large neural network, allowing natural translation if it is between a pair of languages with a large amount of data available. Given such large improvement in the quality of machine translation, many L2 writing instructors insist language learners refrain from using machine translation. It is primarily because some students rely heavily on it without even basic modification of machine-translated sentences, resulting in

no language learning whatsoever. While monitoring the use of machine translation was relatively easy with SMT-based products, NMT has raised quality to the point where results are not easily identified as machine-translated. The goal of this study is to establish a system detecting machine-translated texts. More specifically, we aim to test whether machine learning can learn the traits of machine-translated academic texts and classify data into machine-translated and human-written texts.

[youngheo-402-073-02:2017] Younghyon Heo Incheon Paik and Jeremy Perkins. Classification of Machine-Translated Text Using Deep Learning. In *International Conference on Electronics, Information, and Communication*, 2017.

In this paper, we investigate the automatic detection of machine-translated text using multi-layered perceptron network (MPN). Using more than 4 hidden layers of perceptron network, the architecture learns order of words in a sentence internally. We could reach a very high classification accuracy (99.8) with a large training data set.

Unrefeered proceedings of an academic conference

[anich-402-073-03:2017] A. Nicholas. Concept-based Instruction and Pragmatics: Teaching Requesting in the EFL Classroom. In *Japan Association for Language Teaching PanSIG 2017*, 2017.

This presentation reports on a study in which the principles of concept-based instruction were combined with findings from conversation analysis research to create a short course on talk-in-interaction and making requests in English. By combining these two areas, some of the challenges facing the teaching of pragmatics in the classroom can be addressed. Key features of the course and its applicability to other speech acts are discussed, examples given in relation to requesting and other speech acts, and a set of principles for effective concept-based speech act instruction put forward.

[jperkins-402-073-01:2017] Perkins J., Lee S.J., and J. Villegas. Psychoacoustic roughness as a measure of creakiness in two dialects of Zhuang. In *Proceedings of the 2017 Seoul International Conference on Speech Sciences*, pages 111–112, 2017.

[jperkins-402-073-02:2017] Villegas J., Perkins J., and Lee S.J. Psychoacoustic roughness as proxy of creakiness in White Hmong. In *Proceedings of the*

2017 Seoul International Conference on Speech Sciences, pages 74–75, 2017.

[jperkins-402-073-03:2017] Heo Y., Perkins J., and Paik. I. Depiction of Machine-Translated Academic Texts Using Machine Learning. In *Proceedings of the 2017 Summer Conference of the Korean Association of Language Sciences*, pages 43–47, 2017.

[jperkins-402-073-04:2017] Perkins J. Consonants and tones: A view from two Tibeto-Burman languages. In *The 156th Meeting of the Linguistic Society of Japan*, 2017.

[kimusik-402-073-07:2017] Kim Rockell. English Noh in Cyberspace: A practical solution to the dilemma of oral English production. In *Paper presented at the 16th International Conference of AsiaCALL. College of International Studies and Education of Tongren University, China.*, 2018.

Paper presented at the 16th International Conference of AsiaCALL. College of International Studies and Education of Tongren University, China.

Writing a textbook or technical book

[kaneko-402-073-05:2017] Vance T., Kaneko E., and Watanabe Y. *Study of Rendaku*. Kaitakusha, 2017.

Writing a part of textbook or technical book

[droy-402-073-08:2017] Debopriyo Roy. *Understanding the Value of Website Design and Analysis in a Comprehensive CALL Environment: Website Analysis in a Wider CALL Environment*, chapter 5, pages 86–117. IGI Global Press, 2017.

Book Name: Handbook of Research on Integrating Technology Into Contemporary Language Learning and Teaching

[kaneko-402-073-06:2017] Vance T., Kaneko E., and Watanabe Y. *Introduction*, chapter Introduction, pages 1–24. Kaitakusha, 2017.

[kimusik-402-073-08:2017] Kim Rockell. *Critical Inquiries in the Sociolinguistics of Globalization. Eds. Tyler Andrew Barrett, Sender Dovchin.*, chapter The

Coding Catastrophe: Translingualism and Noh in the Japanese Computer Science EFL Classroom, page 200. Multilingual Matters, 2019.

[kimusik-402-073-09:2017] Kim Rockell. *Critical Inquiries in the Sociolinguistics of Globalization. Eds. Tyler Andrew Barrett, Sender Dovchin.*, chapter The Coding Catastrophe: Translingualism and Noh in the Japanese Computer Science EFL Classroom, page 200. Multilingual Matters, 2019.

Research grants from scientific research funds and public organizations

[anich-402-073-04:2017] E. Kaneko, I. Wilson, Y. Heo, T. Yasuta, and A. Nicholas. Development of the University of Aizu Survival Word List (internal competitive research funding), 2017.

[jperkins-402-073-05:2017] Heo Y., Perkins J., and Paik I. Using Google Translate for Academic English Writing Instruction, 2018.

[kaneko-402-073-07:2017] Kaneko E. and Hirai A. The development of picture prompts with objective difficulty information and the effects of their features on L2 utterances, 2016-2020.

[kaneko-402-073-08:2017] Negishi M. et al. Development of can-do pedagogic and test tasks based on CEFR-J, 2016-2019.

[kaneko-402-073-09:2017] Hirai A. and Kaneko E. Instruction on vocabulary and grammar that facilitates L2 spoken fluency, 2015-2018.

[wilson-402-073-02:2017] I. Wilson, J. Blake, S. Dovchin, Y. Heo, J. Perkins, D. Roy, and T. Yasuta. University of Aizu Strategic Research Funding, 2017.

[yasuta-402-073-03:2017] Y. Heo Takako Yasuta: primary investigator, J. Brine. Kakenhi Category C: Yakuwarigo bunseki-no Eigokyoiku dounyu:Yakuwarigo bunseki-no academic writing-heno ouyou, 2016-2018.

[yasuta-402-073-04:2017] et.al D. Roy, Takako Yasuta: co-investigator. 3D printing in creative factory contexts for English language learning, 2015-2017.

Academic society activities

[droy-402-073-09:2017] Debopriyo Roy, 2017-2018.

> Debopriyo Roy Chair. The ACM Chapter on Elearning and Technical Communication, 2017-2018 I have been organizing international conferences on campus and in other campuses in Japan, and in international locations ever since 2010. I have been doing this single-handedly and every year.

[droy-402-073-10:2017] Debopriyo Roy, 2017-2018.

> Member of the Organizing Committee, Japan Association for Language Teaching JALT Computer Assisted Language Teaching CALL SIG

[droy-402-073-11:2017] Debopriyo Roy, 2017-2018.

> Member of Japanese Technical Communication Association JTCA and has established the Technical Communication certificate program at the University of Aizu.

[droy-402-073-12:2017] Debopriyo Roy, 2018.

> Invited Keynote Presentation, IEEE Professional Communication Society, JAPAN

[droy-402-073-13:2017] Debopriyo Roy, 2017.

> Keynote Presentation, JAPAN Association for Technical Communication JTCA

[kaneko-402-073-10:2017] Kaneko E., 2017.

> Organizing committee chair of the 21st Japan Language Testing Association Annual Conference

[kaneko-402-073-11:2017] Kaneko E., 2017.

> Chair of research meeting committee

[kaneko-402-073-12:2017] Kaneko E., 2017.

> Annonymous reviewer of JLTA Journal

[kaneko-402-073-13:2017] Kaneko E., 2017.

> Academic publications committee

Summary of Achievement

[yasuta-402-073-05:2017] Takako Yasuta, 2017.

> Japan Association for Language Teaching, regular member

[yasuta-402-073-06:2017] Takako Yasuta, 2017.

> Regular member

[yasuta-402-073-07:2017] Takako Yasuta, 2017.

> Regular member

[yasuta-402-073-08:2017] Takako Yasuta, 2017.

> regular member

Advisor for undergraduate research and graduate research

[jblake-402-073-12:2017] Hiroki Inoue. Verification and improvement of software to support reading English aloud, Computer Science and Engineering, 2017/8.

> Graduation Thesis (undergraduate)

[wilson-402-073-03:2017] Hamed Ahmed Dahan Al-Tairi. PhD Dissertation: Tongue retraction in Arabic: An ultrasound and acoustic study, University of Auckland, Department of Applied Language Studies and Linguistics, November 2017.

> External Examiner: I. Wilson

[wilson-402-073-04:2017] Kyori Suzuki. MSc Thesis: Visual Learning: Pronunciation iPhone app with ultrasound, video and MRI data, Graduate School of Computer Science and Engineering, March 2018.

> Thesis Advisor: I. Wilson, Referees: Prof. M. Hamada and Prof. J. Villegas

[wilson-402-073-05:2017] Yuki Iguro. MSc Thesis: Praat script for automatic vowel labeling of new English and Japanese speech databases, Graduate School of Computer Science and Engineering, March 2018.

> Thesis Advisor: I. Wilson, Referees: Prof. K. Markov and Prof. J. Villegas

[wilson-402-073-06:2017] Yui Takeda. MSc Thesis: Readability categorization of Eiken documents using machine learning, Graduate School of Computer Science and Engineering, March 2018.

Thesis Advisor: Prof. I. Paik, Referees: I. Wilson and Prof. K. Ofuji

[wilson-402-073-07:2017] Yohei Tomita. Graduation Thesis: Investigation of differences between Aizu regional dialects by acoustic data analysis, School of Computer Science and Engineering, March 2018.

Thesis Advisor: I. Wilson, Referee: Prof. M. Cohen

[wilson-402-073-08:2017] Aozora Kobayashi. Graduation Thesis: Automatically extracting phoneme samples from an ultrasound, video, and audio speech database, School of Computer Science and Engineering, March 2018.

Thesis Advisor: I. Wilson, Referee: Prof. M. Cohen

[wilson-402-073-09:2017] Nagisa Yonehara. Graduation Thesis: Influence of complexity on kanji identification reaction time, School of Computer Science and Engineering, March 2018.

Thesis Advisor: I. Wilson, Referee: Prof. J. Villegas

Others

[kimusik-402-073-10:2017] 2018.

Undergraduate Student Mentor meeting with students and interviewing them as well as coordinating mentor class social activities.

[yasuta-402-073-09:2017] Takako Yasuta. Manga comics as new EFL materials: Through role language analysis. The Hawaii International Conference on Education, 2017.

Conference oral presentation

[yasuta-402-073-10:2017] Takako Yasuta. Language in Manga: role language analysis for L2 writing. The 17th annual Second Language Acquisition and Teaching Interdisciplinary Roundtable 2017, 2017.

Conference oral presentation

[yasuta-402-073-11:2017] Takako Yasuta. Language in Manga: role language analysis for L2 writing. The 17th annual Second Language Acquisition and Teaching Interdisciplinary Roundtable 2017, 2017.

Conference oral presentation

Summary of Achievement

[yasuta-402-073-12:2017] Jungpil Shin Sassy Wong Eunjin Bang, Takako Yasuta. Engineering students'stereotypic images of scientists in Japan. Science, Technology, Engineering, Arts, Math and Education 7th annual conference, 2017.

Conference oral presentation

[yasuta-402-073-13:2017] Takako Yasuta. Role language analysis: how language in Manga can help L2 writing. Symposium on Second Language Writing 2017, 2017.

Conference oral presentation

[yasuta-402-073-14:2017] Takaok Yausta. Teaching writing through the language in Manga. The 45th Japan Language Testing Association Research Meeting, 2017.

Conference oral presentation

[yasuta-402-073-15:2017] Takako Yasuta. Fukushima Revitalization EFL Project through Akabeko-chan Role Language Analysis. Role Language Research Meeting, 2017.

Conference oral presentation

[yasuta-402-073-16:2017] Takako Yasuta. Fukushima Revitalization EFL Project through Akabeko-chan Role Language Analysis. Role Language Research Meeting, 2017.

Conference oral presentation

[yasuta-402-073-17:2017] Takako Yasuta. Project-based EFL for Fukushima Revitalization: Through Role Language Analysis. The 2017 Tohoku ELT expo, 2017.

Conference oral presentation

[yasuta-402-073-18:2017] Takako Yasuta. Project-based EFL for Fukushima Revitalization: Through Role Language Analysis. The 2017 Tohoku ELT expo, 2017.

Conference oral presentation

Contributions related to syllabus preparation

[anich-402-073-05:2017] Co-ordinator of Introductory English 3 and Introductory English 4 freshmen English courses.

[anich-402-073-06:2017] Member of the CLR Curriculum Working Group.

[kaneko-402-073-14:2017] Introductory English 1, 2, 3, 4

[kimusik-402-073-11:2017] 2017 Group coordinator for exam question creation for University Entrance Exam

[yasuta-402-073-19:2017] Introductory English 1 Introductory Enlgish 2 Language in Manga Japanese pop culture through English

[youngheo-402-073-03:2017] I created the syllabus for the two core courses (Intermediate English 1 and 2) and also my elective courses (Design of Human Languages and Presentation Skills).

Preparation of course examination to measure comprehension

[youngheo-402-073-04:2017] I created course exams for Intermediate English 1, Intermedaite English 2, Design of Human Languages and Presentation Skills.

Contribution related to the selection of library or textbook materials

[yasuta-402-073-20:2017] Chose the textbook for Introductory English 1 and 2.

[yasuta-402-073-21:2017] Library Committee: Created the journal subscription list for 2018 for CLR

[youngheo-402-073-05:2017] I selected the textbooks of two core courses (Intermediate English 1 and 2).

Contribution related to toward equipment management, classroom management, building management, and crime or fire prevention.

[youngheo-402-073-06:2017] I am a member of Harassement Prevention committee.

Summary of Achievement

Advisor of a student club or circle

[yasuta-402-073-22:2017] SGU Global Lounge coordinator: Hirig and traing TAs. File monthly activity reports.

Contribution related to faculty personnel (outside scouting, etc.)

[kaneko-402-073-15:2017] Hiring committee member for the Center for Language Research

[kaneko-402-073-16:2017] Hiring committe for the Center for Cultural Research and Studies

Contribution related to on-campus/off-campus publicity work

[anich-402-073-07:2017] Gave lecture at Aizu High School.

Contribution related to educational planning management

[kaneko-402-073-17:2017] Chair of the English curriculum revision committee

[kaneko-402-073-18:2017] Member of the Academic Affairs Committee

[youngheo-402-073-07:2017] I am the course coordinator of Intermediate English 1 and 2. I created the course materials and am managing course websites on Schoology.

[youngheo-402-073-08:2017] I plan on the schedule of on-campus TOEIC tests and participate in the administration of them.

Contribution related to planning administration for research, research conferences, or international research

[droy-402-073-14:2017] Organized an ACM Chapter Conference on Project Based Language Learning http://web-ext.u-aizu.ac.jp/labs/clr/pbll.html

[droy-402-073-15:2017] Helped University of Aizu sign a Memorandam of Understanding MoU with Karlsruhe University of Applied Sciences, HSKA Germany for international research partnership. We will henceforth be collaborating on coursewide international research with student groups from UoA and HSKA, Germany.

[kaneko-402-073-19:2017] Organizing chair of the 21st Japan Language Testing Association Annual Conference (JLTA2017)

[youngheo-402-073-09:2017] I was a member of the organizing committee of Japan Language Testing Association held on the UoA campus in September 2017.

[youngheo-402-073-10:2017] I was a member of the organizing committee of Japan Language Testing Association held on the UoA campus in September 2017.

Other significant contribution toward university planning, management, or administration

[anich-402-073-08:2017] University entrance examination item writing.

[anich-402-073-09:2017] University of Aizu Special Entrance Examination for applicants from abroad. Responsible for evaluating applicants' English proficiency levels.

[anich-402-073-10:2017] University entrance examination proctoring.

[droy-402-073-16:2017] - In charge of organizing the CLR wide effort in the making of the English questions for the undergraduate entrance examinations. - Member of the undergraduate entrance exam committee at the university of Aizu.

[droy-402-073-17:2017] - Member of the university public relations and website management working group

[jperkins-402-073-06:2017] Statistical analysis of student TOEIC test scores with presentations given at U. of Aizu administrative meetings

[jperkins-402-073-07:2017] English Admission Exam Creation: Question creation and grading

[jperkins-402-073-08:2017] English Entrance Exam Service: Available during the test in order to answer queries from applicants

[kaneko-402-073-20:2017] Project management team member of the Top Global University project

Summary of Achievement

[yasuta-402-073-23:2017] Evaluation Office Working Group Governance Improvement Group Library Committee University-High School Cooperation Committee Entrance Exam Committee (queston making)

Contributions related to regional education

[kimusik-402-073-12:2017] July 19th Lecture at Aizu High School as part of the Project for Development of Future Global Leaders

[kimusik-402-073-13:2017] 2017 Study Abroad Student Escort to Waikato University, New Zealand (Pathways College) as part of the Global Experience Gateway

[yasuta-402-073-24:2017] Eiken STEP test interviewer

[yasuta-402-073-25:2017] March 2017. Globalization of Japan: The importance of English, Spot lecture series at Aizu Gakuho Junior High School, Aizuwakamatsu-shi, Fukushima, Japan

[yasuta-402-073-26:2017] July 2017. Presentation skills in English, Super Science High School Project at Aizu Gakuho High School, Aizuwakamatsu-shi, Fukushima, Japan

Contribution toward promotion of traditional arts and industries (for example, lacquer ware arts)

[kimusik-402-073-14:2017] Collaborative performance with Aizu Calligrapher Igarashi

[youngheo-402-073-11:2017] Students enrolled in the course Presentation Skills created brochures of local businesses such as Horse meat butcher and Suehiro.

Did you participate in students recruitment, support the alumni, and/or contact with student's parent? (Yes or No) If yes, please describe what you did.

[wilson-402-073-10:2017] Gave a lecture at "Yumenavi Live" Tokyo on using cutting-edge technology for improving English pronunciation, July 2017.

Did you participate in Faculty Development? (Yes or No) If yes, please describe what you did.

[kaneko-402-073-21:2017] Member of the Faculty Development Committee

Did you participate in Public Lectures, and/or Open Campus? (Yes or No) If yes, please describe what you did.

[wilson-402-073-11:2017] Participated in Open Labs in 2017.

[yasuta-402-073-27:2017] Public lecture: Let's learn Korean! (canceled due to the number of participants)

Centers

Research Center for Advanced Information Science and Technology

Wenxi Chen
Professor

Hirohide Demura
Professor

Keitaro Naruse
Senior Associate Professor

Naru Hirata
Senior Associate Professor

Naohito Nakasato
Senior Associate Professor

Yutaka Watanobe
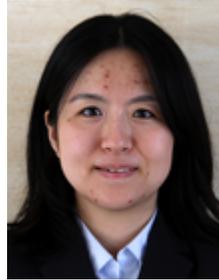Senior Associate Professor

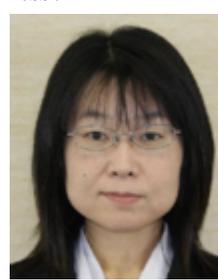Xin Zhu
Senior Associate Professor
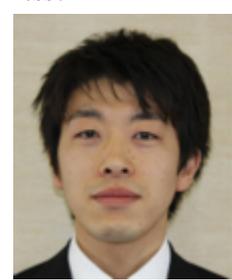
Akihito Nakamura
Senior Associate Professor

Junya Terazono
Associate Professor

Kyoko Okudaira
Associate Professor

Yoshiko Ogawa
Associate Professor

Kohei Kitazato
Associate Professor

Chikatoshi Honda
Associate Professor

Yuichi Yaguchi
Associate Professor

Keita Nakamura
Associate Professor

Jun Ogawa
Associate Professor

Centers

CAIST was taking advantage of the leading-edge ICT platforms in the University of Aizu, and striving to establish an R and D hub, in parallel with promoting R and D activities to meet diverse social needs and proactively collaborating with external organizations, including universities, companies and research institutes.

CAIST had taken on a series of commitments and undertaken missions assigned below.

(1) R and D on leading-edge information science and technology

(2) Inter-disciplinary R and D in multiple fields

(3) Creation and utilization of intellectual properties based on research results

(4) Heightening the recognition of the University of Aizu through activities in academic societies and hosting domestic/international conferences

(5) Development and formulation of new knowledge and understanding

There are three types of clusters in CAIST. The first is the strategically planed cluster which is strategically planned based on the management and governance of UoA strategy. The second is the strategic research project-evolved cluster which is established based on evaluation of a strategic research when it is mature enough as a new CAIST cluster. The third is the on-campus open competition-based cluster which is open to all faculty for competitive proposal.

Five clusters are active in AY2017. Three clusters, ARC-Space, ARC-BME and ARC-Robot are the first type. Two clusters, ARC-HPC and ARC-Cloud, are the second type. There is no cluster belonging to the third type currently.

Activities and achievements of each cluster are summarized below.

ARC-BME The research of ARC-BME is focused on the following fields. (1) ICT-based healthcare domain for a long-term strategy for daily healthcare. These studies developed an Internet-based infrastructure, including a series of instrumentation for seamless monitoring of vital signs without disturbing subjects in daily life activities, and a variety of algorithms for in-depth data mining and big data analytics in biomedical application. Several cooperative studies with external institutions and companies were implemented for field trial and exploring possibility of commercialization. - A cooperative study with four nursing homes aimed to collect elderly data and to assess the system performance through field trial. - A cooperative study with Bange Welfare General Hospital collected clinical data from patients suffered from kidney disorder, and evaluated the therapeutic effect during dialysis. - A cooperative study with Simplex Quantum Inc. developed API libraries for healthcare application and relevant commercialized products. (2) Biomedical signal processing, image processing, and cardiac modeling and simulation. The collaboration research supported by JSPS with Fukuoka University is to develop an organic model for the study on the mechanism of atrial fibrillation.

Currently, we are also studying the computer-aided diagnosis of colorectal polyps from colonoscopy videos/images using deep learning with Aizu Medical Center, Fukushima Medical University.

ARC-Cloud This cluster promotes three core activities; research, contribution to society, and education. As research, we conduct multidisciplinary research on security and related fields. For contribution to the society, we satisfy the social needs by industry-academia-government collaboration. As education, we will develop human resources, particularly security talent. ARC-Cloud puts emphasis on information security technology and conducted research on data protection on cloud and safe web-browsing. Also, we aimed to apply our security technology to the fields of IoT by developing network simulation technology to test IoT devices against network and hosts failures and cyber attacks. Through the collaborative research and projects, we contributed to industrial development and competitiveness of technology-based companies. In addition, we conducted security seminars and drill to contribute to develop outstanding human resource in the field.

