Center for Globalization

Mizuo Kansen
Professor

Tatsuki kawaguchi
Associate Professor

Wang Junbo
Associate Professor

Refereed academic journal

[j-wang-410-080-01:2016] J. Wang; S. Guo; Z. Cheng; P. Li; J. Wu. Optimization of Deployable-Base-Stations with Guaranteed QoE in Disaster Scenarios. *IEEE Transactions on Vehicular Technology*, 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-410-080-02:2016] 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*, 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-410-080-03:2016] H. Hsu Z. Cheng Y. Wu, J. Wang. 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.

Refereed proceedings of an academic conference

[j-wang-410-080-04:2016] J. Wang Y. Wang, M. C. Meyer and X. Jia. Delay minimization for spatial data processing in wireless networked disaster areas. In *Proc. of 2017 IEEE Global Communications Conference (GLOBE-COM)*, 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, 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-410-080-05:2016] Shanshan Zhang Amitangshu Pal Junbo Wang Yilang Wu, Krishna Kant. Disaster Network Evolution Using Dynamic Clustering of Twitter Data. In *Proc. of 2017 IEEE 37th International Conference on Distributed Computing Systems Workshops*, 2017.

Ad hoc smartphone networks can be used to aug- ment 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.

[j-wang-410-080-06:2016] Z. Cheng K. Sato, J. Wang. Design of a Method to Support Twitter based Event Detection with Heterogeneous Data Resources. In *Proc. of iCAST2017*, 2017.

Abstract: 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.

[kawaguch-410-080-01:2016] T Kawaguchi. Regional and International Creativity for Sustainable Human Development - In Case of Engineering Education -. In *In proceedings of 14th Annual Conference, Japan Academy of Human Resource Development*, pages 221 – 222. Japan Academy of Human Resource Development, 2016.

This is a case study of local and international exchange activities to develop the enginnerig students' creative skills.

Writing a part of textbook or technical book

[j-wang-410-080-07:2016] H. Hsu J. Wang, Y. Wu and Z. Cheng. *Spatial Big Data Analytics for Cellular Communication Systems*, chapter A Book chapter in Big Data Analytics for Sensor-Network Collected Intelligence. Elsevier, 2017.

[j-wang-410-080-08:2016] Y. Wu and J. Wang. *A Web-based System with Spatial Clustering to Observe the Changes of Emergency Distribution using Social Big Data*, chapter A Book-chapter in Behavior Engineering and Applications, the Springer International Series on Computer Entertainment and Media Technology. Springer, 2018.

Research grants from scientific research funds and public organizations

[j-wang-410-080-09:2016] Junbo Wang. JST-NSF Joint Funding SICORP: Dynamic Evolution of Smartphone-Based Emergency Communications Network, 2015 to 2018.

[kawaguch-410-080-02:2016] T. Kawaguchi. The Pedagogical Challenges to Collaborative Technologies and Globalization - Think Globally and Act Locally-, 2016.

[kawaguch-410-080-03:2016] T. Kawaguchi. Field Study of the Local Community Revitalization to Protect the Environmental Resources with Design Thinking, 2016.

Academic society activities

[kawaguch-410-080-04:2016] T. Kawaguchi, 2016.

Active Member

Others

[kawaguch-410-080-05:2016] T. Kawaguchi. Expand Your Network with Active Participants. Fukushima Minpo, June 2016.

Contributed to the University of AIzu Relay Essay

Contributions related to syllabus preparation

[kawaguch-410-080-06:2016] Improved the Syllabus for the Intercultrual Leadership Training and Aizu Culture and Histroy

Contribution related to the creation of the annual schedule

[kawaguch-410-080-07:2016] Managed the Global activities on Campus, and activitly 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-410-080-08:2016] Relocated the Global Lounge and in charge of taking care of the Global Lounge.

Employment guidance

[kawaguch-410-080-09:2016] Supported to revise the international studnets' resume for working in Japan and assisted to get an internaship and job overseas.

Advisor of a student club or circle

[kawaguch-410-080-10:2016] Team Nakagoya: Being an adviser of the local revitalization activitiies with the global team of 55 students.

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

[kawaguch-410-080-11:2016] Consulted the internaitonal student's financial issues, visa extension, etc. Communicated with correspondents of partner university when dispatching students got a trouble.

Summary of Achievement

Contribution related to educational planning management

[kawaguch-410-080-12:2016] Proposal of the AY2016 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.

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

[kawaguch-410-080-13:2016] Supported the international conferences and workshops on campus financially with the Office for Strategy of International Programs.

Contribution related to educational research technology and facility planning management

[kawaguch-410-080-14:2016] Merged the Center for Strategy of International Programs and Promotion Office for Super Global University to the Center for Globalization, and relocalted to the new office at Rm123 of Research Building

Other significant contribution toward university planning, management, or administration

[kawaguch-410-080-15:2016] Working Group member, the General Plan on Establishment of the Evaluation Office of the Public University Cooperation, the U of Aizu

[kawaguch-410-080-16:2016] Co-leading faculty member, enPiT2 (Educational Network for Practical Information Tech), U of Aizu

[kawaguch-410-080-17:2016] Director, Office for Strategy of International Programs, Center for Globalization, U of Aizu

[kawaguch-410-080-18:2016] Member, Top Global University Project Mangers Meeting, U of Aizu

[kawaguch-410-080-19:2016] Member, Top Global University Project Committee II: Student Support and Services, U of Aizu

[kawaguch-410-080-20:2016] Member, Top Global University Project Committee III: Intern and Entrepreneurship, U of Aizu

Contributions related to regional education

[kawaguch-410-080-21:2016] Fukushima Prefectural International Association and JICA Nihonmatsu invited me as a keynote speaker to give a workshop on getting to know yourself - first step to understand the intercultural communication in Fukushima Global Seminar at JICA Nihonmatsu, Japan on September 24, 2016

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

[kawaguch-410-080-22:2016] was invited to the 2016 5th China-France International Workshop on New Information Communication Sciences and Technology for Sustainable Development at Harbin Institute of Technology on July 16, 2016, and a presentation of Strategy for Engineering Student Success: Study Abroad Programs into Life-Changing and Experiential Learning Opportunities was given.

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

[kawaguch-410-080-23:2016] invited Global Seminar, Aizu High school, Japan, October 14, 2016, and give an open lecture on understanding the importance of learning to living in glocalization for high school student

[kawaguch-410-080-24:2016] Partcipated in Open Campus in both August and October to 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.