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[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, Jungpil 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. Ogo-
hara, K. Sugiyama, H. Kashimura, S. Ohtsuki, S. Takagi, Y. Ya-
mamoto, 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 re-
trieved 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 ob-
servations, suggesting a remarkable stability of the thermal structure. Local
time-dependent features are seen within and above the clouds, which is lo-
cated around 48-70 km altitude. The H_2SO_4 vapor density roughly follows
the saturation curve at cloud heights, suggesting equilibrium with cloud par-
ticles. 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 Mat-
sunaga, Moe Matsuoka, Shuji Matsuura, Tomoki Nakamura, Aiko
Nakato, Yusuke Nakauchi, Takahito Osawa, Hiroki Senshu, Ya-
suhiko 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