ARC-HPC (1) Co-development of MOST in software and hardware Method Of Splitting Tsunami (MOST) is an algorithm to solve the shallow water equation for the evolution of Tsunami. This algorithm is a fundamental tool to predict wave height after an earthquake event in the Pacific Ocean. In AY2017, we have ported MOST algorithm on FPGA systems using the OpenCL-based high-level synthesis tool Intel FPGA SDK for OpenCL. We have successfully implemented the MOST by using OpenCL kernels with various optimization techniques. Our latest implementation shows roughly compatible performance to the dedicated FPGA implementations we did in last year. (2) Development of a high-performance linear equation solver The gyrokinetic toroidal five-dimensional Eulerian code (GT5D) is a nuclear fusion simulation code developed by researchers at Japan Atomic Energy Agency. A compute intensive part of GT5D is to solve linear systems of equations. In the linear equation solver, the data communication time is a performance bottleneck. We have been developing an implementation of communication avoided (CA) generalized minimal residual method (CA-GMRES) on GPUs. The CA-GMRES has two major computations: a matrix powers kernel (MPK) and a tall-skinny QR decomposition (TSQR). In this project, we first have developed high-performance MPK and TSQR routines for GPUs. Based on the improved routines, we have evaluated our CA-GMRES implementation on GPU clusters. Results of the evaluation is currently in preparation for publication.

ARC-Robot The objective of this cluster is to develop an information system for multiple and heterogeneous robots with a different OS and CPU. For connecting them and working as a whole system, we have introduced OpenRTM, which is a

robot middleware of defining a common data transmission method in a different OS. This year of 2017, we have developed and demonstrated a robot tele-operation system of a ground vehicle, a ground camera, and an aerial one. It is operated with two kinds of interface system, a camera viewer displaying scenes of the real world, and a virtual robot viewer showing a pose of the whole robot, which cannot be seen from a physical camera. We have expected, and it has been shown that the virtual viewer can improve a robot operationality. The key technology and main contribution of our group is to establish a robot system integration methodology for the multiple and heterogeneous robots. 1 In addition, because the robotics is an integrated field involving mechanical, electrical, control, and computational engineering, we need education programs for robot developers from a beginner or student to an intermediate level or industrial engineer. We have carried out a series of seminars for a local industrial society and contributed to our society.

ARC-Space ARC-Space has started since April 1st in 2009 on the basis of advanced informatics of UoA and experiences of the researchers in operations and developments of optical instruments in deep space explorations. Main topics are Geo-informatics, GIS, Deep Space Explorations such as Hayabusa2 to the asteroid Ryugu, and supporting tools for the explorations. Goal of the cluster is to be a COE for Archive Science, which is a interdisciplinary one between Space Science and Informatics with archived data sets of lunar planetary explorations. Space exploration projects in AY2017 are Hayabusa2 to the asteroid Ryugu, Tanpopo Program for astrobiology on the International Space Station, SLIM (Smart Lander for Investigating Moon), Akatsuki around Venus, MMX (Martian Moon eXploration for Sample Return), DESTINY+ to the asteroid Phaeton, etc. We have another topic for monitoring volcanic activities in Fukushima as a regional contribution. This cluster members have been assigned for WG of Satellite Data Analysis in Meteorological Agency's Volcanic Eruption Prediction Liaison Council by means of InSAR (Interferometric SAR, Synthetic Aperture Radar), whose target is crustal deformation of cm-class. Visibility of this cluster is significant based on public outreach activities, more than 20 Delivery Lectures and Exhibitions.

Review Committee was established to evaluate achievements and social significance of cluster activities, and to discuss establishment/discontinuation of a cluster and other relevant affairs. The evaluation results were reported to the Deans and Directors Council and the Education and Research Council for official authorization of CAIST activities. Advisory Board, consisting of internal members and external members, was established for providing professional advice to relevant cluster and promoting cluster's activities. Center office was in charge of making and implementing an annual budget plan, daily management of CAIST and

cluster activities, promoting public recognition of CAIST, enhancing cooperative connection among academia-industry-government, organizing annual symposium and advisory board meeting, and etc.

Refereed academic journal

[chonda-403-079-01:2017] M.; Kouyama T.; Tatsumi E.; Kameda S.; Honda R.; Sawada H.; Ogawa N.; Morota T.; Honda C.; Sakatani N.; Hayakawa M.; Yokota Y.; Yamamoto Y.; Sugita S. Suzuki, H.; Yamada. Initial inflight calibration for Hayabusa2 optical navigation camera (ONC) for science observations of asteroid Ryugu. *Icarus*, 2018.

Hayabusa2, the first sample return mission to a C-type asteroid was launched by the Japan Aerospace Exploration Agency (JAXA) on December 3, 2014 and will arrive at the asteroid in the middle of 2018 to collect samples from its surface, which may contain both hydrated minerals and organics. The optical navigation camera (ONC) system on board the Hayabusa2 consists of three individual framing CCD cameras, ONC-T for a telescopic nadir view, ONC-W1 for a wide-angle nadir view, and ONC-W2 for a wide-angle slant view will be used to observe the surface of Ryugu. The cameras will be used to measure the global asteroid shape, local morphologies, and visible spectroscopic properties. Thus, image data obtained by ONC will provide essential information to select landing (sampling) sites on the asteroid. This study reports the results of initial inflight calibration based on observations of Earth, Mars, Moon, and stars to verify and characterize the optical performance of the ONC, such as flat-field sensitivity, spectral sensitivity, point-spread function (PSF), distortion, and stray light of ONC-T, and distortion for ONC-W1 and W2. We found some potential problems that may influence our science observations. This includes changes in sensitivity of flat fields for all bands from those that were measured in the pre-flight calibration and existence of a stray light that arises under certain conditions of spacecraft attitude with respect to the sun. The countermeasures for these problems were evaluated by using data obtained during initial in-flight calibration.

[chonda-403-079-02:2017] H.; Takamatsu T.; Cho Y.; Yasuda T.; Yamada M.; Sawada H.; Honda R.; Morota T.; Honda C.; Sato M.; Okumura Y.; Shibasaki K.; Ikezawa S.; Sugita S. Kameda, S.; Suzuki. Preflight Calibration Test Results for Optical Navigation Camera Telescope (ONC-T) Onboard the Hayabusa2 Spacecraft. *Space Science Reviews*, 2017.

The optical navigation camera telescope (ONC-T) is a telescopic framing camera with seven colors onboard the Hayabusa2 spacecraft launched on December 3, 2014. The main objectives of this instrument are to optically navigate the spacecraft to asteroid Ryugu and to conduct multi-band mapping the asteroid.

We conducted performance tests of the instrument before its installation on the spacecraft. We evaluated the dark current and bias level, obtained data on the dependency of the dark current on the temperature of the charge-coupled device (CCD). The bias level depends strongly on the temperature of the electronics package but only weakly on the CCD temperature. The dark-reference data, which is obtained simultaneously with observation data, can be used for estimation of the dark current and bias level. A long front hood is used for ONC-T to reduce the stray light at the expense of flatness in the peripheral area of the field of view (FOV). The central area in FOV has a flat sensitivity, and the limb darkening has been measured with an integrating sphere. The ONC-T has a wheel with seven bandpass filters and a panchromatic glass window. We measured the spectral sensitivity using an integrating sphere and obtained the sensitivity of all the pixels. We also measured the point-spread function using a star simulator. Measurement results indicate that the full width at half maximum is less than two pixels for all the bandpass filters and in the temperature range expected in the mission phase except for short periods of time during touchdowns.

[chonda-403-079-03:2017] Kohei; Abe Masanao; Ohtake Makiko; Arai Takehiko; Arai Tomoko; Hirata Naru; Hiroi Takahiro; Honda Chikatoshi; Imae Naoya; Komatsu Mutsumi; Matsunaga Tsuneo; Matsuoka Moe; Matsuura Shuji; Nakamura Tomoki; Nakato Aiko; Nakauchi Yusuke; Osawa Takahito; Senshu Hiroki; Takagi Yasuhiko; Tsumura Kohji; Takato Naruhisa; Watanabe Sei-ichiro; Barucci Maria Antonietta; Palomba Ernesto; Ozaki Masanobu Iwata, Takahiro; Kitazato. NIRS3: The Near Infrared Spectrometer on Hayabusa2. *Space Science Reviews*, 2017.

NIRS3: The Near Infrared Spectrometer is installed on the Hayabusa2 spacecraft to observe the target C-type asteroid 162173 Ryugu at near infrared wavelengths of 1.8 to 3.2 um. It aims to obtain reflectance spectra in order to detect absorption bands of hydrated and hydroxide minerals in the 3 um-band. We adopted a linear-image sensor with indium arsenide (InAs) photo diodes and a cooling system with a passive radiator to achieve an optics temperature of 188 K (-85degC), which enables to retaining sufficient sensitivity and noise level in the 3 um wavelength region. We conducted ground performance tests for the NIRS3 flight model (FM) to confirm its baseline specifications. The results imply that the properties such as the signal-to-noise ratio (SNR) conform to scientific requirements to determine the degree of aqueous alteration, such as CM or CI chondrite, and the stage of thermal metamorphism on the

asteroid surface.

[keita-n-403-079-01:2017] T.Matsumoto, Y.Oyama, J.Ogawa, K.Nakamura, and K.Naruse. Mechanism of generating drawbar pull of rod wheel on loose soil. *Journal of Artificial Life and Robotics*, 2017.

In this paper, we propose a model of drawbar pull generated by wheels fitted with a rod and assess it by comparing measured values obtained from an experiment with those from the model. In recent years, many kinds of robots for weeding in paddy fields have been developed. However, almost all of these are large and heavy. We have previously developed a small, lightweight robot for weeding. This robot is equipped with a rod wheel that has roles of weeding and running. However, this wheel was developed by experience from demonstrations and its dynamics for control remain unknown. To solve this problem, we propose a new model for drawbar pull generated by rod wheels and evaluate it by comparing experimental values with those from the model.

[keita-n-403-079-02:2017] W.Chen, Y.Yaguchi, K.Naruse, Y.Watanobe, and K.Nakamura. QoS-aware Robotic Streaming Workflow Allocation in Cloud Robotics Systems. *IEEE Transactions on Services Computing*, 2018.

Current solutions of computation offloading for cloud robotics face challenges: 1) traditional approaches do not consider the characteristics of networked cloud robotics (NCR)(e.g., heterogeneity and robotic cooperation); 2) they fail to capture the characteristics of tasks in a robotic streaming workflow (RSW) (e.g., strict latency requirements and different task semantics); and 3) they do not consider quality-of-service (QoS) issues for cloud robotics. In this paper, we address these issues by proposing a QoS-aware RSW allocation algorithm for NCR with joint optimization of latency, energy efficiency, and cost, while considering the characteristics of RSW and NCR. We first propose a novel framework that combines robot individuals, robot clusters, and a remote cloud for computation offloading. We then formulate the joint QoS optimization problem for RSW allocation in NCR while considering latency, energy consumption, and operating cost, and show that the problem is NP-hard. Next, we construct a data flow graph based on the characteristics of RSW and NCR, and transform the RSW allocation problem into a mixed-integer linear programming problem. To obtain an optimal solution in reasonable time, we also develop a heuristic-based algorithm. Experiments demonstrate significant performance gains, with improved QoS and reduced execution times.

[keita-n-403-079-03:2017] Kizuku Mineta Keita Nakamura and Keitaro Naruse. Investigation of 3D Reconstruction from Time-series Images by Towing Camera. *IFAC-PapersOnLine*, 2017.

> This study shows the investigation of three dimensional (3D) reconstruction using a towing camera system in order to collect the information inside the nuclear plant for reactor decommissioning. The towing camera obtains time-series inside the nuclear plant by moving through a cable. The camera can move by pulling the cable. However, in this case, passive rotation affects the 3D reconstruction. In this study, in order to investigate effect of the passive rotation, the experiments are carried out for 3D reconstruction with actual camera at a mockup. In order to investigate influence of passive rotation, we prepare two types of camera. One is towing passive joint camera which is influenced by passive rotations and the other is towing fix joint camera which is not influenced by them. We compare 3D reconstruction from time-series images by these two cameras. A square log is adopted as a target for 3D reconstruction in mockup. Experimental results show that time-series images by a passive joint camera reconstruct the target more accurate and the floor more flatly in comparison to a fixed joint camera. Additionally, we verify that it is difficult to reconstruct the points with respect to the vertical height when towing camera is set to downward.

[kitazato-403-079-01:2017] T. Okada, T. Fukuhara, S. Tanaka, M. Taguchi, T. Imamura, T. Arai, H. Senshu, Y. Ogawa, H. Demura, K. Kitazato, R. Nakamura, T. Kouyama, T. Sekiguchi, S. Hasegawa, T. Matsunaga, T. Wada, J. Takita, N. Sakatani, Y. Horikawa, K. Endo, J. Helbert, T. G. Mueller, and A. Hagermann. Thermal Infrared Imaging Experiments of C-Type Asteroid 162173 Ryugu on Hayabusa2. *Space Science Reviews*, 208(1-4):255–286, 2017.

[kitazato-403-079-02:2017] T. Iwata, K. Kitazato, M. Abe, M. Ohtake, T. Arai, T. Arai, N. Hirata, T. Hiroi, C. Honda, N. Imae, M. Komatsu, T. Matsunaga, M. Matsuoka, S. Matsuura, T. Nakamura, A. Nakato, Y. Nakauchi, T. Osawa, H. Senshu, Y. Takagi, K. Tsumura, N. Takato, S. Watanabe, M. A. Barucci, E. Palomba, and M. Ozaki. NIRS3: The Near Infrared Spectrometer on Hayabusa2. *Space Science Reviews*, 208(1-4):317–337, 2017.

[kitazato-403-079-03:2017] M. Matsuoka, T. Nakamura, T. Osawa, T. Iwata, K. Kitazato, M. Abe, Y. Nakauchi, T. Arai, M. Komatsu, T. Hiroi,

N. Imae, A. Yamaguchi, and H. Kojima. An evaluation method of reflectance spectra to be obtained by Hayabusa2 Near-Infrared Spectrometer (NIRS3) based on laboratory measurements of carbonaceous chondrites. *Earth, Planets and Space*, 69(1):1–12, 2017.

[nakamura-403-079-01:2017] Kikuchi S., Watanabe S., Kenmotsu T., Yoshino D., Nakamura A., and Hayashi T. Analysis of Impactful Factors on Performance in Combining Architectural Elements of IoT. *Advances in Internet of Things (AIT)*, 7(4):121–138, October 2017.

We implemented a generalized infrastructure for Internet of Things (IoT infrastructure) to be applicable in various areas such as Smart Grid. That IoT infrastructure has two methods to store sensor data. They commonly have the features of double overlay structure, virtualization of sensors, composite services as federation using publisher/subscriber. And they are implemented as synthesizing the elemental architectures. The two methods majorly have the common architectural elements, however there are differences in how to compose and utilize them. But we observed the non-negligible differences in their achieved performance by the actual implementations due to operational items beyond these architectural elements. In this paper, we present the results of our analysis about the factors of the revealed differences based on the measured performance. In particular, it is clarified that a negative side effect due to combining independent elemental micro solutions naively could be amplified, if maximizing the level of loose coupling is applied as the most prioritized design and operational policy. Primarily, these combinations should be evaluated and verified during the basic design phase. However, the variation of how to synthesize them tends to be a blind spot when adopting the multiple independent architectural elements commonly. As a practical suggestion from this case, the emphasized importance in carrying out a new synthetization with multiple architectures is to make a balance naturally among architectural elements, or solutions based on them, and there is a certain demand to establish a methodology for architectural synthetization, including verification.

[naru-403-079-01:2017] Ryuhei Yamada, Hiroki Senshu, Noriyuki Namiki, Takahide Mizuno, Shinsuke Abe, Fumi Yoshida, Hirotomo Noda, Naru Hirata, Shoko Oshigami, Hiroshi Araki, Yoshiaki Ishihara, and Koji Matsumoto. Albedo Observation by Hayabusa2 LIDAR: Instrument Performance and Error Evaluation. *Space Science Reviews*, 208(1):49–64, 2017.

The Japanese asteroid explorer Hayabusa2 was launched at the end of 2014.

Hayabusa2 is supposed to observe the near-Earth C-type asteroid 162173 Ryugu (1999 JU3) and bring surface material samples back to Earth in 2020. It is equipped with Light Detection and Ranging (LIDAR) instrument for laser ranging which can be used to measure the intensities of transmitted and received pulses. The intensity data can be used to estimate the normal albedo of Ryugu at a laser wavelength of 1.064 um. To perform this estimation, we determined the transfer functions of the laser module and receiver to convert the intensity data into pulse energies, along with the utilization ratio of the returned pulse energy, through verification tests of the LIDAR flight model. Then, we evaluated the error of the normal albedo. This error is affected not only by the performance of the LIDAR but also by the slope and roughness of the asteroid's surface. In this paper, we focus on the error in the normal albedo due only to the instrument error, which will be 18.0 % in an observation at a nominal altitude of 20 km.

[naru-403-079-02:2017] S. Yamamoto, T. Matsunaga, T. Nakamura, Y. Sekine, N. Hirata, and Y. Yamaguchi. An Automated Method for Crater Counting Using Rotational Pixel Swapping Method. *IEEE Transactions on Geoscience and Remote Sensing*, 55(8):4384–4397, 2017.

We develop a fully automated algorithm for determining the geological ages by crater counting from the digital terrain model (DTM) and the digital elevation model (DEM) taken by remote-sensing observations. The algorithm is based on the rotational pixel swapping method, which uses a multiplication operation between the original DTM/DEM data and the rotated data to detect impact craters. Our method does not need binarization and/or noise reduction, because noise components are automatically erased. We show that our method can detect not only simple craters but also complex circular structures such as imperfect, degraded, or overlapping craters. We demonstrate that this method succeeds in the automatic detection of hundreds to thousands of impact craters, and the estimated ages are consistent with those by manual counting in previous works. In addition, it is shown that the calculation time by this method is more than several hundred times faster than by previous methods.

[naru-403-079-03:2017] T. Mizuno, T. Kase, T. Shiina, M. Mita, N. Namiki, H. Senshu, R. Yamada, H. Noda, H. Kunimori, N. Hirata, F. Terui, and Y. Mimasu. Development of the Laser Altimeter (LIDAR) for Hayabusa2. *Space Science Reviews*, 208(1):33–47, 2017.

Hayabusa2 was launched on 3 December 2014 on an H-IIA launch vehicle from

the Tanegashima Space Center, and is, at the time of writing, cruising toward asteroid 162137 Ryugu (1999 JU 3). After reaching the asteroid, it will stay for about 1.5 years to observe the asteroid and collect surface material samples.

[naru-403-079-04:2017] Wataru Ueno, Hirohide Demura, and Naru Hirata. HAR-MONICS: A Visualization Tool for Hayabusa and Hayabusa 2 Missions. *TRANSACTIONS OF THE JAPAN SOCIETY FOR AERONAUTI-CAL AND SPACE SCIENCES*, 60(3):132–136, 2017.

> We developed a tool for visualizing the spatial geometry of objects and field-of-view (FOV) of scientific instruments for mission plans and data analysis of Hayabusa and Hayabusa 2, and named "HARMONICS (Hayabusa Remote MONItoring and Commanding System)." We also implemented a graphical user interface to simulate a changing FOV. Displaying arbitrary viewpoints over a time sequence helps determine the geometry observed and supports later data analysis. HARMONICS loads ancillary data with the SPICE kernel format: position and attitude of the spacecraft, properties of scientific instruments and target's shape model, etc. Here, we report on the system details and enhanced functions of HARMONICS compared to the original version in 2005.

[naru-403-079-05:2017] T. Imamura, H. Ando, S. Tellmann, M. Peatzold, B. Heausler, A. Yamazaki, T.M. Sato, K. Noguchi, Y. Futaana, J. Oschlisniok, S. Limaye, R.K. Choudhary, Y. Murata, H. Takeuchi, C. Hirose, T. Ichikawa, T. Toda, A. Tomiki, T. Abe, Z. Yamamoto, H. Noda, T. Iwata, S. Murakami, T. Satoh, T. Fukuhara, K. Ogohara, K. Sugiyama, H. Kashimura, S. Ohtsuki, S. Takagi, Y. Yamamoto, N. Hirata, G. L. Hashimoto, M. Yamada, M. Suzuki, N. Ishii, T. Hayashiyama, Y. J. Lee, and M. Nakamura. Initial performance of the radio occultation experiment in the Venus orbiter mission Akatsuki. *Earth, Planets, and Space*, 69:137, 2017.

> After the arrival of Akatsuki spacecraft of Japan Aerospace Exploration Agency at Venus in December 2015, the radio occultation experiment, termed RS (Radio Science), obtained 19 vertical profiles of the Venusian atmosphere by April 2017. An onboard ultra-stable oscillator is used to generate stable X-band downlink signals needed for the experiment. The quantities to be retrieved are the atmospheric pressure, the temperature, the sulfuric acid vapor mixing ratio, and the electron density. Temperature profiles were successfully obtained down to 38 km altitude and show distinct atmospheric structures

depending on the altitude. The overall structure is close to the previous observations, suggesting a remarkable stability of the thermal structure. Local time-dependent features are seen within and above the clouds, which is located around 48-70 km altitude. The H2SO4 vapor density roughly follows the saturation curve at cloud heights, suggesting equilibrium with cloud particles. The ionospheric electron density profiles are also successfully retrieved, showing distinct local time dependence. Akatsuki RS mainly probes the low and middle latitude regions thanks to the near-equatorial orbit in contrast to the previous radio occultation experiments using polar orbiters. Studies based on combined analyses of RS and optical imaging data are ongoing.

[naru-403-079-06:2017] Takahiro Iwata, Kohei Kitazato, Masanao Abe, Makiko Ohtake, Takehiko Arai, Tomoko Arai, Naru Hirata, Takahiro Hiroi, Chikatoshi Honda, Naoya Imae, Mutsumi Komatsu, Tsuneo Matsunaga, Moe Matsuoka, Shuji Matsuura, Tomoki Nakamura, Aiko Nakato, Yusuke Nakauchi, Takahito Osawa, Hiroki Senshu, Yasuhiko Takagi, Kohji Tsumura, Naruhisa Takato, Sei-ichiro Watanabe, Maria Antonietta Barucci, Ernesto Palomba, and Masanobu Ozaki. NIRS3: The Near Infrared Spectrometer on Hayabusa2. *Space Science Reviews*, 208(1):317–337, 2017.

NIRS3: The Near Infrared Spectrometer is installed on the Hayabusa2 spacecraft to observe the target C-type asteroid 162173 Ryugu at near infrared wavelengths of 1.8 to 3.2 um. It aims to obtain reflectance spectra in order to detect absorption bands of hydrated and hydroxide minerals in the 3 um-band. We adopted a linear-image sensor with indium arsenide (InAs) photo diodes and a cooling system with a passive radiator to achieve an optics temperature of 188 K, which enables to retaining sufficient sensitivity and noise level in the 3 um wavelength region. We conducted ground performance tests for the NIRS3 flight model (FM) to confirm its baseline specifications. The results imply that the properties such as the signal-to-noise ratio (SNR) conform to scientific requirements to determine the degree of aqueous alteration, such as CM or CI chondrite, and the stage of thermal metamorphism on the asteroid surface.

[naru-403-079-07:2017] M. Arakawa, K. Wada, T. Saiki, T. Kadono, Y. Takagi, K. Shirai, C. Okamoto, H. Yano, M. Hayakawa, S. Nakazawa, N. Hirata, M. Kobayashi, P. Michel, M. Jutzi, H. Imamura, K. Ogawa, N. Sakatani, Y. Iijima, R. Honda, K. Ishibashi, H. Hayakawa, and H. Sawada. Scientific Objectives of Small Carry-on Impactor (SCI) and Deployable

Camera 3 Digital (DCAM3-D): Observation of an Ejecta Curtain and a Crater Formed on the Surface of Ryugu by an Artificial High-Velocity Impact. *Space Science Reviews*, 208(1):187–212, 2017.

The Small Carry-on Impactor (SCI) equipped on Hayabusa2 was developed to produce an artificial impact crater on the primitive Near-Earth Asteroid (NEA) 162173 Ryugu (Ryugu) in order to explore the asteroid subsurface material unaffected by space weathering and thermal alteration by solar radiation. An exposed fresh surface by the impactor and/or the ejecta deposit excavated from the crater will be observed by remote sensing instruments, and a subsurface fresh sample of the asteroid will be collected there. The SCI impact experiment will be observed by a Deployable CAMera 3-D (DCAM3-D) at a distance of, 1 km from the impact point, and the time evolution of the ejecta curtain will be observed by this camera to confirm the impact point on the asteroid surface. As a result of the observation of the ejecta curtain by DCAM3-D and the crater morphology by onboard cameras, the subsurface structure and the physical properties of the constituting materials will be derived from crater scaling laws. Moreover, the SCI experiment on Ryugu gives us a precious opportunity to clarify effects of microgravity on the cratering process and to validate numerical simulations and models of the cratering process.

[naru-403-079-08:2017] Kazunori Ogohara, Masahiro Takagi, Shin-ya Murakami, Takeshi Horinouchi, Manabu Yamada, Toru Kouyama, George L. Hashimoto, Takeshi Imamura, Yukio Yamamoto, Hiroki Kashimura, Naru Hirata, Naoki Sato, Atsushi Yamazaki, Takehiko Satoh, Naomoto Iwagami, Makoto Taguchi, Shigeto Watanabe, Takao M. Sato, Shoko Ohtsuki, Tetsuya Fukuhara, Masahiko Futaguchi, Takeshi Sakanoi, Shingo Kameda, Ko-ichiro Sugiyama, Hiroki Ando, Yeon Joo Lee, Masato Nakamura, Makoto Suzuki, Chikako Hirose, Nobuaki Ishii, and Takumi Abe. Overview of Akatsuki data products: definition of data levels, method and accuracy of geometric correction. *Earth, Planets and Space*, 69(1):167, 2017.

We provide an overview of data products from observations by the Japanese Venus Climate Orbiter, Akatsuki, and describe the definition and content of each data-processing level. Levels 1 and 2 consist of non-calibrated and calibrated radiance (or brightness temperature), respectively, as well as geometry information (e.g., illumination angles). Level 3 data are global-grid data in the regular longitude, latitude coordinate system, produced from the contents of Level 2. Non-negligible errors in navigational data and instrumental align-

ment can result in serious errors in the geometry calculations. Such errors cause mismapping of the data and lead to inconsistencies between radiances and illumination angles, along with errors in cloud-motion vectors. Thus, we carefully correct the boresight pointing of each camera by fitting an ellipse to the observed Venusian limb to provide improved longitude, latitude maps for Level 3 products, if possible. The accuracy of the pointing correction is also estimated statistically by simulating observed limb distributions. The results show that our algorithm successfully corrects instrumental pointing and will enable a variety of studies on the Venusian atmosphere using Akatsuki data.

[naru-403-079-09:2017] Takehiko Satoh, Takao M. Sato, Masato Nakamura, Yasumasa Kasaba, Munetaka Ueno, Makoto Suzuki, George L. Hashimoto, Takeshi Horinouchi, Takeshi Imamura, Atsushi Yamazaki, Takayuki Enomoto, Yuri Sakurai, Kosuke Takami, Kenta Sawai, Takashi Nakakushi, Takumi Abe, Nobuaki Ishii, Chikako Hirose, Naru Hirata, Manabu Yamada, Shin-ya Murakami, Yukio Yamamoto, Tetsuya Fukuhara, Kazunori Ogohara, Hiroki Ando, Ko-ichiro Sugiyama, Hiroki Kashimura, and Shoko Ohtsuki. Performance of Akatsuki/IR2 in Venus orbit: the first year. *Earth, Planets and Space*, 69(1):154, 2017.

The first year (December 2015 to November 2016) of IR2 after Akatsuki's successful insertion to an elongated elliptical orbit around Venus is reported with performance evaluation and results of data acquisition. The single-stage Stirling-cycle cryo-cooler of IR2 has been operated with various driving voltages to achieve the best possible cooling under the given thermal environment. A total of 3091 images of Venus (1420 dayside images at 2.02 um and 1671 night-side images at 1.735, 2.26, and 2.32 um) were acquired in this period. Additionally, 159 images, including images of stars for calibration and dark images for the evaluation of noise levels, were captured. Low-frequency flat images (not available in pre-launch calibration data) have been constructed using the images of Venus acquired from near the pericenter to establish the procedure to correct for the IR2 flat-field response. It was noticed that multiple reflections of infrared light in the PtSi detector caused a weak but extended tail of the point-spread function (PSF), contaminating the night-side disk of Venus with light from the much brighter dayside crescent. This necessitated the construction of an empirical PSF to remove this contamination and also to improve the dayside data by deconvolution, and this work is also discussed. Detailed astrometry is performed on star-field images in the H-band (1.65 um), hereby confirming that the geometrical distortion of IR2 images is negligible.

Summary of Achievement

[yaguchi-403-079-01:2017] W. Chen, Y. Yaguchi, K. Naruse, Y. Watanobe, and
K. Nakamura. QoS-aware Robotic Streaming Workflow Allocation in
Cloud Robotics Systems. *IEEE Transactions on Services Computing*,
PP(99):1–1, 2017.

Current solutions of computation offloading for cloud robotics face challenges:
1) traditional approaches do not consider the characteristics of networked cloud
robotics (NCR)(e.g., heterogeneity and robotic cooperation); 2) they fail to
capture the characteristics of tasks in a robotic streaming workflow (RSW)
(e.g., strict latency requirements and different task semantics); and 3) they do
not consider quality-of-service (QoS) issues for cloud robotics. In this paper, we
address these issues by proposing a QoS-aware RSW allocation algorithm for
NCR with joint optimization of latency, energy efficiency, and cost, while con-
sidering the characteristics of RSW and NCR. We first propose a novel frame-
work that combines robot individuals, robot clusters, and a remote cloud for
computation offloading. We then formulate the joint QoS optimization prob-
lem for RSW allocation in NCR while considering latency, energy consumption,
and operating cost, and show that the problem is NP-hard. Next, we construct
a data flow graph based on the characteristics of RSW and NCR, and trans-
form the RSW allocation problem into a mixed-integer linear programming
problem. To obtain an optimal solution in reasonable time, we also develop
a heuristic-based algorithm. Experiments demonstrate significant performance
gains, with improved QoS and reduced execution times.

[yoshiko-403-079-01:2017] T. Nakamura S. Tanaka H. Demura Y. Ogawa N.
Sakatani Y. Horikawa H. Senshu T. Fukuhara T. Okada Arai, T. Ther-
mal Imaging Performance of TIR Onboard the Hayabusa2 Spacecraft.
Space Science Reviews, 208:239–254, July 2017.

The thermal infrared imager (TIR) is a thermal infrared camera onboard the
Hayabusa2 spacecraft. TIR will perform thermography of a C-type asteroid,
162173 Ryugu (1999 JU3), and estimate its surface physical properties, through
remote in-situ observations in 2018 and 2019.

[yoshiko-403-079-02:2017] T. Fukuhara S. Tanaka M. Taguchi T. Imamura T. Arai
H. Senshu Y. Ogawa H. Demura K. Kitazato R. Nakamura T. Kouyama
T. Sekiguchi S. Hasegawa T. Matsunaga T. Wada J. Takita N. Sakatani
Y. Horikawa K. Endo J. Helbert T. G. Muller A. Hagermann Okada,
T. Thermal Infrared Imaging Experiments of C-Type Asteroid 162173
Ryugu on Hayabusa2. *Space Science Reviews*, 208:255–286, July 2017.

The thermal infrared imager TIR onboard Hayabusa2 has been developed to investigate thermo-physical properties of C-type, near-Earth asteroid 162173 Ryugu. TIR is one of the remote science instruments on Hayabusa2 designed to understand the nature of a volatile-rich solar system small body, but it also has significant mission objectives to provide information on surface physical properties and conditions for sampling site selection as well as the assessment of safe landing operations.

[yutaka-403-079-01:2017] W. Chen, Y. Yaguchi, K. Naruse, Y. Watanobe, and K. Nakamura. QoS-aware Robotic Streaming Workflow Allocation in Cloud Robotics Systems. *IEEE Transactions on Services Computing*, PP(99):1–1, 2017.

Current solutions of computation offloading for cloud robotics face challenges: 1) traditional approaches do not consider the characteristics of networked cloud robotics (NCR)(e.g., heterogeneity and robotic cooperation); 2) they fail to capture the characteristics of tasks in a robotic streaming workflow (RSW) (e.g., strict latency requirements and different task semantics); and 3) they do not consider quality-of-service (QoS) issues for cloud robotics. In this paper, we address these issues by proposing a QoS-aware RSW allocation algorithm for NCR with joint optimization of latency, energy efficiency, and cost, while considering the characteristics of RSW and NCR. We first propose a novel framework that combines robot individuals, robot clusters, and a remote cloud for computation offloading. We then formulate the joint QoS optimization problem for RSW allocation in NCR while considering latency, energy consumption, and operating cost, and show that the problem is NP-hard. Next, we construct a data flow graph based on the characteristics of RSW and NCR, and transform the RSW allocation problem into a mixed-integer linear programming problem. To obtain an optimal solution in reasonable time, we also develop a heuristic-based algorithm. Experiments demonstrate significant performance gains, with improved QoS and reduced execution times.

Refereed proceedings of an academic conference

[chonda-403-079-04:2017] T. Kouyama S. Kameda Y. Yokota S. Sakatani H. Suzuki M. Yamada H. Sawada R. Honda C. Honda T. Morota K. Ogawa M. Hayakawa K. Yoshioka N. Ogawa N. Tanabe H. Kamiyoshihara Y. Iijima ONC Team S. Sugita, E. Tatsumi. Pre-Arrival Scientific Cali-

bration of the Hayabusa2 Multi-Band Visible Camera. In *49th Lunar and Planetary Science Conference*, 2018.

Introduction: JAXAs Hayabusa2 is planned to bring back samples to Earth from one of the C-type asteroids, which are widely believed to contain water and organics, important ingredients for life. When the spacecraft arrives at the target asteroid Ryugu, it will start detailed observations on its surface for both understanding its geologic history and selecting sampling sites.

[chonda-403-079-05:2017] C. Honda M. Ohtake M. Hareyama, Y. Ishihara. Preliminary Unsupervised Classification of the Mercurys Surface Using Multiband Reflectance Data Obtained by MESSENGER/MDIS. In *49th Lunar and Planetary Science Conference*, 2018.

Introduction: The final goal of our study is to create a global geologic map of Mercury to approach Mercurian crustal evolution. For that purpose, we decide geological unit of Mercury's surface by using automatic classification methods for different physical quantities such as reflectance spectrum, element concentration, and elevation acquired by US Mercury Explorer MESSENGER.

[keita-n-403-079-04:2017] K.Hamatani, J.Ogawa, K.Nakamura, and K.Naruse. Distributed Localization by Camera Robots with Consensus Filter. In *Proceedings of SWARM2017: THE SECOND INTERNATIONAL SYMPOSIUM ON SWARM BEHAVIOR AND BIO-INSPIRED ROBOTICS*, 2017.

This paper proposes a new self-localization method based on Extended Kalman Consensus Filter (EKCF) using only angular informations observed by many standing robots each other that are not controlled and that are dispersed in an environment as a localization method using only local information around robots. In a localization method by Extended Kalman Filter (EKF), to localize more dozen robots is difficult because matrix calculation are difficult for a regular computer. Therefore, to solve this problem a consensus is introduced to the EKF. Each EKF localize some robots in each EKF group and take consensus with each other to localize as a whole. To verify this method the numerical experiments were carried out and the effectiveness is confirmed.

[keita-n-403-079-05:2017] H.Nakazawa, J.Ogawa, K.Nakamura, and Keitaro Naruse. Robot Sweep Path Planning with Weak Field Constrains under Large Motion Disturbance. In *Proceedings of SWARM2017: THE*

SECOND INTERNATIONAL SYMPOSIUM ON SWARM BEHAV-IOR AND BIO-INSPIRED ROBOTICS, 2017.

Our research group has developed robot for a rice field ("Aigamo robot"). The problem of Aigamo robot are motion is uncertainty by disturbance and robot damages to rice plants. Sweep path for Aigamo robot generates by separating sweeping field into square cells. The sweep path planning at traditional type that sweep all cells in sequence is difficult and taking too much time for Aigamo robot because robot motion is uncertainty. Aigamo robot cannot enter into the target cell, and robot sweep many times at same point when robot introduces it. Aigamo robot actually sweep every day. Aigamo robot can sweep upward another day when robot cannot sweep completely. Therefore, it is assumed that sweep rate of 80[%] is enough. We propse to reducing the number of visiting cells. The proposed method is realized that sweep rate is 80[%] or more and the damage to rice plants is smaller.

[keita-n-403-079-06:2017] F.Abe, K.Nakamura, Jun Ogawa, and Keitaro Naruse. Stable Pulling Out Strategy for Small Disaster Response Robot with Dual-arm. In *Proceedings of The Twenty-Third International Symposium on Artificial Life and Robotics 2018*, 2018.

Abstract: Many disaster response robots have been studied and developed to reduce the risk of secondary disaster. These robots are expected to improve efficiency and security. However, it is difficult for these robots to enter narrow spaces due to their size. Therefore, small disaster response robots are expected to remove debris. In this paper, we consider the task that a small disaster response robot pulls a bar whose length and mass are unknown stably out of a wall as debris removal. Pulling out motion involves a big problem that rotation center of the bar changes instantly and largely when it is left from a wall. Therefore, we propose stable pulling out motion to suppress rotation and translation. Experimental results show our proposal motion can stably pull out.

[keita-n-403-079-07:2017] I.Otani, Y.Yaguchi, K.Nakamura, and Keitaro Naruse. Quantitative Evaluation of Streaming Image Quality for The Robot Teleoperation. In *Proceedings of The Twenty-Third International Symposium on Artificial Life and Robotics 2018*, 2018.

Abstract: In this paper, we define a novel measure of streaming video quality for remotely operated robots. Controlling robots remotely is crucial for disaster response, and many attempts have been made to create such systems.

Summary of Achievement

Wireless communication, which is used in remote-control systems for unmanned vehicles, change dynamically and the streaming quality also changes to the quality of the network; however, wireless conditions are not typically measured in conventional robot systems. We are developing a quality measure for remote control using video proprieties such as delay and degrading of image quality as Quality of Control (QoC). In this paper, we introduce this QoC measure using delay and degrading of image quality curves in simulation environments, and we discuss the implications for robot system design.

[keita-n-403-079-08:2017] K.Nakamura, D.Kai, K.Mineta, Jun Ogawa, and Keitaro Naruse. Improvement for 3D Reconstruction Considering Passive Rotation by Towing Camera. In *Proceedings of The 1st International Conference on Digital Practice for Science, Technology, Education, and Management*, 2018.

Abstract: This study shows the improvement for three dimensional (3D) reconstruction using a towing camera system. This camera system collects the information inside the nuclear plant for reactor decommissioning. The camera obtains timeseries inside the nuclear plant by moving through a cable. It can move by pulling the cable. However, in this case, passive rotation affects the 3D reconstruction. In this study, in order to investigate effect of the passive rotation, the experiments are carried out for 3D reconstruction with actual camera at a mockup. In order to investigate influence of passive rotation, we consider three major factors for 3D reconstruction. These factors are motion of camera, angle of view and environmental background. We compare 3D reconstruction from time-series images in order to investigate how each factor affects 3D reconstruction. Experimental evaluation is the number of reconstructed points from time-series data. A square log is adopted as a target for 3D reconstruction in mockup. Experimental results show that there are few feature points in background when swinging camera. Additionally, we clarify that it is important that removing the image when swinging camera from the time-series data in order to improve 3D reconstructed result.

[keita-n-403-079-09:2017] J.Ogawa, M.Taira, K.Nakamura, and K.Naruse. Cellular Automaton Approach for Motion Pattern Analysis of Soft-bodied Agent. In *Proceedings of The 1st International Conference on Digital Practice for Science, Technology, Education, and Management*, 2018.

Soft-bodied agent (SBA) with ambiguous boundary between driving part and body such as gel robot is expected to give action that can not be realized by conventional robot composed of metal parts in the field of soft robotics.

There is a high degree of freedom in the arrangement of the drive system embedded in the soft body, however, there is no study to verify what kind of motion the agent is generated and how motional feature the agent is classified through these soft body. This paper discusses a motion pattern of soft-bodied agent by using one-dimensional cellular automaton through an elastic robot simulation by using voxel model. A one-dimensional cellular automaton (CA) is an approach that can classify temporal evolution of a state into four classes such as an ordered state and a chaotic state by using a discrete calculation model by a simple rule. We design an agent chemically bonded vibration motor and hard gel-like body in an virtual space and give an he volumetric vibration pattern of sine wave determined by CA into voxels as actuator in the body. As the result, we found that an ordered class gives the periodic and constant change of motion unless an external noise works the agent, and we discussed that chaos class is expressed as the improvement factor of motional robustness for SBA.

[nakamura-403-079-02:2017] Watanabe S. and Nakamura A. Integrated Data Access to Heterogeneous Data Stores for IoT Cloud. In Sieminski A. et al., editor, *Modern Approaches for Intelligent Information and Database Systems, Studies in Computational Intelligence Vol.769*. Springer, 2018.

Recently, Internet of Things (IoT) attract attention. The authors are developing a cloud platform for IoT applications. The IoT cloud needs to deal with various types of data and large data sets depending on applications and purpose of use. That is, the IoT cloud necessarily includes heterogeneous data stores in a mixed manner. For example, relational databases and NoSQL databases have different connection methods and query languages. This configuration complicates the system design and increases the development cost. This paper presents a configuration method of data access component (DAC) that absorbs the connection method and the query language differences among data stores. This allows us to develop IoT applications without worrying about data store differences and later replacements. In the implementation, we used specific DACs optimized for specific data stores and a multi-purpose DAC Apache MetaModel. With a large scale data set of more than one million records under most configurations, the response time for various kinds of queries are less than 1 second.

[yaguchi-403-079-02:2017] Y. Yaguchi, M. Omura, and T. Okumura. Geometrical mapping of diseases with calculated similarity measure. In *2017*

IEEE International Conference on Bioinformatics and Biomedicine, Workshop on BHI, pages 1131–1134, November 2017.

Disease similarity is a useful measure that has potential application to various aspects of medicine. One such application is the mapping of diseases in a two-dimensional plane, which can be the foundation of a useful diagnostic reminder method called the "pivot and cluster strategy." However, the mapping of diseases using a similarity measure has yet to be explored. This article investigates such a mapping, and quantifies its basic characteristics. We first collected mutual similarity data for 1,550 diseases using a machine learning approach. The calculated similarity data were then used to map the diseases using a "multidimensional scaling" algorithm. Quantitative analysis indicated that it is difficult to express all the diseases on the map and yet still show the similarity information between the items. Then, by restricting the input, the algorithm performed well in practice. To our knowledge, this is the first study to investigate the automated mapping of diseases on a plane for use in clinical practice.

[yaguchi-403-079-03:2017] Y. Yaguchi, K. Moriuchi, and K. Amma. Comparison of camera configuration for real-time drone route planning in 3D building maze. In *2017 IEEE 8th International Conference on Awareness Science and Technology (iCAST)*, pages 244–249, November 2017.

In this research, we investigate what camera settings are effective for an indoor automatic search system. We recommend installing RGB cameras with depth sensors like the Kinect and show how they should be installed to facilitate searches in indoor environments such as buildings with multiple floors. To validate camera configurations, the RTA* algorithm is used for automatic searching and we also measured how fast a drone could move to goal points in a simulation of a 3D-building model. We also studied various patterns of restart points because a drone has limited battery life, which restricts the available flight time. In the experiment, we allowed six batteries and each flight could last 600 seconds. This experiment showed that we should use three cameras positioned on the forward, upward, and backward of a drone to conduct a 3D building floor search because drones can easily rotate in the yaw direction, but cannot rotate in the pitch direction. We also showed that once the drone had returned to its start position for a battery replacement, it should restart from that point for effective searching.

[yaguchi-403-079-04:2017] Y. Yaguchi, Y. Nitta, S. Ishizaka, T. Tannai, T. Mamiya, K. Naruse, and S. Nakano. Formation control for different

maker drones from a game pad. In *2017 26th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)*, pages 1373–1378, September 2017.

> This paper describes a generalized software interface for formation flying by drones from different manufacturers. Conventional research into formation flight assumes that the drones all have the same power and functionality. However, consider a disaster response, where we might assemble a platoon of drones to sense the environment and to search for survivors by combining the different functions of drones provided by different manufacturers. The difficulties of controlling formation flight by such a variety of drones include both different mechanical specifications and different interfaces from the manufacturers for activating the same command. In this research, we construct a generalized interface for drones from each manufacturer using OpenRTM-aist. We can then assemble these drones and establish formation flight by using a virtual leader-follower system. The leader and the follower positions are calculated by using speed and rotation data from feedback information such as the GPS, velocity and rotation data from each individual machine. We also investigate good features of flight commands that can express the attributes of the representative motion of the drones. From our experiments, we show that we can establish formation flight using drones of different power and from multiple manufacturers.

[yaguchi-403-079-05:2017] I. Otani, Y. Yaguchi, K. Nakamura, and K. Naruse. Quantitative Evaluation of Streaming Image Quality for The Robot Teleoperation. In *2018 23rd International Symposium on Artificial Life and Robotics*, pages 230–235, January 2018.

> In this paper, we define a novel measure of streaming video quality for remotely operated robots. Controlling robots remotely is crucial for disaster response, and many attempts have been made to create such systems. Wireless communication, which is used in remote-control systems for unmanned vehicles, change dynamically and the streaming quality also changes to the quality of the network; however, wireless conditions are not typically measured in conventional robot systems. We are developing a quality measure for remote control using video proprieties such as delay and degrading of image quality as Quality of Control (QoC). In this paper, we introduce this QoC measure using delay and degrading of image quality curves in simulation environments, and we discuss the implications for robot system design.

[yaguchi-403-079-06:2017] R. Yamada, Y. Yaguchi, and M. Yoshida. Performances

of 3D mapping and odometry tools, and of a visualization system for analyzing accidents of unmanned aerial vehicles. In *2018 23rd International Symposium on Artificial Life and Robotics*, pages 389–394, January 2018.

Our target is to replace the accident conditions of the unmanned aerial vehicles (UAVs) using data obtained from the sensors and flight recorder loaded on the UAVs to analyze their causes. In this paper, we have first investigated the performances of three types of tools for 3D mapping and odometry to reproduce the surrounding environment and its orbit, and found that the tool using the LIDAR data are more accurate and can reproduce broader areas compared with methods that use monocular and stereo camera images. Second, we applied an optical flow method to images taken by a monocular camera rotating with 4 types of velocities, and found that imaging over 120 fps is required to analyze accurately the velocity field of the rotating and falling UAV. Finally, we have developed a visualization system that displays the reproduced situations of the UAV flights and accidents on a computer screen.

[yoshiko-403-079-03:2017] Ogawa Y. Hirata N. Demura H. Narusawa M. Hayashi Y. Kato, H. Application of Deep Learning for Automatic Detection of Lunar Swirls by Combining Data from Multi-Band Imager and DEM. In *49th Lunar and Planetary Science Conference*, page 1869, March 2018.

This study challenges automatic identification of lunar swirls by deep learning. We conducted evaluations.

[yoshiko-403-079-04:2017] Fukuhara T. Tanaka S. Taguchi M. Arai T. Senshu H. Sakatani N. Ogawa Y. Demura H. Kitazato K. Kouyama T. Sekiguchi T. Hasegawa S. Matsunaga T. Wada T. Imamura T. Takita J. Shimaki Y. Kyoda H. Aoki Y. Helbert J. Mueller T. G. Hagermann A. Okada, T. Thermal Infrared Imager TIR on Hayabusa2 and Its Preparation for Asteroid Proximity Phase Operations Around 162173 Ryugu. In *48th Lunar and Planetary Science Conference*, page 1403, March 2018.

Thermal infrared imager on Hayabusa2 is to investigate thermo-physical properties of 162173 Ryugu. Its in-flight performance and observation plan are presented.

[yutaka-403-079-02:2017] T. Yamashita and Y. Watanobe. Consensus Building

Algorithm with BFT for Permissioned Blockchain. In *World Congress 2018*, February 2018.

In the blockchain technology, distributed consensus building algorithms are employed so that multiple peers can keep the same states. Generally, the consensus building algorithm in the blockchain must have a feature of Byzantine Fault Tolerance (BFT) which guarantees proper operations even if some peers with Byzantine obstacles are involved in the ledger. Although, for permissioned blockchain, the consensus building algorithms can be applied to the blockchain with a basis of PBFT, another mechanism called OrderingService for constructing a block of transactions is required. Besides, algorithms with BFT which consider all phases from transactions provided by clients to storing data into the blockchain, have not been published. In this paper, a novel algorithm with strict BFT for the blockchain which has a basis of PBFT, is presented.

[yutaka-403-079-03:2017] C.M. Intisar and Y. Watanobe. Fuzzy Rule Mining by Clustering Approach to Estimate the Difficulty of Programming Problems. In *World Congress 2018*, February 2018.

Programming is one of the vital skill for the next generation. Currently there exists many online platforms where programmers compete and solves programming problem. Those platforms are composed of problems with varying degree of difficulty. For expert programmer the difficulty level is not a concern, but it is very important for novice programmers to approach programming problems based on their experience and level. Thus there rises a need for an expert system which can categorize the programming problems based on their difficulty. In our research we have proposed a knowledge based system which is implemented based on fuzzy rules derivation. These fuzzy rules have been derived from cluster analysis of programming problems. Later, inference system has been build based on these rules and knowledge to estimate the difficulty of the programming problems.

Unrefeered proceedings of an academic conference

[chonda-403-079-06:2017] M. Yamada S. Kameda H. Suzuki T. Kouyama R. Honda H. Sawada N. Ogawa K. Ogawa T. Morota C. Honda N. Sakatani M. Hayakawa Y. Yokota Y. Yamamoto S. Sugita N. Tanabe, E. Tatsumi. Multi-band image analysis of Itokawa and optical properties analysis of Hayabusa2/ONC-T. In *JpGU-AGU Joint Meeting 2017*, 2017.

Aerospace Exploration Agency, 8. Kobe Univ., 9. Nagoya Univ., 10. Univ. of Aizu Hayabusa2 is planned to bring samples from Ryugu back to the earth. Choosing sampling sites on Ryugu is very important. Sampling fresh materials not affected by space weathering very much is important for obtaining information on early evolution of the Solar System, because space weathering may overwrite record from the long past. In order to understand where on small asteroid we can find fresh materials, we analyzed the data taken by AMICA/Hayabusa. In addition, we analyzed optical characteristic, especially the point spread function (PSF), of the multi-band visible camera (ONC-T) of Hayabusa2 in order to carry out the same spectral analysis of space weathering.

[chonda-403-079-07:2017] H. Demura N. Hirata C. Honda S. Kamata Y. Karouji J. Kimura M. Morota H. Nagaoka R. Nakamura S. Yamamoto Y. Yokota M. Ohtake M. Hareyama, Y. Ishihara. Global classification map of lunar absorption spectra and new impression of lunar crust formation. In *JpGU-AGU Joint Meeting 2017*, 2017.

This report presents the global classification map of lunar absorption spectra by unsupervised classification methods and new impression of lunar crust formation based on the map.

[chonda-403-079-08:2017] C. Honda M. Ohtake SLIM MBC team K. Saiki, H. Shiraishi. Design and development of Multi-band Camera proposed for SLIM mission. In *JpGU-AGU Joint Meeting 2017*, 2017.

Smart Lander for Investigating Moon (SLIM) is being planned by Japan Aerospace Exploration Agency (JAXA). SLIM aims to research and demonstrate the engineering key issues related to the smart landing on the gravitational planets.

[chonda-403-079-09:2017] C. Honda Y. Yasuda. Improvement of the extraction method of lunar secondary crater using the Voronoi tessellation. In *JpGU-AGU Joint Meeting 2017*, 2017.

One of the estimation methods of formation age of planet surface is the crater chronology. Generally, craters are increasingly formed on the planet surface at random over time. From this perspective, the crater chronology utilizes the crater number density to estimate the formation age of planet surface. When we utilize the crater chronology, we should exclude secondary craters. Secondary craters are formed by ejecta thrown out from primary crater produced by the impact object from interplanetary space.

[chonda-403-079-10:2017] C. Honda T. Sato. Positive openness map for visual inspection of fault scarp associated with lunar wrinkle ridges. In *JpGU-AGU Joint Meeting 2017*, 2017.

> Wrinkle ridges are topographic features observed often in plains of the moon. Both edges of wrinkle ridge have scarps related to the fault slip in the subsurface. According to a hypothesis of the origin of wrinkle ridges (e.g., Suppe et al., 1983), the scarps are defined as fore-limb and back-limb, and the fore-limb which has abrupt slope compared with back-limb corresponds to a fault scarp. These fault scarps are formed by horizontal pressure related to tectonic deformation of subsurface of the moon. The spatial distribution and their scale of fault scarps with wrinkle ridges lead us to understand the evolution of the lunar subsurface.

[chonda-403-079-11:2017] C. Honda R. Ito, R. Nakamura. Automatic detection of lunar sub-km craters via deep learning. In *JpGU-AGU Joint Meeting 2017*, 2017.

> Crater chronology is a method that estimates generated age on surface of a body from size-frequency distribution (SFD) of impact craters. Coordinates and diameter are needed for computing SFD, and measurement accuracy of crater information is factored into the estimation accuracy of crater chronology. So, highly accurate crater information is important for discussing evolution process of the lunar surface.

[keita-n-403-079-10:2017] S.Kaminokado, Y.Oyama, K.Mineta, M.Yokokawa, T.Matsumoto, H.Nakazawa, F.Abe, T.Honda, K.Nakamura, and K.Naruse. Investigation of Observation Points Distribution Using GPS Modules for Weeding Robot. In *Proceedings of the 2017 JSME Conference on Robotics and Mechatronics*, 2017.

[keita-n-403-079-11:2017] W.Chen, Y.Yaguchi, K.Naruse, Y.Watanobe, and K.Nakamura. Latency-Aware Computation Offloading Algorithm for Cloud Robotics. In *Proceedings of the 2017 JSME Conference on Robotics and Mechatronics*, 2017.

[keita-n-403-079-12:2017] K.Hamatani, J.Ogawa, K.Nakamura, K.Naruse, N.Ogawa, and T.Kubota. Self-Localization Method for a Super Decentralized Camera Robots System Based on Consensus. In *Proceedings of the 2017 JSME Conference on Robotics and Mechatronics*, 2017.

[keita-n-403-079-13:2017] D.Yoshino, Y.Watanobe, Y.Yaguchi, K.Nakamura, and K.Naruse. Application possibility of OpenRTM-aist-based integrated robot systems using CORBA interfaces and brokered Pub/Sub messaging interfaces. In *Proceedings of the 2017 JSME Conference on Robotics and Mechatronics*, 2017.

[keita-n-403-079-14:2017] H.Nakazawa, J.Ogawa, K.Nakamura, and K.Naruse. The Proposal of Path Planning for Sweeping Robot with Movement Instability. In *Proceedings of the 2017 JSME Conference on Robotics and Mechatronics*, 2017.

[keita-n-403-079-15:2017] F.Abe, K.Nakamura, J.Ogawa, and K.Naruse. Gripping Point Suggestion of Target Object by Ellipse detection Using Hough Translate for Large Scale Remote Control Robot. In *Proceedings of the 2017 JSME Conference on Robotics and Mechatronics*, 2017.

[keita-n-403-079-16:2017] T.Matsumoto, Y.Oyama, J.Ogawa, K.Nakamura, and K.Naruse. Modeling of Generating Driving Force Mechanism for Rod Wheel Interacting with Particles in the Soil. In *Proceedings of the 2017 JSME Conference on Robotics and Mechatronics*, 2017.

[keita-n-403-079-17:2017] Y.Oyama, K.Nakamura, J.Ogawa, T.Matsumoto, and K.Naruse. Modeling of bulldozed soil volume by rod wheel considering interaction by soil particles. In *Proceedings of the 2017 JSME Conference on Robotics and Mechatronics*, 2017.

[keita-n-403-079-18:2017] F.Abe, K.Nakamura, J.Ogawa, and K.Naruse. Gripping Point Suggestion of Target Object by Image Processing for Large Scale Remote Control Robot. In *The 6th Workshop of Sustainable / Robotics System Design*, 2017.

[keita-n-403-079-19:2017] H.Nakazawa, J.Ogawa, K.Nakamura, and K.Naruse. The Proposal of Path Planning for Sweeping Robot considering Movement Error. In *The 6th Workshop of Sustainable / Robotics System Design*, 2017.

[keita-n-403-079-20:2017] T.Matsumoto, Y.Oyama, J.Ogawa, K.Nakamura, and K.Naruse. Modeling of Generating Driving Force Mechanism for Rod Wheel considering Interaction with the Soil. In *The 6th Workshop of Sustainable / Robotics System Design*, 2017.

[keita-n-403-079-21:2017] S.Kaminokado, F.Abe, J.Ogawa, K.Nakamura, and K.Naruse. Investigation of Position Accuracy using RTK-GNSS for Control of Weeding Robot. In *Proceedings of The Autum Conference on Precision Engineering*, 2017.

[keita-n-403-079-22:2017] M.Yokokawa, J.Ogawa, K.Nakamura, and K.Naruse. Three-Dimensional Attitude Estimation of Mobile Robot in Unsmooth Loose soil by Extended Kalman Filter and Inertial Sensor. In *Proceedings of The Autum Conference on Precision Engineering*, 2017.

[keita-n-403-079-23:2017] K.Nakamura, J.Ogawa, and K.Naruse. Behavior pattern labeling based on coaching in evolutionary robotics. In *Proceedings of The Autum Conference on Precision Engineering*, 2017.

[keita-n-403-079-24:2017] J.Ogawa, M.Taira, K.Nakamura, and K.Naruse. Crawler Robot Simulation by using Elastic Voxels. In *Proceedings of The Autum Conference on Precision Engineering*, 2017.

[keita-n-403-079-25:2017] H.Nakazawa, K.Nakamura, J.Ogawa, and K.Naruse. Path Planning Based on Probability Theory for Uncetain Robot's Movement. In *Proceedings of the 18th SICE System Integration Division Annual Conference*, 2017.

[keita-n-403-079-26:2017] F.Abe, K.Nakamura, J.Ogawa, and K.Naruse. Stable Pull Out Strategy Considering Instant Change of Rotation Center for Dual-arm Robot. In *Proceedings of the 18th SICE System Integration Division Annual Conference*, 2017.

Best presentation award

[keita-n-403-079-27:2017] D.Yoshino, Y.Watanobe, Y.Yaguchi, K.Nakamura, J.Ogawa, and K.Naruse. Publish/Subscribe Messaging Interface using Bridges among Message Brokers on RT Middleware. In *Proceedings of the 18th SICE System Integration Division Annual Conference*, 2017.

Best presentation award

[keita-n-403-079-28:2017] K.Naruse, K.Hamatani, K.Nakamura, J.Ogawa, N.Ogawa, and T.Kubota. Localization Using Extended Kalman Consensus Filer for a Super Distributed Camera Robot System. In *Proceedings of 61st Space Sciences and Technology Conference*, 2017.

[keita-n-403-079-29:2017] J.Ogawa, K.Nakamura, and K.Naruse. Biological expression by coupled oscillator system of fixed topology. In *Proceedings of the 18th SICE System Integration Division Annual Conference*, 2017.

[keita-n-403-079-30:2017] I.Otani, K.Nakamura, Y.Yaguchi, and K.Naruse. The relation between robot operability and video delay based on benchmark. In *Proceedings of the 48th JSME Tohoku chapter conference for graduation research*, 2018.

[keita-n-403-079-31:2017] S.Kaminokado, J.Ogawa, K.Nakamura, and K.Naruse. Simultaneous Measurement System of Position and Direction using Dual RTK-GNSS. In *Proceedings of The Spring Conference on Precision Engineering*, 2018.

[kitazato-403-079-04:2017] T. Inasawa, K. Kitazato, N. Hirata, and H. Demura. Cluster analysis of near-infrared reflectance spectra of asteroid Itokawa. In *American Astronomical Society, DPS meeting 49*, number 110.03. AAS, October 2017.

[kitazato-403-079-05:2017] K. Kitazato, N. Hirata, H. Demura, T. Inasawa, M. Abe, Y. Yamamoto, A. Miura, and J. Kawaguchi. Thermally induced rock breakdown on asteroid Itokawa. In *American Astronomical Society, DPS meeting 49*, number 204.10. AAS, October 2017.

[kitazato-403-079-06:2017] D. Takir, C. A. Hibbitts, L. Le Corre, J. P. Emery, K. Kitazato, S. Sugita, and Y. Nakauchi. Hayabusa2 NIRS3 Investigation to Characterize and Select Sampling and Landing Sites on Asteroid (25143) Ryugu. In *American Astronomical Society, DPS meeting 49*, number 219.07. AAS, October 2017.

[kitazato-403-079-07:2017] K. Kitazato, S. Nasu, T. Iwata, M. Abe, M. Ohtake, and Hayabusa2 NIRS3 Team. Near-Infrared Spectroscopy of Mars and Jupiter from the NIRS3 Instrument on Hayabusa2. In *48th Lunar and Planetary Science Conference*, number 1964, page 1508. LPI, March 2017.

[nakamura-403-079-03:2017] Sato Y., Fujii Y., and Nakamura A. Development of Health Care Applications using Personal Data Store. In *IPSJ SIG Technical Report, 2018-GN-104*, March 2018.

With the rapid advances in AI and IoT technologies, personal data became valuable resources to society and business. Vendor Relationship Management (VRM) is an activity which aims to provide customers with control of personal data and independence from vendors. A software tool called PDS (Personal Data Store) realizes VRM. Although VRM and PDS are factors that are important in personal data utilization, they have not become common. We are proceeding with the research of PDS technology by developing applications in the field of health care. The objectives are definitions of the functional requirements and the external interfaces of PDS. In this paper, we present user cases and applications which utilize health care data and PDS. We use an open source PDS, Personium, for implementation. The base system collects user's health care data via wearable devices and stores them in PDS. The applications assist user's effort to promote good health by visualization of health care data and automatic reminding. The prototype confirmed that PDS facilitates implementation of self-information control rights and data portability requirements demanded by VRM.

[nakamura-403-079-04:2017] Nochi T. and Nakamura A. Network Simulator for IoT. In *IPSJ 80th National Convention*, March 2018.

[nakamura-403-079-05:2017] Kokubun Y. and Nakamura A. Analysis of Malicious URLs on Social Networking Services and Protection. In *Society of Socio-Informatics (SSI) Annual Meeting*, September 2017.

Cyber attack is one of the most serious threats facing many organizations in the Internet era. In addition to hardening computer and network systems, it is important to surely deliver security information to end users. This paper presents the results of analysis on malicious messages and URLs sent on a social networking service; Twitter. We also present a method and system for safe-browsing of URL links. URLs, and sometimes shortened URLs, on SNS may be utilized for malicious activities to redirect users to unexpected resources, e.g. phishing and malware, by obscuring the final destinations. The analysis results show that about 20 percent of messages contain at least one URL, 0.1 percent of messages contain malicious URLs. The users sent such messages and messages themselves have short lifetime on Twitter. That is, they are removed soon after malicious activities; 99 percent of them are disappeared within one month. The proposed system enables users to know how safe a particular Web resource might be before users dereference it. Our system retrieves and delivers safety information of the URLs on user's demand by a simple operation.

[yaguchi-403-079-07:2017] D. Yoshino, Y. Watanobe, Y. Yaguchi, K. Nakamura, J. Ogawa, and K. Naruse. Proposal of MQTT and MQTT-SN Communication Interfaces on RT Middleware for IoR System Construction. In *The 18th Meeting of SICE System Integration Department, SI2018*, 2017.

[yaguchi-403-079-08:2017] Y. Yaguchi and K. Moriuchi. Real-time 3D Maze Searching by A Drone Using The Depth Cameras. In *2017 JSME Conference on Robotics and Mechatronics, ROBOMECH2017*, 2017.

[yaguchi-403-079-09:2017] D. Yoshino, Y. Watanobe, Y. Yaguchi, K. Nakamura, and K. Naruse. Application possibility of OpenRTM-aist-based integrated robot systems using CORBA interfaces and brokered Pub/Sub messaging interfaces. In *2017 JSME Conference on Robotics and Mechatronics, ROBOMECH2017*, 2017.

[yaguchi-403-079-10:2017] Y. Yaguchi, Y. Nitta, S. Ishizaka, T. Tannai, T. Mamiya, K. Naruse, and S. Nakano. RT Components for Formation Flight with The Hetero Manufacturer Drones. In *2017 JSME Conference on Robotics and Mechatronics, ROBOMECH2017*, 2017.

[yaguchi-403-079-11:2017] K. Amma, Y. Yaguchi, Y. Watanobe, and K. Naruse. Constructing Cloud base RTM and automatic deploy to Raspberry Pi. In *2017 JSME Conference on Robotics and Mechatronics, ROBOMECH2017*, 2017.

[yaguchi-403-079-12:2017] I. Otani and Y. Yaguchi. The Simple Robot Prototyping for RT-Midlleware of the FaBo.inc Sensors. In *2017 JSME Conference on Robotics and Mechatronics, ROBOMECH2017*, 2017.

[yaguchi-403-079-13:2017] M. Yoshida and Y. Yaguchi. 3D Environment Map Reconstruction with Aerial Camera on A Drone. In *2017 JSME Conference on Robotics and Mechatronics, ROBOMECH2017*, 2017.

[yoshiko-403-079-05:2017] Y. Ogawa Y. Hayashi N. Hirata H. Demura T. Matsunaga S. Yamamoto Y. Yokota M. Ohtake Iimura, S. Extension of the lunar Web-GIS GEKKO: Toward statistical analyses of the lunar spectral data. In *JpGU-AGU Joint Meeting 2017*, pages PPS08–P02, May 2017.

[yoshiko-403-079-06:2017] Y. Ogawa M. Ohtake Y. Hayashi N. Hirata H. Demura T. Matsunaga S. Yamamoto Matsubara, Y. Implementation of assortment algorithm for excluding noisy data in the lunar web-GIS: GEKKO. In *JpGU-AGU Joint Meeting 2017*, pages PPS08–P03, May 2017.

[yoshiko-403-079-07:2017] Y. Ogawa Y. Hisada H. Demura S. Miura T. Ozawa Abe, K. Crustal deformation around Azumayama volcano : InSAR analysis compared with GNSS data. In *JpGU-AGU Joint Meeting 2017*, pages STT57–07, May 2017.

[yoshiko-403-079-08:2017] Y. Ogawa H. Demura Nakamura, Y. Detection of phyllosilicates around ouflow channels in the northeast of the Hellas basin, Mars. In *JpGU-AGU Joint Meeting 2017*, pages PPS05–P05, May 2017.

[yoshiko-403-079-09:2017] Y. Ogawa H. Demura Oya, N. Distribution of phyllosilicates in relation with topographic features on Utopia Region, Mars. In *JpGU-AGU Joint Meeting 2017*, pages PPS05–P06, May 2017.

[yoshiko-403-079-10:2017] T. Dairaku K. Suko T. Takahashi H. Demura Y. Ogawa T. Arai T. Fukuhara T. Okada S. Tanaka Endo, K. HEAT: Image and database browser for the thermal imager on Hayabusa2. In *JpGU-AGU Joint Meeting 2017*, pages PPS02–P22, May 2017.

[yoshiko-403-079-11:2017] T. Fukuhara S. Tanaka M. Taguchi T. Arai H. Senshu Y. Ogawa H. Demura K. Kitazato R. Nakamura T. Kouyama T. Sekiguchi S. Hasegawa T. Matsunaga T. Wada T. Imamura J. Takita N. Sakatani Y. Horikawa K. Endo J. Helbert T. G. Mueller A. Hagermann Okada, T. Detectability Performance of Thermal Infrared Imager TIR on Hayabusa2. In *JpGU-AGU Joint Meeting 2017*, pages PPS02–P20, May 2017.

[yutaka-403-079-04:2017] D. Yoshino, Y. Watanobe, Y. Yaguchi, K. Nakamura, J. Ogawa, and K. Naruse. Proposal of MQTT and MQTT-SN Communication Interfaces on RT Middleware for IoR System Construction. In *The 18th Meeting of SICE System Integration Department, SI2018*, 2017.

[yutaka-403-079-05:2017] D. Yoshino, Y. Watanobe, Y. Yaguchi, K. Nakamura, and K. Naruse. Application possibility of OpenRTM-aist-based integrated robot systems using CORBA interfaces and brokered Pub/Sub

messaging interfaces. In *2017 JSME Conference on Robotics and Mechatronics, ROBOMECH2017*, 2017.

[yutaka-403-079-06:2017] K. Amma, Y. Yaguchi, Y. Watanobe, and K. Naruse. Constructing Cloud base RTM and automatic deploy to Raspberry Pi. In *2017 JSME Conference on Robotics and Mechatronics, ROBOMECH2017*, 2017.

Research grants from scientific research funds and public organizations

[ogawa-403-079-01:2017] J. Ogawa. Evolutionary Soft Robotics for Traveling Rough Terrain at Disaster Site, 2017–2019.

Academic society activities

[naru-403-079-10:2017] Chair of the committee for information system, The Japanese Society for Planetary Sciences

[naru-403-079-11:2017] A Member of the steering committee, The Japanese Society for Planetary Sciences

[ogawa-403-079-02:2017] J. Ogawa., 2017.

ROBOMECH2017 Organizing Committee Member, Industrial exhibition, Robotics and Mechatronics Division, The Japan Society of Mechanical Engineers, 2017

[ogawa-403-079-03:2017] J. Ogawa., 2017.

Committee menber, Sustainable Systems Design Conference, 2017

[ogawa-403-079-04:2017] J. Ogawa., 2017.

Committee menber, Technical Committee on Swarm Systems, The Society of Instrument and Control Engineers, 2017

[ogawa-403-079-05:2017] J. Ogawa., 2017.

Committee menber, RoboCon in Aizu 2017, 2017

[yoshiko-403-079-12:2017] Y. Ogawa, 2016.

> Member of Diversity Promotion Committee

[yoshiko-403-079-13:2017] Y. Ogawa, 2016.

> Member of Foreign Cooperation and Collaboration Technical Committee

[yoshiko-403-079-14:2017] Y. Ogawa, 2016.

> Member of Planning Committee

[yutaka-403-079-07:2017] Y. Watanobe, August 2017.

> Program Committee, The International Conference on Big data, IoT, and Cloud computing.

[yutaka-403-079-08:2017] Y. Watanobe, December 2017.

> Program Committee, The 9th International Conference on Computer Science and its Applications

[yutaka-403-079-09:2017] Y. Watanobe, December 2017.

> Organizing Committee Member, ACM-ICPC Asia Regional 2018 Tsukuba

Advisor for undergraduate research and graduate research

[kitazato-403-079-08:2017] Tomoki Inasawa. Master Thesis: Near-infrared reflectance spectral analysis of asteroid Itokawa based on re-estimating trajectory data of Hayabusa spacecraft, University of Aizu, 2018.

> Thesis Advisor: K. Kitazato

[kitazato-403-079-09:2017] Yasuhiro Takahashi. Graduation Thesis: Pseudo-fieldwork on asteroids using virtual reality, University of Aizu, 2018.

> Thesis Advisor: K. Kitazato

[kitazato-403-079-10:2017] Takefumi Onodera. Graduation Thesis: Investigation of doublet craters on the Moon using spatial statistics, University of Aizu, 2018.

> Thesis Advisor: K. Kitazato

[kitazato-403-079-11:2017] Ryuta Nozaki. Graduation Thesis: Search for doublet craters on Mare Moscovience of the Moon, University of Aizu, 2018.

Thesis Advisor: K. Kitazato

[kitazato-403-079-12:2017] Natsuko Mori. Graduation Thesis: Development of space educational VR content on Hayabusa touchdown operation, University of Aizu, 2018.

Thesis Advisor: K. Kitazato

[okudaira-403-079-01:2017] author = Tomoki Azuma. title = Track morphology estimation using improved image analysis method for JAXA TANPOPO mission, University of Aizu, 2018.

note = Thesis Advisor: K. Okudaira

[okudaira-403-079-02:2017] author = Takashi Sonoke. title = Screening candidates of unicellular organisms in microscopic images using machine learning, University of Aizu, 2018.

note = Thesis Advisor: K. Okudaira

[yaguchi-403-079-14:2017] Ikumi Otani. Graduation Thesis: Quantitative evaluation of streaming image quality for the robot teleoperation, University of Aizu, 2017.

Thesis Advisor: Y. Yaguchi

[yaguchi-403-079-15:2017] Kazutake Suzuki. Graduation Thesis: A Characters Select Recommendation System for League of Legends Beginners, University of Aizu, 2017.

Thesis Advisor: Y. Yaguchi

[yaguchi-403-079-16:2017] Masaki Sakuma. Graduation Thesis: Comparison of Cameras and Sensors for 3D Mapping by using mobile robot, University of Aizu, 2017.

Thesis Advisor: Y. Yaguchi

[yaguchi-403-079-17:2017] Pham Hung Cuong. Master Thesis: Sensor Fusion of 3D LiDAR and Fish-eye Camera for Landscape Mapping, University of Aizu, 2017.

Thesis Advisor: Y. Yaguchi

[yaguchi-403-079-18:2017] Yuta Oshima. Master Thesis: Generation of similar disease map based on disease similarity and sparse network, University of Aizu, 2017.

Thesis Advisor: Y. Yaguchi

[yaguchi-403-079-19:2017] Yukinori Inoue. Master Thesis: Collision Avoidance for Drone Fleets using Potential Method, University of Aizu, 2017.

Thesis Advisor: Y. Yaguchi

[yaguchi-403-079-20:2017] Takaaki Mamiya. Master Thesis: Data Fusion of LI-DAR and Stereo Camera for Real Time 3D Dense Mapping, University of Aizu, 2017.

Thesis Advisor: Y. Yaguchi

[yoshiko-403-079-15:2017] m5201113 Hiroaki Kato. Master Thesis: Application of Deep Learning for Automatic Detection of Lunar Swirls by Combining Data from Multi-Band Imager and DEM, University of Aizu, March 2018.

Thesis Advisor: Y. Ogawa

[yoshiko-403-079-16:2017] s1220031 Koji Sato. Graduation Thesis: Development of a GIS tool for viewing volcanic and tectonic data in Japan, University of Aizu, March 2018.

Thesis Advisor: Y. Ogawa

[yoshiko-403-079-17:2017] s1220015 Masaki Narusawa. Graduation Thesis: Evaluation of deep learning for identifying lunar swirls, University of Aizu, March 2018.

Thesis Advisor: Y. Ogawa

[yoshiko-403-079-18:2017] s1220163 Kazuya Matsumoto. Graduation Thesis: Seasonal change of water environment in Oze marsh indicated by ALOS/PALSAR data, University of Aizu, March 2018.

Thesis Advisor: Y. Ogawa

[yutaka-403-079-10:2017] Takumi Yamashita. Graduation Thesis: Consensus Building Algorithm with BFT for Permissioned Blockchain, University of Aizu, 2018.

Thesis Advisor: Y. Watanobe

Summary of Achievement

[yutaka-403-079-11:2017] Motohiko Abe. Graduation Thesis: Rose: New Byzantine Consensus on Hashgraph based Data Structure, University of Aizu, 2018.

Thesis Advisor: Y. Watanobe

[yutaka-403-079-12:2017] Keigo Ebihara. Graduation Thesis: Evaluation of Language Network System, University of Aizu, 2018.

Thesis Advisor: Y. Watanobe

[yutaka-403-079-13:2017] Yunosuke Teshima. Graduation Thesis: Bug Detection based on Deep Learning and Solution Source Codes, University of Aizu, 2018.

Thesis Advisor: Y. Watanobe

[yutaka-403-079-14:2017] Ryoya Komatsu. Graduation Thesis: Online Text Editor with Logical Error Correction, University of Aizu, 2018.

Thesis Advisor: Y. Watanobe

[yutaka-403-079-15:2017] Kazuya Watanabe. Master Thesis: Grading Algorithm using Difficulty Level Estimation of Problem Sets, University of Aizu, 2018.

Thesis Advisor: Y. Watanobe

Others

[ogawa-403-079-06:2017] J. Ogawa. Embodiment Intelligence of Evolving Soft Robot, 2017.

Invited Talk, SWEL lecture, Yamagata Univ.

[ogawa-403-079-07:2017] J. Ogawa. Motion Analysis Simulator for Soft robot, Nov. 2017.

Panel Exhibition, 2017 Fukushima Prefecture New Technology / New Construction Method Exhibition Business Talks (in Daihatsu)

[yoshiko-403-079-19:2017] Y. Ogawa. Reviewer of Grants-in-Aid for Scientific Research ¡KAKENHI¿ Research Activity Start-up, 2017.

[yoshiko-403-079-20:2017] Y. Ogawa. Member of satellite data analysis group in Coordinating Committee for Prediction of Volcanic Eruptions created by Japan Meteorological Agency, April 2017.

[yoshiko-403-079-21:2017] Y. Ogawa. Co-I of the Special Collaborative Research (B) funded by Earthquake Institute, the University of Tokyo, Research for crustal deformation by using synthetic aperture radar of new generation, PI: Taku Ozawa (NIED), 2017.

[yoshiko-403-079-22:2017] Y. Ogawa. Cooperation member of the MEXT project: Integrated project of developing the human resources for volcano researches in the Next generation: Development of the new observation technology, 2017.

[yoshiko-403-079-23:2017] Y. Ogawa. The 4th Oze academic research team member, 2017.

[yoshiko-403-079-24:2017] Y. Ogawa. JAXA/ISAS science team members.

[yoshiko-403-079-25:2017] Y. Ogawa. Hayabusa 2 project members.

[yoshiko-403-079-26:2017] Y. Ogawa. Part-time Lecturer at Shibaura Institute of Technology, 2017.

Applied physics: Thermodynamics

[yutaka-403-079-16:2017] Y. Watanobe, Feburary 2018.

Programming Challenge on New Aizu Online Judge

Contributions related to syllabus preparation

[chonda-403-079-12:2017] Computational geometry for visual computing 1 Course outline Computational geometry is one of important field of computer science to solve geometric problems. In recent, to solve geometric problem with large data and handle with high-speed processing is required for such as geographic information system (GIS), computational graphics (CG), computer-aided design (CAD), and pattern recognition, robotics, and others. In the class, students learn about computational geometric concepts in the first half section (Chap.1-7), and learn about information visualization on the premise of various concepts / algorithms in the latter part (Chap.8-14). ...

Summary of Achievement

[nakamura-403-079-06:2017] CSC01 Information Security

[nakamura-403-079-07:2017] L06 Information Security

[yaguchi-403-079-21:2017] A undergraduate school course syllabus constructed: [IT03] Digital Image Processing

[yaguchi-403-079-22:2017] A graduate school course syllabus constructed: [ITC05] Pattern Recognition and Machine Learning

[yaguchi-403-079-23:2017] A graduate school course syllabus constructed: [ITA06] Image Rcognition and Understanding

[yutaka-403-079-17:2017] A undergraduate school course syllabus constructed: [F01] Algorithms and Data Structures

[yutaka-403-079-18:2017] A undergraduate school course syllabus constructed: [IE03] Integrated Exercise for Software I

[yutaka-403-079-19:2017] A undergraduate school course syllabus constructed: [OT04] Courses for the Information Technology Examination

[yutaka-403-079-20:2017] A graduate school course syllabus constructed: [CSC11F] Advanced Data Structures and Algorithms

[yutaka-403-079-21:2017] A graduate school course syllabus constructed: [SEC04A] Programming Strategies and Software Development Tools

Preparation of course examination to measure comprehension

[yutaka-403-079-22:2017] Problem Setter for Entrance Exam Questions of Mathematics

Scholarly paper prepared by undergraduate/graduate student(s) you advised

[naru-403-079-12:2017] Wataru Ueno, Hirohide Demura, and Naru Hirata. HARMONICS: A Visualization Tool for Hayabusa and Hayabusa 2 Missions. *TRANSACTIONS OF THE JAPAN SOCIETY FOR AERONAUTICAL AND SPACE SCIENCES*, 60(3):132–136, 2017.

Contribution related to the selection of library or textbook materials

[chonda-403-079-13:2017] Library committee member

Contribution related to toward equipment management, classroom management, building management, and crime or fire prevention.

[yoshiko-403-079-27:2017] Fire prevention manager of 223B and 245

Advisor of a student club or circle

[yaguchi-403-079-24:2017] Circle Advisor: Pokemon Circle

[yaguchi-403-079-25:2017] Circle Advisor: Confort Utopian Orchestra

[yaguchi-403-079-26:2017] Circle Advisor: Soccer Circle

[yutaka-403-079-23:2017] Circle Advisor: Competitive Programming Club (ICPC), ACM-ICPC World Finals 2017, ACM-ICPC Asia Regional 2017 Tsukuba, ACM-ICPC Asia Regional 2017 Hualien, ACM-ICPC Asia Regional 2017 Daejeon, ACM-ICPC Asia Regional 2017 Ho Chi Minh

Contribution related to the building or operation of the university computer system

[nakamura-403-079-08:2017] ISTC Steering Committee, member

[naru-403-079-13:2017] ISTC steering committee

Contribution related to on-campus/off-campus publicity work

[yoshiko-403-079-28:2017] Exhibition of UoA at University Information Fair (Astrology and planetary science major), August 27, 2017 at Tokyo University of Science, Shinjuku-ku, Tokyo

Summary of Achievement

Contribution related to educational planning management

[yaguchi-403-079-27:2017] A member of Curriculum Working Group

Contribution related to planning administration for research, research conferences, or international research

[terazono-403-079-01:2017] Operation of CAIST Managing Office

[terazono-403-079-02:2017] Management of The 1st CAIST Symposium

[yoshiko-403-079-29:2017] LOC of 10th Practical training seminar on the data analysis in planetary missions at UoA, March 5-7, 2018

Contribution related to educational research technology and facility planning management

[nakamura-403-079-09:2017] Revitalization Center Steering Committee, member

Other significant contribution toward university planning, management, or administration

[terazono-403-079-03:2017] Management of CAIST

[yaguchi-403-079-28:2017] A member of PC Koshien

[yaguchi-403-079-29:2017] A member of entrance examination working group

[yoshiko-403-079-30:2017] Member of committee for Claim Management

[yoshiko-403-079-31:2017] Member of Harassment Prevention Committee

[yoshiko-403-079-32:2017] Member of committee for Harassment management

[yutaka-403-079-24:2017] A member of Judge for Programming Division of PC Koshien

[yutaka-403-079-25:2017] A member of entrance examination committee

Contributions related to regional education

[keita-n-403-079-32:2017] Instructor for RT middleware workshop in College of engineering, Nihon University (2017-09-29)

[keita-n-403-079-33:2017] Instructor for RT middleware workshop in University of Aizu (2017-12-14, 2017-12-15)

[keita-n-403-079-34:2017] Instructor for robot engineers in a training course by Fukushima Prefecture (2017-02-03, 2017-02-10, 2017-02-24, 2017-03-03)

[nakamura-403-079-10:2017] Cyber Security Trends, lecture at Fukushima Prefecture Police, April 2017

[nakamura-403-079-11:2017] Cyber Security Trends, lecture at Fukushima Prefecture Police School, September 2017

[yoshiko-403-079-33:2017] Committee member of Aizu-Wakamatsu city Disaster Control Council

[yoshiko-403-079-34:2017] On-campus lecture for Sukagawa municipal Nida junior high school students, 1st grade students + teachers, 53 attendees, May, 18, 2017

[yoshiko-403-079-35:2017] Open lecture for public at Aizu IT Aki Forum, October 20, 2017

[yoshiko-403-079-36:2017] Dispatched off-campus lectures at Shizuoka City high school, October 26, 2017, 2nd grade students, 40 attendee

[yoshiko-403-079-37:2017] Preparation for Exhibition of UoA at Fukushima Aerospace Fair, November 23, 2017 Fukushima City

[yutaka-403-079-26:2017] Special Lecture: Programming Education for Elementary Schools, Koriyama Central Public Hall, 2017, July

Proposal/implementation of a new industry

[nakamura-403-079-12:2017] Secure Cloud Computing, presentation and exhibition at Industry, Academia, Government, Finance, Collaboration Fair 2018 in Miyagi, January 2018

[yaguchi-403-079-30:2017] A vice chairman of the investigation and review meeting of wireless system related to grasp of flight position of small unmanned aerial vehicles, Tohoku Integrated Communication Bureau

Summary of Achievement

[yaguchi-403-079-31:2017] A member of the bid for UTM to be implemented in Fukushima Robot Test Field

Contribution toward education for employees of regional industries

[nakamura-403-079-13:2017] Cyber Security Seminar for Business Leaders, Aizu, November 2017 and Koriyama, December 2017

[nakamura-403-079-14:2017] Cyber Security Seminar and Drill for IT Professionals, Aizu, January 2018

[yaguchi-403-079-32:2017] A lecturer of the Fukushima Robot Software Study Meeting

[yutaka-403-079-27:2017] Lecture for RT Middleware in Minamisoma-City, Minamisoma, 2017, August

[yutaka-403-079-28:2017] Software for Robot, Koriyama, 2017, August

[yutaka-403-079-29:2017] Fukushima Human Resource Development Curriculum, Koriyama, 2018, Feburary

Other noteworthy contribution related to regional industries

[yaguchi-403-079-33:2017] A member of the Fukushima Prefecture Industry-Robot Technology Development Support Project

Did you participate in Public Lectures, and/or Open Campus? (Yes or No) If yes, please describe what you did.

[chonda-403-079-14:2017] Off-campus Lectures: 2 Off-Campus Public Lectures by Dispatched Faculty Members: 2 Open Campus (summer / autumn): both

[nakamura-403-079-15:2017] Information Security, open lecture, Aizu Keikodo, August 2017

[nakamura-403-079-16:2017] Building Secure Computing Environment, open labs, August 2017

[nakamura-403-079-17:2017] Building Secure Computing Environment, open labs, October 2017

[naru-403-079-14:2017] exhibition in Open Campus of the University of Aizu, 2017.8.11

[naru-403-079-15:2017] lecture in Aizu-Wakamatsu 5th Junior Highschool, Aizu-Wakamatsu, 2017.7.18

[naru-403-079-16:2017] lecture in Aizu-Wakamatsu 1st Junior Highschool, Aizu-Wakamatsu, 2017.10.6

[naru-403-079-17:2017] lecture in Kaneyama Village, Fukushima, 2017.8.4

[naru-403-079-18:2017] lecture in Aizu-Wakamatsu Kawahigashi Junior Highschool, Aizu-Wakamatsu, 2017.11.7

[naru-403-079-19:2017] exhibition in Open Campus of the University of Aizu, 2017.10.7-8

[okudaira-403-079-03:2017] note = Summer/Fall Open Lab, poster exhibition, TAN-POPO mission

[yoshiko-403-079-38:2017] Preparation of posters for open campus

[yutaka-403-079-30:2017] Trial Lesson of Programming, Gakuho High School, 2017, July

[yutaka-403-079-31:2017] Sports Programming and Online Judge System, Lecture for Computer Science Summer Camp, 2017, August

[yutaka-403-079-32:2017] Introduction to Programming, Kitakata High School, 2017, October

[yutaka-403-079-33:2017] Introduction to Programming, Yamagata Institute High School, 2017, November

[yutaka-403-079-34:2017]

[yutaka-403-079-35:2017]

[yutaka-403-079-36:2017]

Research achievement that can be used for University-Industry collaboration and its characteristics.(for UBIC's information)

Summary of Achievement

[yutaka-403-079-37:2017] Online Judge System (Aizu Online Judge): https://onlinejudge.u-aizu.ac.jp/

[yutaka-403-079-38:2017] Visual Programming Language and Environment (*AIDA): http://aida.u-aizu.ac.jp/

Do you have experience of University-Industry collaboration? If yes, please describe your experience. (for UBIC's information)

[yaguchi-403-079-34:2017] Commissioned research: UAV Security, East-Japan Accounting Center, co.

[yaguchi-403-079-35:2017] Commissioned research: Motion recognition of drive recorder on forklift, Toolmart, co.

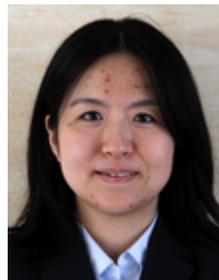# Information Systems and Technology Center

Office for Planning and Management

Kazuaki Yamauchi
Senior Associate Professor

Junya Terazono
Associate Professor

Kyoko Okudaira
Associate Professor

Yasuhiro Abe
Associate Professor

Office for Planning and Management (OPM), headed by the University President, was established at the start of the University of Aizu as an internal research organization to carry out implementing the following assignments of the University:

- General investigative research concerning university functions

- Performing general program planning and design regarding university education and research

- International exchange

- Public relations and publications

- Legal affairs

- Local arrangement of international conference

- Other necessary matters concerning administrative management

As the University develops, the expectations for the OPM have been changing from time to time. After the corporatization, in 2008, dealing with the matters of special mission given by the regents of the University was added to its functions. However, collaborating with other organizations of the University for the advancement of its education and research always remain the most important mission of the OPM.

For education and coaliation with high schools and junior high schools as well as local community, the OPM is planning and arranging "Science Cafe", a scientific

talk session with small number of general citizens (20 to 30 persons in most cases). Additionally, collaboration with several high schools, especially ones which have SSH (Super Science High School) course, has been carried out. These activities can be good opportunities for the University to increase the name recognition.

Kazuaki Yamauchi is assigned to serve as Director-General of Department for Student Affairs. His main work is to recruit prospective students by visiting high schools all over Japan and attending career counseling meetings for high school students held in major cities in Japan. In addition, he visits various IT related companies in Tokyo metropolitan area to solicit jobs for graduating students and also invite those companies to the campus for their recruitment. He is responsible for management of entrance examinations and admissions of the university. His current research theme is "Research on admission methods to secure the superior new students in accordance with university admission policy".

The main work of Kyoko Okudaira, concurrent assignment with CAIST, was personnel matters of fresh hiring and education collaboration with high schools and junior high schools.

Junya Terazono, concurrent assignment with CAIST, worked for Annual Review compilation. He was also busy for so many public lectures, events nationwide, media appearance and on-site lecture (Demae-Kogi) which will contribute spreading name of the University. He also engaged in CAIST-related management work, including setup of CAIST meetings, support of CAIST Manager and many kinds of minute yet essential management work including preparation of meeting minutes.

Yasuhiro Abe supports faculty and students to apply for external grants, especially international collaboration and research fellowship programs of the Japan Society for the Promotion of Science.

All members of OPM worked collaboratively and proactively for the realization of better University research and education.

Refereed proceedings of an academic conference

[terazono-405-071-01:2017] J. Terazono and S. Bhalla. WISE-CAPS 1 to 2: Evolution of System for Lunar Surface Exploration. In *BASE 2017 (3rd International Symposium on Big Data Analytics in Science and Engineering)*, November 2017.

This paper describes the evolution of the system of Lunar and Planetary Data browsing, analyzing, shareing system called as "WISE-CAPS" (Web-based Integrated Secure Environment for Collaborative Anaylsis of Planetary Science). The WISE-CAPS 2 inherits merits and advantage of older system, WISE-CAPS 1, with several system improvement such as system virtualization and fine tuning. This paper reports the outline of the new system and future prospective.

[terazono-405-071-02:2017] J. Terazono, S. Sakamoto, M. Yoshikawa, N. Wakabayashi, J. Watanabe, and The Moon Station operating team. Moon and Planets Exploration Outreach in IT Era - 20 years' Challenge in The Moon Station. In *Communicating Astronomy With Public 2018, Fukuoka*. International Astronomical Union (IAU), March 2018.

We operated the website called "The Moon Station" which introduces information on domestic and worldwide lunar and planetary exploration. This website welcomes 20 years' anniversary on November 2, 2018. We summarize here our history of web operation and management and address future direction of Internet-based publication of lunar and planetary exploration outreach.

[yamauchi-405-071-01:2017] Kazuaki YAMAUCHI Atsuko YAMAZAKI Sayoko ODA. An example of global skill assessment at an American engineering university. In *2017 JSEE Annual Conference*, 2017.

In the United States since the 1990s, global citizenship training has been advocated as an educational policy, and universities are also required to foster core competencies and skills related to their education. The Rose - Hulman Institute of Technology (RHIT) is known for its high average reputation for undergraduate education and graduates. In this paper, we also describe RHIT 's soft skill assessment and electronic portfolio, and also the engineering education practice that the University of Aizu has done in collaboration with RHIT.

Unrefeered proceedings of an academic conference

[terazono-405-071-03:2017] J. Terazono. Lesson Learned from the publication on the Internet. In *Annual Conference on The Japan Society for Astronautical and Space Sciences 2017*, August 2017.

This paper describes my 20 years' experience and lessons derived from this activity of the Internet-based public outreach in astronomy and lunar and planetary exploration area.

[terazono-405-071-04:2017] J. Terazono. Lunar and Planetary Exploration Outreach as a Business - For the Long-Term Growth -. In *The 61th Space Sciences and Technology Conference*, October 2017.

This paper shows my recent attempt of management of public outreach as a business. I show the current result of this attempt and show the future trends and current problems.

[terazono-405-071-05:2017] J. Terazono and J. Saito. The Situation Around Domestic and Worldwide Space Resources Exploration. In *The 61th Space Sciences and Technology Conference*, October 2017.

We continuously presented the latest situation of space resources exploration in this Conference as a "fixed-point observation". This is its newest version including advancement of lunar resources utilization. We also address current issues and problems to be solved for sustainable growth of this area.

[yamauchi-405-071-02:2017] Yasuhiro Abe and Kazuaki Yamauchi. International strategy of the University of Aizu. In *20th JAHER Annual Meeting*, 2017.

University of Aizu recruited outstanding researchers from all over the world. As a result, an unprecedented system was completed in Japan, in which the majority of faculty members are occupied by foreign faculty members in April 9, 1939. Even today in 2017, the proportion of foreign faculty members at Aizu University is very high, at less than 40 percent Of the 107 teachers, 39 foreign teachers account for about 40percent of the total (as of May 1, 2016). Country of origin is diverse, and from faculty of Russia, China, USA etc. from 16 countries are collecting teachers / researchers working on advanced research of computer science and engineering. English is used as an official language in campus. Computer science and engineering is a discipline in which many of the thesis and technical terms are transmitted in English, and English is indispensable to capture cutting edge technology trends. The University of Aizu was adopted solely as a project for strengthening the Ministry of Education, Culture, Sports, Science and Technology's International Strategy Headquarters, and based on it,

established the International Strategy Headquarters in 2005 and supports it to facilitate exchange with researchers from domestic and overseas . In 2014, it is adopted as the Ministry of Education, Culture, Sports, Science and Technology super globally university creation support (type B: global leadership type) and aims to produce innovative ICT talent active in the world by the 'heart, skill, body' trinity. We are also promoting a strategy to actively acquire international students from overseas by preparing all English courses triggered by being certified by Super Global University. In this thesis, we follow the transition of internationalization of the University of Aizu and discuss how to proceed internationalization in the future.

[yasu-abe-405-071-01:2017] Yasuhiro ABE and Kazuaki YAMAUCHI. International strategy of the University of Aizu. In *The 20th Japanese Association of Higher Education Research Annual Meeting*. The 20th JAHER Annual Meeting Committee, May 2017.

Academic society activities

[terazono-405-071-06:2017] Managing Committee member, Northern Japan Branch, The Japan Society for Astronautical and Space Sciences, 2017

[terazono-405-071-07:2017] Manager, Tohoku Branch, The Japan Society for Astronautical and Space Sciences, 2017

[yamauchi-405-071-03:2017] Kazuaki Yamauchi, 2017.

He was acting as a Vice Chair of IEEE PCSJ.

[yasu-abe-405-071-02:2017] Yasuhiro ABE, May 2017.

Committee Member of the 20th Japanese Association of Higher Education Research Annual Meeting.

Contributions related to syllabus preparation

[yasu-abe-405-071-03:2017] Following course planning, a syllabus becomes the Practical Approach to Learning the Enterprise Distributed Web Infrastructure

Contribution related to toward equipment management, classroom management, building management, and crime or fire prevention.

[yasu-abe-405-071-04:2017] Squad Chief of the research quadrangles in the disaster prevention team

Advisor of a student club or circle

[yamauchi-405-071-04:2017] Advisor of Table Tennis Club

[yasu-abe-405-071-05:2017] Advisor to the University Wind Orchestra

Contribution related to faculty personnel (outside scouting, etc.)

[okudaira-405-071-01:2017] note = Recruiting new faculty members

Contribution related to the building or operation of the university computer system

[terazono-405-071-08:2017] ISTC steering committee member

[terazono-405-071-09:2017] ISTC proculation specification document subcomittee member for computer system

[terazono-405-071-10:2017] ISTC proculation specification document subcomittee member for network system

Contribution related to on-campus/off-campus publicity work

[terazono-405-071-11:2017] Public Relations committee, Web sub-working-group member

[terazono-405-071-12:2017] Off-Campus Public Lecture: "Asteroid Impact on Earth: What We Can Do and What We Should Do", The first lecture on the Senior College, Haramachi Lifelong Learning Center, Minami-Soma, Fukushima, May 24, 2017

[terazono-405-071-13:2017] Off-Campus Lecture for High School Student: "Hot Year of the Lunar Exploration 2017!: The Future of The Moon Exploration", Hirosaki-Minami High School, Hirosaki, Aomori, May 25, 2017

Summary of Achievement

[terazono-405-071-14:2017] Public Event: "Yajiken and Terakin's Let's See the Total Eclipse!", Astronomy Pub 2017 June Stage, Mitaka Network University, Mitaka, Tokyo, June 17, 2017

[terazono-405-071-15:2017] Off-Campus Lecture for High School Student: "The Secrets Not to Be Cheated by Conspiracy Theories: Apollo Landing Hoax as The Example", Minami-Aizu High School, Minami-Aizu, Fukushima, July 7, 2017

[terazono-405-071-16:2017] Off-Campus School Lecture: "Apollo to Hayabusa: The Human Go the Beyond", ISTS Pre-Event (One-Day Onsite Lecture), Kita-Yoshii Elementary School, Toon City, Ehime, July 11, 2017

[terazono-405-071-17:2017] Off-Campus School Lecture: "Exploring the First Star of Evening: Venus and Akatsuki, the Venus Explorer", ISTS Pre-Event (One-Day Onsite Lecture), Mitsuhama Elementary School, Matsuyama City, Ehime, July 12, 2017

[terazono-405-071-18:2017] Off-Campus School Lecture: "The Moon and the Lunar Exploration: Hot Year of Lunar Exploration!", ISTS Pre-Event (One-Day Onsite Lecture), Kikuma Junior High School, Imabari City, Ehime, July 12, 2017

[terazono-405-071-19:2017] Off-Campus School Lecture: "The Day of Manned Landing on Mars: The Way to Mars is Already on the Track", ISTS Pre-Event (One-Day Onsite Lecture), Habu Elementary School, Matsuyama City, Ehime, July 13, 2017

[terazono-405-071-20:2017] Public Short Introductory Remarks: "The Fukushima Star and Space Exhibition", Fukushima Museum, Aizu-Wakamatsu, July 22 and 23, 2017

[terazono-405-071-21:2017] Off-Campus Public Lecture: "Hot Year of the Lunar Exploration 2017!: Now the Humankind Targets the Moon", The 5th Hayabusa Festival, Kakuda Space Tower (Cosmo-House), Kakuda City, Miyagi, September 10, 2017

[terazono-405-071-22:2017] Off-Campus Public Lecture: "Hot Year of the Lunar Exploration 2017!: Now the Humankind Targets the Moon", Starry Night Observation Event at "The Village of Madei", Kikori (Iitate Stay Experience Facility), Iitate Village, Fukushima, October 21, 2017

[terazono-405-071-23:2017] Public Lecture: "The Newest Information of Lunar Exploration: The Day The Japanese Stands on the Lunar Surface", Starry Night Observation Event at "The Village of Madei", Kikori (Iitate Stay Experience Facility), Iitate Village, Fukushima, October 21, 2017

[terazono-405-071-24:2017] Off-Campus Lecture for High School Student: "Enjoy Programming!: To Step One More Into Fun Computing", Sukagawa Toyo High School, Sukagawa, Fukushima, December 7, 2017

[terazono-405-071-25:2017] Off-Campus Public Lecture: "Hot Year of the Lunar Exploration 2017!: The Humans' New Challenge to The Moon", Cultural Lecture Night of Numata Kikyo Club, Dyran, Numata City, Gunma, February 7, 2018

[terazono-405-071-26:2017] Off-Campus School Lecture: "Hot Year of the Lunar Exploration 2018!: The Humans' New Challenge to The Moon", Tokyo Seitoku University Junior and Senior High School, Kita-ku, Tokyo, February 9, 2018

[terazono-405-071-27:2017] Public Event: "The Talk Show of The Moon: Take Me to the Moon!", TeNQ (Tokyo Dome Space Museum), Bunkyo-ku, Tokyo, February 18, 2018

[terazono-405-071-28:2017] Public Event: "After All, the Moon is the Best!: How Should We Move to The Manned Lunar Exploration?", Loft Plus-One West, Chuo-ku, Osaka, March 17, 2018

[terazono-405-071-29:2017] Off-Campus Public Lecture: "Back To The Moon 2018: The Humans' New Challenge to The Moon", Katsushika City Museum, Katsushika-ku, Tokyo, March 31, 2018

[terazono-405-071-30:2017] Supervision: The 12th Special Exhibition "Over the Sailor Moon: An Invitation to Space", TeNQ (Tokyo Dome Space Museum), Bunkyo-ku, Tokyo, December 15, 2017 to April 15, 2018

[terazono-405-071-31:2017] Book Publication: "The Tale of The Moon That Makes You Awaken Overnight", PHP Institute Paperback Series, January 5, 2018

Contribution related to planning administration for research, research conferences, or international research

[terazono-405-071-32:2017] Operation of CAIST Managing Office

[terazono-405-071-33:2017] Management of The 1st CAIST Symposium

Other significant contribution toward university planning, management, or administration

Summary of Achievement

[terazono-405-071-34:2017] Management of CAIST

[yasu-abe-405-071-06:2017] Member of the evaluation office

[yasu-abe-405-071-07:2017] Member of the committee for promotion of faculty development

Contributions related to regional education

[okudaira-405-071-02:2017] note = Advisor, Super Science High School, Aizu Gakuho Junior/Senior High School

Contribution toward education for employees of regional industries

[yasu-abe-405-071-08:2017] Seminar instructor organized by Fukushima Prefectural Police Department

[yasu-abe-405-071-09:2017] Delivery lecture for Cyber Security Attack Prevention Exercise Seminar

Other noteworthy contribution related to regional industries

[terazono-405-071-35:2017] Operation of LLC, Lunar and Planets

[yasu-abe-405-071-10:2017] Aizu Special School Councilor

Did you participate in students recruitment, support the alumni, and/or contact with student's parent? (Yes or No) If yes, please describe what you did.

[yamauchi-405-071-05:2017] Student recruitment activities in Malaysia and Singapore In December 2017, we began recruiting new students in Southeast Asia as part of the top global university project. Initially I participated in JASSO sponsored Japan Study Abroad Fair (International Education Exhibition: Malaysia) sponsored by JASSO from December 2 to 3, and carried out advanced school counseling. On December 10, I participated in a briefing session at a Japanese university in Singapore

(2017), held a presentation and advanced counseling. In addition, on December 11, we visited the high school of ISS International School and exchanged information with college adviser and introduced the university to students.

[yasu-abe-405-071-11:2017] Admission consultant in Open Campus 2017

[yasu-abe-405-071-12:2017] Admission consultant in University Festival 2017

[yasu-abe-405-071-13:2017] Yumenabi LIVE 2017 at Tokyo and Sendai

[yasu-abe-405-071-14:2017] Participated in briefing session for visitors from Ohtama Junior High School

[yasu-abe-405-071-15:2017] Participated in briefing session for visitors from Tokyo Gakkan Niigata High School

Did you participate in Faculty Development? (Yes or No) If yes, please describe what you did.

[yasu-abe-405-071-16:2017] Member of the committee for promotion of faculty development

Did you participate in Public Lectures, and/or Open Campus? (Yes or No) If yes, please describe what you did.

[terazono-405-071-36:2017] Live tweets of the Open Campus (Summer Stage)

[terazono-405-071-37:2017] Live tweets of the Open Campus (Autumn Stage)

[yasu-abe-405-071-17:2017] Delivery lecture for Koriyama Primary School Study Group, Information Education Division.

[yasu-abe-405-071-18:2017] Delivery lecture for Shirakawa Asahi High School.

[yasu-abe-405-071-19:2017] Delivery lecture for Oyama Nishi High School, Tochigi.

[yasu-abe-405-071-20:2017] Delivery lecture for Fukushima Technical High School

Research achievement that can be used for University-Industry collaboration and its characteristics.(for UBIC's information)

Summary of Achievement

[terazono-405-071-38:2017] Web-based publication, operation and management of Lunar and Planetary Outreach

Do you have experience of University-Industry collaboration? If yes, please describe your experience. (for UBIC's information)

[yasu-abe-405-071-21:2017] Working group member of automotive headunit security with Alpine Electronics, Inc.

[yasu-abe-405-071-22:2017] Support of Ideason and Hackathon sponsored by the Aizu General Holdings.

Student Affairs Division

University-Business Innovation Center

Shiro Ishibashi
Professor

Yasushi Fujii
Associate Professor

Masayoshi Namba
Associate Professor

Unrefereed academic journal

[shiro-i-408-077-01:2017] S. Ishibashi. Collaboration between local industry group and the University of Aizu. *Research on Regional Vitalization*, 2018.

Unrefeered proceedings of an academic conference

[shiro-i-408-077-02:2017] S. Ishibashi. Intellectual property management and industry-academia collaboration in the University of Aizu. In *Annual conference of Japan society for intellectual production*, 2017.

[shiro-i-408-077-03:2017] S. Ishibashi. Collaboration between local industry group and the University of Aizu. In *Annual conference of the Japan association of regional development and vitalization*, 2017.

[shiro-i-408-077-04:2017] S. Ishibashi. Intellectual property management and university-business cooperation in University of Aizu. In *Annual conference of intellectual property association of Japan*, 2017.

Contributions related to syllabus preparation

[shiro-i-408-077-05:2017] to make syllabus for Basic Knowledge Course on Starting Up Ventures I and II

[shiro-i-408-077-06:2017] to make syllabus for Factories for Experiencing Starting Up Ventures 7 (Data Analytics)

[shiro-i-408-077-07:2017] to make syllabus for Student Cooperative Class Project 5 (Data Science)

Contribution related to the selection of library or textbook materials

[shiro-i-408-077-08:2017] Member of library committee

Contribution related to the building or operation of the university computer system

Summary of Achievement

[shiro-i-408-077-09:2017] Member of information systems and technology center committee

Did you participate in Public Lectures, and/or Open Campus? (Yes or No) If yes, please describe what you did.

[shiro-i-408-077-10:2017] Planning and execution of open seminar (Data science)

Research achievement that can be used for University-Industry collaboration and its characteristics.(for UBIC's information)

[namba-408-077-01:2017] Consultations with industries or local gov't, for the matching of technology(seeds) and needs.

[namba-408-077-02:2017] Support for the extry of compepitive and outer funds.

[namba-408-077-03:2017] Attendance at university-industry collaboration meetings.

Do you have experience of University-Industry collaboration? If yes, please describe your experience. (for UBIC's information)

[shiro-i-408-077-11:2017] Consultation with industries for seeds and needs matching

[shiro-i-408-077-12:2017] Support for acquisition of compepitive funds

[shiro-i-408-077-13:2017] Attendance at university-industry collaboration meetings

[shiro-i-408-077-14:2017] Attendance at various technology exhibitions and fairs

Revitalization Center

Makoto Yashiro
Professor

Hiroyuki Saito
Senior Associate Professor

Keita Nakamura
Associate Professor

Jun Ogawa
Associate Professor

Summary of Achievement

Refereed academic journal

[ogawa-409-078-01:2017] T. Matsumoto., Y. Oyama., J Ogawa., K. Nakamura., and K. Naruse. Mechanism of generating drawbar pull of rod wheel on loose soil. *Artificial Life and Robotics*, 22(4):503–508, Dec. 2017.

In this paper, we propose a model of drawbar pull generated by wheels fitted with a rod and assess it by comparing measured values obtained from an experiment with those from the model. In recent years, many kinds of robots for weeding in paddy fields have been developed. However, almost all of these are large and heavy. We have previously developed a small, lightweight robot for weeding. This robot is equipped with a rod wheel that has roles of weeding and running. However, this wheel was developed by experience from demonstrations and its dynamics for control remain unknown. To solve this problem, we propose a new model for drawbar pull generated by rod wheels and evaluate it by comparing experimental values with those from the model.

Refereed proceedings of an academic conference

[keita-n-409-078-01:2017] K.Nakamura and T.Fujisawa. Music recommendation system using lyric network. In *Proceedings of 2017 IEEE 6th Global Conference on Consumer Electronics*, 2017.

This paper proposes the method to recommend music using lyric network. This method corresponding to more than thousands of musics. The authors focus each lyric of the music. Keywords representing music are extracted from its lyric by combining TF-IDF method and principle of discriminant analysis. Lyric network is generated based on extracted keywords. The connection of generated network can recommend other musics. Numerical experiment is carried out in order to analyze the lyric network constructed by the proposed method and investigate the effect on music recommendation. Experimental result shows the extraction for collection of musics whose lyrics are similar.

[ogawa-409-078-02:2017] J. Ogawa., M. Taira., K. Nakamura., and K. Naruse. Cellular Automaton Approach for Motion Pattern Analysis of Soft-bodied Agent. In *Proceedings of The 1st International Conference on Digital Practice for Science, Technology, Education, and Management*, Mar. 2018.

Soft-bodied agent (SBA) with ambiguous boundary between driving part and

body such as gel robot is expected to give action that can not be realized by conventional robot composed of metal parts in the field of soft robotics. There is a high degree of freedom in the arrangement of the drive system embedded in the soft body, however, there is no study to verify what kind of motion the agent is generated and how motional feature the agent is classified through these soft body. This paper discusses a motion pattern of soft-bodied agent by using one-dimensional cellular automaton through an elastic robot simulation by using voxel model. A one-dimensional cellular automaton (CA) is an approach that can classify temporal evolution of a state into four classes such as an ordered state and a chaotic state by using a discrete calculation model by a simple rule. We design an agent chemically bonded vibration motor and hard gel-like body in an virtual space and give an The volumetric vibration pattern of sine wave determined by CA into voxels as actuator in the body. As the result, we indicate that an ordered class and a chaos class give the chaotic behavior to the agent without an external noise, and we discuss that the chaos behavior

[ogawa-409-078-03:2017] K. Nakamura., D. Kai., K. Mineta., J. Ogawa., and K. Naruse. Improvement for 3D Reconstruction Considering Passive Rotation by Towing Camera. In *Proceedings of The 1st International Conference on Digital Practice for Science, Technology, Education, and Management*, Mar. 2018.

[ogawa-409-078-04:2017] F. Abe., J. Ogawa., K. Nakamura., and K. Naruse. Stable Pulling Out Strategy for Small Disaster Response Robot with Dual-arm. In *Proceedings of the 23rd International Symposium on Artificial Life and Robotics*, Jan. 2018.

[ogawa-409-078-05:2017] H. Nakazawa., J. Ogawa., K. Nakamura., and K. Naruse. Robot Sweep Path Planning with Weak Field Constrains under Large Motion Disturbance. In *Proceedings of the SWARM 2017*, 2017.

[ogawa-409-078-06:2017] K. Naruse., K. Hamatani., J. Ogawa., and K. Nakamura. Distributed Localization by Camera Robots with Consensus Filter. In *Proceedings of the SWARM 2017*, 2017.

Unrefeered proceedings of an academic conference

[ogawa-409-078-07:2017] S. Kaminokado., J. Ogawa., K. Nakamura., and

K. Naruse. Simultaneous measurement system of position and orientation using Dual RTK-GNSS. In *The Spring Conference on Precision Engineering 2018*, 2018.

[ogawa-409-078-08:2017] D. Yoshino., Y. Watanobe., Y. Yaguchi., K. Nakamura., J. Ogawa., and K. Naruse. Proposal of Pub / Sub message communication interface using RT-Middleware bridge between Message Brokers. In *SICE SI 2017*, 2017.

[ogawa-409-078-09:2017] H. Nakazawa., Jun Ogawa., K. Nakamura., and K. Naruse. Probabilistic re-route planning for robots whose movement by environment is uncertain. In *SICE SI 2017*, 2017.

[ogawa-409-078-10:2017] F. Abe., J. Ogawa., K. Nakamura., and K. Naruse. A drawing strategy considering sudden rotation center change for a dual arm robot. In *SICE SI 2017*, 2017.

[ogawa-409-078-11:2017] J. Ogawa., K. Nakamura, and K. Naruse. Biological expression by coupled oscillator system of fixed topology. In *SICE SI 2017*, 2017.

[ogawa-409-078-12:2017] J. Ogawa., M. Taira., K. Nakamura., and K. Naruse. Crawler Robot Simulation by using Elastic Voxels. In *The Autumn Conference on Precision Engineering 2017*, Sep. 2017.

[ogawa-409-078-13:2017] F. Abe., K. Nakamura., J. Ogawa., and K. Naruse. Gripping Point Suggestion of Target Object by Ellipse detection Using Hough Translatefor Large Scale Remote Control Robot. In *2017 JSME Conference on Robotics and Mechatronics*, May. 2017.

[ogawa-409-078-14:2017] T. Matsumoto., Y. Ooyama., J. Ogawa., K. Nakamura., and K. Naruse. Modeling of Generating Driving Force Mechanism for Rod WheelInteracting with Particles in the Soil. In *2017 JSME Conference on Robotics and Mechatronics*, May. 2017.

[ogawa-409-078-15:2017] H. Nakazawa., Jun Ogawa., K. Nakamura., and K. Naruse. The Proposal of Path Planning for Sweeping Robot with Movement Instability. In *2017 JSME Conference on Robotics and Mechatronics*, 2017.

[ogawa-409-078-16:2017] Y. Ooyama., T. Matsumoto., K. Nakamura., J. Ogawa., and K. Naruse. Modeling of bulldozed soil volume by rod wheel considering interaction by soil particles. In *2017 JSME Conference on Robotics and Mechatronics*, May. 2017.

Academic society activities

[keita-n-409-078-02:2017] K.Nakamura, 2017.

Japan Society for Precision Engineering (JSPE) Affiliate

[keita-n-409-078-03:2017] K.Nakamura, 2017.

Member of public relations & information committee in Japan Society for Precision Engineering (JSPE)

[keita-n-409-078-04:2017] K.Nakamura, 2017.

Homepage & Public relations, ROBOMECH2017 Organizing Committee

Others

[keita-n-409-078-05:2017] K.Nakamura. Introduction of traveling salesman problem and its extended problem, 2017.
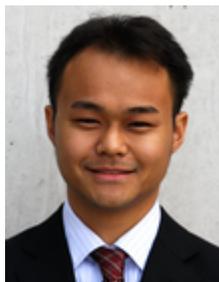
Invited talk at The 6th Workshop of Sustainable / Robotics System Design

Center for Globalization

Jian Chen
Senior Associate Professor

Tatsuki Kawaguchi
Associate Professor

Wang Junbo
Associate Professor

Yuji Mitsunaga
Associate Professor

There are 4 main task for SGU office, which are Honors program, ICTG program, internship program and governance. In the last year, we have finished the regulations related to Honors program, added new admission requirements for ICTG program, established 2 new hubs in China for internship program, and planned to visit 1 or 2 similar university selected by SGU project. We also met the mid-term evaluation of MEXT, and received 3 pointed points. The details will be described as follows.

About the mid-term evaluation of SGU project, we received 3 pointed points which are 1) improving the English level of students, 2) providing the opportunities or building the environments which can make the Japanese students communicate with international students in regular course. 3) third-party certification for curriculum. In order to improve and solve the pointed points, we have put forward some proposals in collaboration with relevant departments in university, and the proposals are realized or in process. Among the 3 pointed points, the first one is a not easy job, we need to consider the other way, for example, improve the English score in admission requirement.

About the Honors program, it consists of 2 types, which are 1) Integrated Undergraduate-Master's Program and 2) Unique Talent Discovery Program. Now, the Honors program has started to receive the application of students. For Honors program, the problem is Honors year, students cannot apply scholarship in this period. If we can set this period as an internship period, the problem of scholarship can be avoided.

About the ICTG program, a new admission requirements - A-level of Cambridge are added. Besides SAT, ACT, IB, HKDSE and Gaokao of China, our recruiting targets can cover the main education system in the world. As we known, the special selection of China is given up. Therefore, we have to meet the problem

of 2019 admissions. Because the number ICTG students come from China is more than 30 persent. In order to keep the number of ICTG students, we plan to do a STEM camp, and invite high school students to visit our university. We hope this event can help the high school students to understand our university deeply. In the other hand, we also plan to improve the 2+2 program.

About the internship program, we established 2 new hubs, which are in Shenzhen, China and Dalian China. Based on the 2 hubs, we are going to create more than 4 new internship programs, in order to provide more opportunities of internship to the students. Now, related SOVO in Dalian, there are 3 internship programs are in preparing, and 1 internship program related to Shenzhen is started to preparing.

About the governance, we planned to visit some universities of selected by SGU project, and improve the future works by learning the experiences and exchange opinions.

Summary of Achievement

Refereed academic journal

[j-wang-410-080-01:2017] J. Wang; S. Guo; Z. Cheng; P. Li; J. Wu. Optimization of Deployable Base Stations With Guaranteed QoE in Disaster Scenarios. *Optimization of Deployable-Base-Stations with Guaranteed QoE in Disaster Scenarios*, 66(7):6536 – 6552, July 2017.

Reconstructing emergency communication networks (ECNs) quickly after a disaster occurs is critical so that people can share information and confirm their safety. In recent studies, deployable base stations (DBSs) have demonstrated their ability to reconstruct an ECN. However, considering limited resources, it is impossible to deploy DBSs in the whole disaster area. The above shortage can be covered by deploying small-cell networks (i.e., low-power transmission base stations) in areas with high communication demand, e.g., in refuges. Considering the above two-tier ECN, in this paper, we study its performance and optimization issue with the objective of minimizing the number/density of DBSs while guaranteeing acceptable coverage probabilities for both communication tiers. The majority of current research focuses on scenarios where the base stations follow a homogeneous Poisson point process of coverage probability. It is difficult to transfer the results to other applications, e.g., when communication resources are shared, such as by refugees following a disaster. In such cases, the distribution of users is closer to that of a Poisson cluster process. We then investigate the optimization method to minimize the number/density of DBSs. We used Monte Carlo methods with various parameter choices to evaluate the results and to determine the accuracy of our evaluation.

[j-wang-410-080-02:2017] J. Wang and Z. Cheng. Optimal Deployment and Traffic Flows in Mobile Mesh Network after a Disaster. *International Journal of Ad Hoc and Ubiquitous Computing*, 25(1-2):97–108, January 2017.

It is a critical research problem to quickly reconstruct a communication system after a disaster. One resolution is to deploy mobile mesh routers MMR in the disaster area to guarantee the connection of users. However, it is still a challenge to find an optimal deployment of MMRs to maximally satisfy users while ensuring a fluent and reliable communication network. In this paper, we focus on the above problems and propose a communication-demand-oriented deployment method CDODM and a global-data-traffic routing optimisation method GTFROM for a disaster. Our main contributions are 1 formalisation and optimisation of computation transmission cost in CDODM and 2 formalisation and optimisation traffic flows in GTFROM. Through the evaluation in NS3, user

satisfaction calculated based on recorded throughput in NS3 can be enhanced clearly in the proposed solutions. In scalability study, the proposed methods works well, with changing range of disaster areas, number of MMRs and communication demands.

[j-wang-410-080-03:2017] Yilang Wu; Junbo Wang; and Zixue Cheng. Activity awareness for development support based on seamless repository. *International Journal of Machine Learning and Cybernetics*, pages 1–16, July 2017.

As project development gets more intensive, there are increasing needs of development support by reusing shared knowledge objects, such as technical know-how and project achievements, which grow along with developers' activities through multiple support systems. However, there is a large gap of knowledge in providing such development support, because of developers' divergent background knowledge, as well as distinct personal preferences in using different support systems. To bridge the knowledge gap, the major challenge is to improve the information coverage in correlating the knowledge from different support systems. This challenge derives two issues: one is the development data analytics to have a deep insight to the correlations among the knowledge objects that are developing and growing; and the other is the development system integration to utilize knowledge objects that are stored in different support systems. For development data analytics, we propose the development activity awareness using the terms-frequency and chained links-ratio (TFCLR) to measure the integrated contextual and relational correlation among knowledge objects. For development system integration, we implement the seamless repository as an integrated development environment. We experiment with the activity awareness for development support on the ICT field with English conducted as medium of development. The seamless repository integrates multiple support systems to cover more knowledge objects. And in comparison with other mentioned knowledge correlation measures, the one using TFCLR covers the most detailed information in knowledge objects. The quantified and visualized knowledge correlation produced by this study is a useful tool to bridge the knowledge gap in development.

Refereed proceedings of an academic conference

[j-wang-410-080-04:2017] Yilang Wu; Krishna Kant; Shanshan Zhang; Amitang-

shu Pal; and Junbo Wang. Disaster Network Evolution Using Dynamic Clustering of Twitter Data. pages 5–8, 2017.

Ad hoc smartphone networks can be used to augment communications degraded by disasters provided that the individual ad hoc clusters can reach some

[j-wang-410-080-05:2017] Y. Wang; M. C. Meyer; J. Wang; and X. Jia. Delay Minimization for Spatial Data Processing in Wireless Networked Disaster Areas. In *2017 IEEE Global Communications Conference GLOBECOM*. IEEE, 2017.

Spatial big data analytics has become possible with the data collected from the sensors in smart phones, which can support decision-making in disaster scenarios. However, sometimes the regular communication infrastructure can be destroyed after disasters. Movable base stations (MBS), as studied by the company NTT, offer an easily deployable solution to construct an emergency communication network, but are not suitable for transmitting big data from sensing devices to the cloud for data processing in the cloud. To solve this issue, we studied a novel algorithm to process spatial big data efficiently in a wirelessly networked disaster area that uses multiple MBSs. More specifically, we proposed a novel algorithm to minimize overall delay for spatial data processing in wirelessly-networked disaster areas (SDP-WNDA), to enable quick responses to data analysis. Our proposed model and genetic algorithm solution showed to have a reduced maximum end- to-end (E2E) delay over various network sizes, when compared to some conventional solutions. For the realistic constraints, the cloud solution was the best conventional method, followed by the system which used the fog nodes to process as much data as possible, but the genetic algorithm (GA) had a slight advantage over all other methods. However, as the computation rate, uk, was increased, the maximum processing algorithm got much stronger. Also, as the communication capacity, R, was increased, the cloud computing solution was more successful. The fact that none of the conventional cases matched the capabilities of the GA for increased computation or increased transmission rates suggests the need for this to be investigated even further.

[j-wang-410-080-06:2017] Koichi Sato; Junbo Wang; and Zixue Cheng. Design of a method to support Twitter based event detection with heterogeneous data resources. In *2017 IEEE 8th International Conference on Awareness Science and Technology (iCAST)*. IEEE, 2017.

There is a high demand for observation of events of public concern in a real time manner by analyzing Big Data. Twitter is a suitable data resource for

event detection due to amount of data/users in the Twitter system, and high frequency of data generation. The possibility of event detection by tweets has been proved by a lot of researches. However it still has the following two problems. The first problem is the reliability of information, since tweets are always very noisy and fake information appears in them. The second problem is the lack of enough information for each tweet. It is because a tweet is restricted to 140 letters, so that it can not describe much information. One possible solution is to retrieve additional information, which is related to a Twitter based event detection result, from heterogeneous data resources such as articles, Web Pages, blog posts etc. If the information is retrieved, it can be used to validate the detection result and also provide as further information to enhance the detection result. However properly retrieving related contents from heterogeneous data resources is not easy because of different types of data. To solve the above problem, we propose a method to retrieve additional information related to a set of tweets, which is detected as an event, from heterogeneous data resources by measuring similarity (distance) between them with Normalized Compression Distance. We mainly consider articles in the web as the additional information for Twitter based event detection, since they are well validated and edited. We evaluate the proposed method in experiments, and the results show that it has high anti-noise capability and performs well in practical situation.

[j-wang-410-080-07:2017] Michael Conrad Meyer; Yu Wang; and Junbo Wang. Cost Minimization of Data Flow in Wirelessly Networked Disaster Areas. In *2018 IEEE International Conference on Communications (ICC)*. IEEE, 2018.

Big data analytics has started to use data collected from the sensors in smartphones. This data may be used by disaster response teams for locating problems. But the regular communication infrastructure can be destroyed after disasters. Movable base stations (MBS), as studied by the company NTT, offer an easily deployable solution to construct an emergency communication network (ECN), but are not suitable for transmitting big data from sensing devices to the cloud for data processing in the cloud. To address this issue, MBSs have been equipped with processing capabilities of their own, which creates an MBS-based Fog-computing Network. We proposed a novel algorithm to minimize the overall cost of the system while maintaining 0 data overflow. This will allow the resources to be used at the most efficient level. Our genetic algorithm solution had a reduced system cost over various network sizes when compared to some conventional solutions. During the simulation, it was clear that the best

conventional method for preventing data overflow was the fog-based solution, but its cost was quite high. The cloud-based solution had the lowest cost but would lead to a large amount of data overflow, which would need to be cached. The GA-based solution maintained the ideal solution throughout the variation of all bandwidth parameters: the processing rate, the data compression ratio, and the cost coefficient ratio. Because none of the conventional solutions were able to match the capabilities of the GA for the current constraints, we believe that this should be investigated further with a faster algorithm.

Unrefeered proceedings of an academic conference

[kawaguch-410-080-01:2017] T. Kawaguchi. Developing the University Faculty and Staff Members' Competences and Skills for Globalization, Especially Those Who Deals with International Education and Exchanges. In *In proceedings of 15th Annual Conference, Japan Academy of Human Resource Development*, pages 13–14. Japan Academy of Human Resource Development, 2017.

[kawaguch-410-080-02:2017] T. Kawaguchi. and S. Tei. Long-term Service Learning for the Local Community Engagement in Japan. In *In proceedings of the 5th University-Community Engagement Conference (UCEC)*. University-Community Engagement Conference, 2017.

[kawaguch-410-080-03:2017] L. Jing J. Wang Z. Cheng Y. Wu, T. Kawaguch. Campus Digital Signage: Connection of Correlated Information between Distributor and Receiver. In *In proceedings of 31st International Conference on Advanced Information Networking and Application Workshops, AINA 2017 Workshop*, pages 581–582. IEEE Computer Society, 2017.

Writing a part of textbook or technical book

[j-wang-410-080-08:2017] Junbo Wang; Yilang Wu; Hui-Huang Hsu and ZixueCheng. *Big Data Analytics for Sensor-Network Collected Intelligence*, chapter Chapter 7 - Spatial Big Data Analytics for Cellular Communication Systems, pages 153–166. Elsevier, 2017.

Cellular communication (CC) is the most popular way to connect people together for real-time communication and data transmission. CC systems have

an enormous number of users, and large amounts of data, including user- and system-oriented data, are generated in CC systems every day. To continually provide better service, CC systems are encountering new challenges, such as unbalanced crowd communication behaviors of users and congestion from huge requests of high-quality video transmission. It has become an emerging research topic to study the huge data generated from CC systems and to predict the behaviors of CC systems, so that better quality of services can be provided. In particular, spatial big data analytics, which primarily handles spatial data, is important, because most data generated from CC systems are spatiotemporal-oriented data, and analyses of these data can significantly support the development of CC systems. In this chapter, we comprehensively survey methodologies of spatial big data analytics, study possible applications to support CC systems with spatial big data analytics, and highlight challenging issues.

[j-wang-410-080-09:2017] Yilang Wu and Junbo Wang. *Behavior Engineering and Applications*, chapter A Web-Based System with Spatial Clustering to Observe the Changes of Emergency Distribution Using Social Big Data. Springer, 2018.

Understanding the changes of emergency distribution is an important step in the response to disaster. There are various emergency-related big data available on Internet; however it requires a complex system to use big data for emergency observation. In this study, we propose a Web-based system with spatial clustering to enable the observation to the changes of emergency distribution using social big data. Based upon the widely available Web technology, the proposed system is designed in three components, the social big data scrubbing, spatial big data clustering, and visualizing the changes of emergency distribution. And we applied the observations on two emergency incidents using the Twitter data, one is the Kumamoto earthquake 2016, and the other is the New York Hurricane Sandy 2012.

Research grants from scientific research funds and public organizations

[j-wang-410-080-10:2017] Zixue Cheng Junbo Wang and Neil Yen. JST-NSF Joint Funding, Strategic International Collaborative Research Program, SICORP, entitled.

[kawaguch-410-080-04:2017] et al. T. Kawaguchi. An ICT Framework of Global-

ization Branding Strategies - to Support Data-driven Promotion of Local Communities -, 2017.

[kawaguch-410-080-05:2017] T. Kawaguch. Developing a Global Competency for STEM Students: Analyzing the Effectiveness of Project-Based Service Learning (PBSL) in Comparison with Different Educational Setting in the US, Thailand, and Japan, 2017.

Academic society activities

[j-wang-410-080-11:2017] Junbo Wang, 2018.

Workshop Chair The 1st Workshop on Collaborative Intelligence for Big Data joint with The IEEE Global Communications Conference 2018, Abu Dhabi, UAE, Dec. 2018

[j-wang-410-080-12:2017] Junbo Wang, 2018.

Workshop Chair Resilient and Intelligent Emergency Systems Communication Networks (RISCN) Workshop, The 14th International Conference on Wireless Communication and Mobile Computing IWCMC 2018

[j-wang-410-080-13:2017] Junbo Wang, 2018.

Program Chair The 9th IEEE International Conference on Awareness Science and Technology (iCAST 2018)

[kawaguch-410-080-06:2017] T. Kawaguchi, 2017.

Active Member

[kawaguch-410-080-07:2017] T. Kawaguchi, 2017.

Active Member

Contributions related to syllabus preparation

[kawaguch-410-080-08:2017] Improved the Syllabus for the Intercultural Leadership Training - International Understanding and Regional Innovation for the Engineering Students

[yumitsu-410-080-01:2017] wrote the syllabus for the Extracurricular Activity Course II: Internship III (Overseas Dalian).

[yumitsu-410-080-02:2017] wrote the syllabus for the Extracurricular Activity Course II: Internship II(Domestic A).

[yumitsu-410-080-03:2017] improved the syllabus for "Internship III (Overseas Silicon Valley)" and "Culture and History of Aizu".

Contribution related to the creation of the annual schedule

[j-chen-410-080-01:2017] Create the AY2018 schedule for SGU project.

[kawaguch-410-080-09:2017] Managed and organized global activities on campus, and actively supported inbound and outbound students under the mid-term and annual goals and schedule.

Contribution related to toward equipment management, classroom management, building management, and crime or fire prevention.

[kawaguch-410-080-10:2017] Renovated the Global Lounge and responsible of taking care of the Global Lounge.

Employment guidance

[kawaguch-410-080-11:2017] Supported to revised the international students' resume for working in Japan and assisted to get an internship and job overseas.

Advisor of a student club or circle

[kawaguch-410-080-12:2017] Team Nakagoya: being an adviser of the local revitalization activities with the global team of 55 students.

Contribution related to student management(for example, solution of a student-related problem)

[j-chen-410-080-02:2017] As the class adviser of ICTG students who entered 2016 and 2017, I have support the students whose academic ability is poor. As the results,

Summary of Achievement

> 2 students improved their achievement by worked hard. But there are 2 students didn't improve their achievement. Therefore, I need to consider other way to help the students.

[kawaguch-410-080-13:2017] Consulted the international student's financial issues, visa extension, etc. Communicated with correspondents of partner university when dispatching students got a trouble.

[yumitsu-410-080-04:2017] contributed to solving problems of ICTG students' daily lives.

Contribution related to the building or operation of the university computer system

[yumitsu-410-080-05:2017] proposed the modified specification of the web server system "University of Aizu Challenger Badge System" and entrusted it to the system integrator.

Contribution related to on-campus/off-campus publicity work

[j-chen-410-080-03:2017] In order to let more people to understand our university, I have prepared the documents and image files for the site of THE, in which, working, studying and living in our university are introduced. Furthermore, I have updated the information of our university on the recruiting site of Keystone and poseted the information of our university on encyclopedia site of baike.baidu.com.

[kawaguch-410-080-14:2017] promoted our university and global activities at the partner univeristy and local communities.

Contribution related to computer literacy education for university faculty members

[j-chen-410-080-04:2017] I have help the Exercise of Computer literacy.

Contribution related to educational planning management

[j-chen-410-080-05:2017] I have applied FY 2018 Subsidy of Fukushima Prefectural Foundation with other professors, although we did not succeed. The purpose of this project is promoting the communication among the senior high students of local and Hong Kong in a series of open lectures and other events related to multi-culture. In the future. we plan to promote the communication among the senior high students of local and the other region besides Hong Kong.

[kawaguch-410-080-15:2017] Co-leading faculty memberof the Creative Development Program at the University of Aizu within the Education Network for Practical Information Technologies (enPiT2)

[kawaguch-410-080-16:2017] Proposal was accepted as the AY2018 Japan Student Services Organization (JASSO) Student Exchange Support Program (Scholarship for Short-term Study in Japan and Oversea) was accepted, and UoA dispatched and hosted the students to/from partner universities and institutions.

[yumitsu-410-080-06:2017] contributed to the enactment of the procedure for the operation of "University of Aizu Challenger Badge System", and also contributed to the actual operation.

[yumitsu-410-080-07:2017] contributed to "University of Aizu Challenger Badge System Review Committee" as the member and the administrative secretariat.

[yumitsu-410-080-08:2017] contributed to the operation of Project Manager committee of SGU as the host.

[yumitsu-410-080-09:2017] totally improved "Dalian Overseas Internship Program", planed and implemented it as the new subjects, tought to students as pre-training and post-training, and dispatched students to Dalian.

[yumitsu-410-080-10:2017] implemented "Silicon Valley Internship Program", dispatched students to Silicon Valley, and supported several presentation events in Silicon Valley.

[yumitsu-410-080-11:2017] contributed to the selection of recipients of SGU scholarship as the interviewer.

Contribution related to planning administration for research, research conferences, or international research

Summary of Achievement

[j-chen-410-080-06:2017] I have provided the analyzed results of recruiting activities related to international students for the paper which is submitted to a Journal of Japanese Association of Higher Education Research. This paper was accepted by the journal of 2018.

[kawaguch-410-080-17:2017] Supported the international conferences and workshops on campus financially with the Office for Strategy of International Programs.

[yumitsu-410-080-12:2017] supported the graduation research as the one of advisors at Computer Network Laboratory.

Other significant contribution toward university planning, management, or administration

[j-chen-410-080-07:2017] With the annual budget cuts, I considered to integrate the jobs of SGU. That is, integrate some functions into departments with similar functions in our university. At present, the jobs of enrolling international students and honors program have been realized to co-work with the Academic Affairs Section. Because of this change, we can have more resourse to promote the internship program and other international exchange program.

[kawaguch-410-080-18:2017] Director, Office for Strategy of International Programs, Center for Globalization, the U of Aizu

[kawaguch-410-080-19:2017] Working Group member, the General Plan on Establishment of the Evaluation Office of the Public University Cooperation, the U of Aizu

[kawaguch-410-080-20:2017] Co-leading faculty member, enPiT2 (Educational Network for Practical Information Technology), U of Aizu

[kawaguch-410-080-21:2017] Member, Top Global University Project Mangers Meeting, U of Aizu

[kawaguch-410-080-22:2017] Member, Top Global University Project Committee II: Student Support and Services, U of Aizu

[kawaguch-410-080-23:2017] Member, Top Global University Project Committee III: Intern and Entrepreneurship, U of Aizu

Contributions related to regional education

[j-chen-410-080-08:2017] Please refer to No. 5110.

[kawaguch-410-080-24:2017] Fukushima Prefectural International Association and JICA Nihonmatsu invited me as a keynote speaker to give a seminar on the Intercultural Leadership Training - Motivations and Practices - in the Fukushima Global Human Development Trainer Seminar at JICA Nihonmatsu, Japan, June 17 - 18, 2017

[kawaguch-410-080-25:2017] invited to the 2nd Local Revitalization Steering Promotion Committee, Junior College Division of the University of Aizu, Japan, January 16, 2018, and give a presentation on a case study of the ICT Framework of Globalization Branding Strategies - to Support Data-driven Promotion of Local Communities

Proposal/implementation of a company plan that addresses the current status of the region and establishes ties with the university.

[kawaguch-410-080-26:2017] implemented the revitalization project with the faculty members of the junior college to create theICT Framework of Globalization Branding Strategies- to Support Data-driven Promotion of Local Communities

[yumitsu-410-080-13:2017] contributed to the realization of the ideathon with regard to internal revitalization of Aizu General Holdings on Sep, 2017.

[yumitsu-410-080-14:2017] contributed to the realization of the health promotion hackathon sponsored by Aizu General Holdings on Feb, 2018.

[yumitsu-410-080-15:2017] invited students from Aizu High School to the lecture on "Culture and History of Aizu" and discussed with our university students includeing international students, and invited faculty members of Aizu Politechnic and Aizu Junior College and the president of the local venture company to discuss future industories of Aizu.

[yumitsu-410-080-16:2017] developed the program to train young ICT leaders for high school students in Hong Kong and Aizu.

Proposal/implementation of a future industry plan

Summary of Achievement

[j-chen-410-080-09:2017] The Fukushima is a prefecture dominated by agriculture and rich in tourism resources. In the future, I think to develop tourism agriculture, and promote the export of agricultural products, which is a suitable choice. Therefore, we need to assist local small and medium-sized agricultural enterprises to establish Internet marketing channels by establishing channels based on faculty and students. At the same time of promoting the development of the local economy, it will provide application stages for our study.

Did you participate in students recruitment, support the alumni, and/or contact with student's parent? (Yes or No) If yes, please describe what you did.

[j-chen-410-080-10:2017] I did the activities for recruiting. I went to Thailand and China to attend the recruiting fairs. I have also visited the parents of the high school students, and introduced our university to their parents.

[kawaguch-410-080-27:2017] promoted our university and global activities to the high school students, and contacted with the teachers and parents in oversea high school in Hong Kong, Thailand, China, and etc.

Did you participate in Faculty Development? (Yes or No) If yes, please describe what you did.

[kawaguch-410-080-28:2017] was invited to the enPiT Faculty Development (FD) Symposium, Ehime University, Japan, September 19, 2017, and a presentation of the new approaches with the Creative Development Program at the University of Aizu was

Did you participate in Public Lectures, and/or Open Campus? (Yes or No) If yes, please describe what you did.

[j-chen-410-080-11:2017] I took part in the open campus event and introduced Geek Dojo to the visitors.

[kawaguch-410-080-29:2017] invited to the 1st ACM Chapter Networking Seminar on Globalization and Innovative Thinking, The University of Aizu, Japan, November

26, 2017, and give a presentation on the Globalization Efforts at the University of
Aizu.

[kawaguch-410-080-30:2017] Participated in Open Campus in both August and Octo-
berto promote our internationalization to high school students and their parents
with Office for Strategy of International Programs, and collaborated with local
residents to sell the local products and foods.

[yumitsu-410-080-17:2017] contributed to the seminar "Thinking of working" sponsored
by the Center for Cultural Research and Studies of the University of Aizu and the
Center for Lifelong Learning of Aizu-Wakamatsu city, as the presentor who talked
his own professional experience and discussed working.

Technical Reports

Technical Report List

2017-001
Satoshi Okui, Taro Suzuki and Yoshiki Iwata
Adapting subset construction to automata over list structures
Jan 10 2018, 15 pages

Projects

Project Supported by the Fukushima Prefectural Foundation for the Advancement of Science and Education 2017

1. Principal Investigator: Hirokuni Kurokawa
   Title: Support Project of Programming Language Understanding Using PROVIT
   Amount: ￥ 1,960,400

Research Project Supported by Collaborative Research, Commissioned Research and Grant Donation 2017

Collaborative Research

1. Financial Provider for Research: Aqua Clue
   Research Representative: Yuichi Yaguchi
   Title: Development of a Remote Centralized Management Device Utilizing Image Processing Technology
   Amount: N/A

2. Financial Provider for Research: International Institute Of Advanced Sceince and Technology (AIST)
   Research Representative: Takeaki Sampe and Saji Hameed
   Title: Research and Development of sophistication of wide area prediction technology for electric generation by renewable energy
   Amount: N/A

3. Financial Provider for Research: Japan Aerospace Exploration Agency (JAXA)
   Research Representative: Keitaro Naruse
   Title: Triangulation based simultaneous localization and mapping by massively distributed robots
   Amount: N/A

Projects

4. Financial Provider for Research: Kitashiba Electric Co. Ltd.
   Research Representative: Qiangfu Zhao
   Title: Research about automation of inspection process in the motor manu-
   facturing facility
   Amount: ¥ 990,000

5. Financial Provider for Research: Socionext Inc.
   Research Representative: Hiroshi Saito
   Title: Research on the High-level Synthesis Technique for Asynchronous Cir-
   cuits
   Amount: ¥ 1,000,000

6. Financial Provider for Research: EWM Japan, Ltd.
   Research Representative: Jiro Iwase (Hideyuki Fukuhara)
   Title: Development for distributed computer system using nano grid photo-
   voltaic solar energy
   Amount: ¥ 1,000,000

7. Financial Provider for Research: SIMPLEX QUANTUM Inc.
   Research Representative: Wenxi Chen
   Title: Development of HRV frequency range parameter calculation (LF/HF)
   Amount: ¥ 3,014,000

8. Financial Provider for Research: Toolmart Corporation
   Research Representative: Keitaro Naruse
   Title: Preliminary analysis for automatic detection of potential incidents
   from video taken from forklift
   Amount: ¥ 110,000

9. Financial Provider for Research: Ai-NET Corporation
   Research Representative: Lei Jing
   Title: R & D of Mimamori Wrist Band for the Elders
   Amount: ¥ 495,000

10. Financial Provider for Research: Institute of Space and Astronautical Sci-
    ence (ISAS), JAXA

Research Representative: Hirohide Demura
Title: Research of "obstruction detection method for evaluation of landing point in lunar and planetary exploration" and "tools for analysis and operation of irregularly shaped small bodies"
Amount: ¥ 1,282,832

11. Financial Provider for Research: East Japan Accounting Center Co.,Ltd.
Research Representative: Yuichi Yaguchi
Title: A Technology Survey to Establish Secure Drone Flight and Security Evaluation of a Feasible Demonstration
Amount: ¥ 1,346,400

12. Financial Provider for Research: Toolmart Corporation
Research Representative: Keitaro Naruse
Title: Analysis for automatic detection of potential incidents from video taken from forklift
Amount: ¥ 550,000

13. Financial Provider for Research: Mitsubishi Shindo Co. Ltd.
Research Representative: Qiangfu Zhao
Title: Automatic defect detection based on surface images of copper plate
Amount: ¥ 300,000

14. Financial Provider for Research: Alpine Electronics, Inc.
Research Representative: Qiangfu Zhao
Title: Situation awareness of nearby environment for a personal vehicle
Amount: ¥ 700,000

15. Financial Provider for Research: Mitsubishi Pencil Co., Ltd.
Research Representative: Lei Jing
Title: Research and Development on an E-Pen to Digitalize the Handwriting
Amount: ¥ 1,320,000

16. Financial Provider for Research: Ai-NET Corporation
Research Representative: Lei Jing
Title: R & D of Mimamori Wrist Band for the Elders (2)
Amount: ¥ 1,485,000

Commissioned Research

1. Financial Provider for Research: Japan Science and Technology Agency (JST)
   Research Representative: Keitaro Naruse
   Title: Enhancement of disaster resilient functions to prevent and reduce damages
   Amount: ¥ 2,785,300

2. Financial Provider for Research: Japan Science and Technology Agency (JST)
   Research Representative: Junbo Wang
   Title: Dynamic Evolution of Smart-Phone Based Emergency Communications Network
   Amount: ¥ 10,660,000

3. Financial Provider for Research: Fukushima Prefecture
   Research Representative: Keitaro Naruse
   Title: Development of farming support robot (weeding robot system for rice fields)
   Amount: ¥ 9,930,000

4. Financial Provider for Research: Ministry of Internal Affairs and Communications
   Research Representative: Toshiaki Miyazaki
   Title: Tracking of Living Activity and Health Condition in Smart Home using Radio reflection and Big data
   Amount: ¥ 10,855,000

5. Financial Provider for Research: Kikuchi Seisakusho Co., Ltd.
   Research Representative: Yuichi Yaguchi
   Title: "Data processing and collecting sample of acquirable 3D topography data using 3D mapping technology" and "Examination for a fall accident simulator development"
   Amount: ¥ 7,000,000

6. Financial Provider for Research: Japan Society for the Promotion of Science (JSPS)
   Research Representative: Ryuhei Yamada
   Title: Lunar impact flash observation by ground stations among two nations and an application of the results to future lunar seismic explorations
   Amount: ¥ 960,000

7. Financial Provider for Research: Japan ADvanced system co.,ltd
   Research Representative: Keitaro Naruse
   Title: Support of prototype development of advanced safety system for industrial workers
   Amount: ¥ 500,000

8. Financial Provider for Research: FUJITSU LABORATORIES LTD.
   Research Representative: Akihito Nakamura
   Title: Study of Personal Data Stores API
   Amount: ¥ 1,000,000

9. Financial Provider for Research: FSK Corporation
   Research Representative: Makoto Yashiro
   Title: General wheel type / Crawler type Robot Model and Simulation Contents Construction, Simulation Accuracy verification
   Amount: ¥ 14,997,150

10. Financial Provider for Research: GClue, Inc.
    Research Representative: Yuichi Okuyama
    Title: Evaluation of an Extension Board Development for Embedded GPU
    Amount: ¥ 495,000

Grant Donation

1. Donation Provider: Telecommunications Advancement Foundation
   Research Representative: Anh T. Pham
   Title: Hybrid Architecture and Cross-Layer Design for Free-space Optics/Millimeter-Wave Front/Backhaul of the Next-Generation Mobile Networks
   Amount: ¥ 550,000

Projects

2. Donation Provider: Foundation for Research of Arteriosclerosis
   Research Representative: Wenxi Chen
   Title: Research for statistical analysis of blood pressure data and Blood pressure measurement at household
   Amount: ¥ 1,000,000

3. Donation Provider: Nakajima Foundation
   Research Representative: Yoichi Tomioka
   Title: Establishment of Fast Camera Identification Method for videos captured by smartphones
   Amount: ¥ 1,100,000

4. Donation Provider: JAL Information Technology Co., Ltd.
   Research Representative: The University of Aizu
   Amount: ¥ 500,000

5. Donation Provider: JAL Information Technology Co., Ltd.
   Research Representative: The University of Aizu
   Amount: ¥ 500,000

6. Donation Provider: Aiki Co., Ltd. / Yakuju Co., Ltd.
   Research Representative: Wenxi Chen
   Title: To encourage a research of the biomedical information measurement technique
   Amount: ¥ 1,000,000

7. Donation Provider: Aizu-Wakamatsu City
   Research Representative: Student Affairs Division and The University of Aizu Revitalization Center
   Amount: ¥ 10,000,000

Research Project Supported by Grants-in-Aid (Kakenhi) 2017

Grant-in-Aid for Scientific Research

1. Category: Scientific Research (C)
   Research Representative: Jung-pil Shin
   Title: Automonous generation of ink brush characters and hand-writing characters with individuality and natural typographical fluctuation
   Amount: ¥ 1,1700,000

2. Category: Scientific Research (C)
   Research Representative: Toshiaki Miyazaki
   Title: Research on ultra-low-power software defined sensor network with self-reparing capability
   Amount: ¥ 780,000

3. Category: Scientific Research (C)
   Research Representative: Yong Liu
   Title: Evolutionary Approaches to Learning Self-awareness for a Decentralized System
   Amount: ¥ 1,040,000

4. Category: Scientific Research (C)
   Research Representative: Anh T. Pham
   Title: Study and development of smart supermarket by using visible light communication (VLC) and smartphone technologies
   Amount: ¥ 1,040,000

Projects

5. Category: Scientific Research (C)
Research Representative: Yodai Watanabe
Title: Research on optimality and existence of confidence variance method
Amount: ¥ 1,170,000

6. Category: Scientific Research (C)
Research Representative: Alexander Vazhenin
Title: Service-oriented infrastructure for education of Tsunami modeling and English
Amount: ¥ 1,040,000

7. Category: Scientific Research (C)
Research Representative: Debopriyo Roy
Title: 3D Printing in Creative Factory Contexts for English Language Learning
Amount: ¥ 910,000

8. Category: Scientific Research (C)
Research Representative: Hiroshi Saito
Title: Tamper resistance evaluation of asynchronous circuit by batch data method using programmable delay element
Amount: ¥ 910,000

9. Category: Scientific Research (C)
Research Representative: Konstantin Markov
Title: Speech based emotional and depressive mental state prediction using Gaussian Process state-space models
Amount: ¥ 1,300,000

10. Category: Scientific Research (C)
Research Representative: Incheon Paik
Title: Web service discovery and linkage on big data of linked service network
Amount: ¥ 1,430,000

11. Category: Young Research (B)
Research Representative: Jeremy Perkins

Title: An Acoustic Typology of Creaky Voice
Amount: ¥ 390,000

12. Category: Young Research (B)
Research Representative: Younghyon Heo
Title: Improving English speaking with parsing training
Amount: ¥ 650,000

13. Category: Scientific Research (C)
Research Representative: Julian Villegas
Title: Saund: Simulation of auditory near-field distance
Amount: ¥ 1,170,000

14. Category: Scientific Research (C)
Research Representative: Qiangfu Zhao
Title: Research on action pattern recognition based on small-scale human-presence sensor network
Amount: ¥ 910,000

15. Category: Scientific Research (C)
Research Representative: Shuxue Ding
Title: Research on real-time processing system of compression sensing and sparse expression
Amount: ¥ 1,300,000

16. Category: Scientific Research (C)
Research Representative: Hisako Yasuda
Title: Introduction of Japanese comics analysis for English education: An application to academic writing of role word analysis
Amount: ¥ 1,040,000

17. Category: Scientific Research (C)
Research Representative: Emiko Kaneko
Title: Development of picture prompt with difficulty level information and its effect of characteristics for L2 deliverance
Amount: ¥ 780,000

Projects

18. Category: Young Researcher (B)
    Research Representative: Peng Li
    Title: A machine learning based system for storing and processing big spatial-temporal data
    Amount: ¥ 1,820,000

19. Category: Young Researcher (B)
    Research Representative: Yutaka Watanobe
    Title: An intelligent programming study support environment
    Amount: ¥ 910,000

20. Category: Young Researcher (B) (period extension)
    Research Representative: Ryuhei Yamada
    Title: Development study of wide range seismometer aiming for network deployment for extreme environment
    Amount: ¥ 0

21. Category: Scientific Research (C)
    Research Representative: Maxim V. Ryzii
    Title: Computer modeling of cardiac conduction system with nonlinear oscillators
    Amount: ¥ 1,040,000

22. Category: Scientific Research (C)
    Research Representative: Evgeny Pyshkin
    Title: Advancing interfaces and algorithms used in traveler-centric information systems supporting geographical, cultural and historical perspectives
    Amount: ¥ 910,000

23. Category: Scientific Research (C)
    Research Representative: Naru Hirata
    Title: Spectral data analysis of Asteroid Itokawa based on high precision shape model
    Amount: ¥ 2,210,000

24. Category: Young Researcher (B)
    Research Representative: Yukihide Kohira

Title: Development of designing technology of integrated circuit which is resistant to delay dispersion and aging degradation
Amount: ￥ 1,300,000

25. Category: Young Researcher (B)
Research Representative: Sender Dovchin
Title: Integrating English language based Western social media in the EFL classrooms in Japanese universities
Amount: ￥ 1,690,000

26. Category: Young Researcher (B)
Research Representative: Jun Ogawa
Title: Evolved soft robotics for efficient development of irregular terrain capable robots in disaster scene
Amount: ￥ 1,040,000

27. Category: Young Researcher (B)
Research Representative: Chunhua Su
Title: Method of authentication and privacy protection in IoT environment
Amount: ￥ 1,085,373

28. Category: Young Researcher (B)
Research Representative: Yosuke Kira
Title: Breakthrough of social dilemma research by etablishing large-scaled online experiment method
Amount: ￥ 1,170,000

29. Category: Scientific Research (B)
Research Representative: Shigeo Takahashi
Title: Research on dynamic configuration optimization for annotative visual information display
Amount: ￥ 7,110,000

30. Category: Publication of Scientific Research Results
Research Representative: Nobuyoshi Asai
Title: Hyper-Dictionary: Hyper English word origin dictionary
Amount: ￥ 1,700,000

Projects

31. Category: JSPS Research Fellow
    Research Representative: Huawei Huang
    Title: Conjoint optimization of routing and protection in software defined network
    Amount: ¥ 780,000

Contribution from outside the University

1. Category: Scientific Research (A)
   Research Representative: Hiroshi Saito
   Title: Research on ultra-low-power consumption technology of high-speed serial communication mechanism
   Distribution: National Institute of Informatics Amount: ¥ 500,000

2. Category: Scientific Research (C)
   Research Representative: Emiko Kaneko
   Title: Vocabulary and grammar coaching for improvement of English deliverance profluence
   Distribution: Kobe Gakuin University Amount: ¥ 60,000

3. Category: Scientific Research (S)
   Research Representative: Maxim V. Ryzhii
   Title: Creation of two-dimensional atomic lamina heterojunction and its application for terahertz opto-electronics device application
   Distribution: Tohoku University Amount: ¥ 700,000

4. Category: Scientific Research on Innovative Areas
   Research Representative: Shigeo Takahashi
   Title: Enhancing visualization foundation encouraging space modeling
   Distribution: Keio University Amount: ¥ 2,600,000

5. Category: Scientific Research (C)
   Research Representative: Takao Maeda
   Title: Production method of novel series by multi-dimensionalization and structuration and their mathematics and application
   Distribution: Niigata University Amount: ¥ 100,000

6. Category: Scientific Research (C)
   Research Representative: Yodai Watanabe
   Title: Production method of novel series by multi-dimensionalization and structuration and their mathematics and application
   Distribution: Niigata University Amount: ¥ 100,000

7. Category: Scientific Research (B)
   Research Representative: Naohito Nakasato
   Title: Co-design of accelerator and software for acclerating multiple-precision integral calculation
   Distribution: Hitotsubashi University Amount: ¥ 500,000

8. Category: Scientific Research (B)
   Research Representative: Zhu Xin
   Title: Multi-hierarchical analysis of role of TRPM family in development mechanism of atrial fibrillation
   Distribution: Fukuoka University Amount: ¥ 500,000

9. Category: Scientific Research (B)
   Research Representative: Yosuke Kira
   Title: Commons moving with citizen society — Mathematical sociology research for enlivenment of hilly and mountainous areas
   Distribution: Shibaura Institute of Technology Amount: ¥ 45,000

10. Category: Scientific Research (A)
    Research Representative: Emiko Kaneko
    Title: CEFR-J (English skill achivement index) compliant CAN-DO coaching task and prototype development and publication
    Distribution: Tokyo University of Foreign Studies Amount: ¥ 250,000

11. Category: Scientific Research (C)
    Research Representative: Kenta Ofuji
    Title: Investigation of linguistic feature of effective evacuation call sentence on natural disaster — for more appeal on refuge psychology
    Distribution: Gunma Prefectural Women's University Amount: ¥ 153,000

Projects

12. Category: Scientific Research (B)
    Research Representative: Shigeyuki Aoki
    Title: Fundamental research for development of interactive educational material for discussion education
    Distribution: Kyushu University Amount: ¥ 150,000