
Editorial

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Biographical notes: Masaki Aida received his BS in Physics and MS in Atomic Physics from St. Paul's University, Tokyo, Japan, in 1987 and 1989, respectively, and received his PhD in Telecommunications Engineering from the University of Tokyo, Japan, in 1999. After joining NTT Laboratories in April 1989, he has been engaged in research on traffic issues in computer communication networks. From April 2005 to March 2007, he was an Associate Professor at the Faculty of System Design, Tokyo Metropolitan University. He has been a Professor of the Graduate School of System Design, Tokyo Metropolitan University since April 2007. He received the Best Tutorial Paper Award of IEICE Communications Society in 2013. He is a member of the IEEE, IEICE, and the Operations Research Society of Japan.

Akira Arutaki received his ME degree from Tohoku University in 1980 and PhD from Kyushu Institute of Technology in 2008. Joining NEC Corporation in 1980, he was engaged in research and development of digital communication systems. From 1987 to 1990, he stayed at Washington University in St. Louis, MO, as a scholarship recipient. He was the General Manager of System Platforms Research Laboratories from 2003 to 2006, and was assigned to the Associate Senior Vice President of NEC Communication Systems, Ltd. in 2006. He joined Kyushu Institute of Technology as a Professor in 2009. He received the Network Systems Research Award of IEICE in 1999. He authored three books in the packet communications. He is a member of IEEE and IEICE of Japan.

Mario Köppen received his Master degree in Solid State Physics from the Humboldt-University of Berlin in 1991. Afterwards, he worked as a Scientific Assistant at the Central Institute for Cybernetics and Information Processing in Berlin and changed his main research interests to image processing and neural networks. From 1992 to 2006, he was working with the Fraunhofer Institute for Production Systems and Design Technology. He received his doctoral degree at the Technical University Berlin with honours in 2005. He has published around 150 peer-reviewed papers in conference proceedings, journals and books. He is a founding member of the World Federation of Soft Computing, and an Associate Editor of the *Applied Soft Computing Journal*. In 2006, he became a JSPS Fellow, and a Professor at the Network Design and Research Centre (NDRC) in 2008 at the Kyushu Institute of Technology, where he is now conducting research in the fields of multi-objective optimisation, digital convergence and multimodal content management.

Masato Tsuru received his BE and ME from Kyoto University, Japan in 1983 and 1985, respectively. He received his DE from Kyushu Institute of Technology, Japan in 2002. From 1985 to 1990, he worked at Oki Electric Industry Co., Ltd., Tokyo. From 1990 to 2000, he was with the Information Science Centre, Nagasaki University, Nagasaki. Then, from 2000 to 2003, he was with Japan Telecom Information Service Co., Ltd., and Telecommunications Advancement Organization of Japan, Kitakyushu. In 2003, he moved to the Department of Computer Science and Electronics, Kyushu Institute of Technology as an Associate Professor, and then has been a Professor in the same department since 2006. His research interests include performance measurement, modelling, and management of computer communication networks. He is a member of the IPSJ, IEICE, JSSST, IEEE and ACM.

Nowadays the internet, in the broadest sense, is playing a role of social and economical infrastructure and is expected to support not only comfortable communication and information dissemination but also any kind of intelligent and collaborative activities in a dependable manner. However, the explosive growth of its usage with diversifying the communication technologies and the service applications makes it difficult to manage efficient sharing of the internet. In addition, an inconsistency between internet technologies and the human society forces a complex and unpredictable tension among end-users, applications, and internet service providers (ISPs).

It is thought, therefore, that the internet is approaching a turning point and there might be the need for rethinking and redesigning the entire system composed of the human society, nature, and the internet. To solve the problems across multiple layers on a large-scale and complex system and to design the entire system of systems towards future information networks for human/social orchestration, a new tide of multi-perspective and multi-disciplinary research is essential. It will involve not only the network engineering (network routing, mobile and wireless networks, network measurement and management, high-speed networks, etc.) and the networked applications (robotics, distributed computing, human computer interactions, Kansei information processing, etc.), but the network science (providing new tools to understand and control the huge-scale complex systems based on theories, e.g., graph theory, game theory, information theory, learning theory, statistical physics, etc.) and the social science (enabling safe, secure, and human-centric application principles and business-models).

Information network design aims at exploring ongoing efforts in the theory and application on a wide variety of research fields related to the design and management of information networks and resource sharing in the networks with particular, but not exclusive, regard to:

- large scale and/or complex networks
- cross layered networks
- overlay and/or P2P networks
- sensor and/or mobile ad-hoc networks
- delay/disruption tolerant networks
- social networks
- applications on networks
- fundamental theories for network design.

The five articles presented in this special issue cover a broad field of related research themes, with a main focus on the design of new general solution methodologies for newly appearing problems in network design and management.

- The article ‘A large-scale network diagnosis system based on user-cooperative active measurements’ by

Atsuo Tachibana, Shigehiro Ano and Masato Tsuru provides a contribution to network diagnostics. A user cooperative measurement scheme is proposed that targets large-scale network diagnosis. The approach, based on intelligent and dynamic selection of beacons excels in the treatment of the trade-off between coverage and timeliness of measurements.

- In the article ‘Method for finding protected links to keep small diameter against failures’ by Koji Imagawa, Takeshi Fujimura and Hiroyoshi Miwa, authors study the topic of link protection against failures. The efficient selection of links to protect is formulated as a combinatorial optimisation problem, which is shown to be NP-hard. However, authors can contribute a polynomial time algorithm in case of at most one link failure.
- Mario Köppen, Kaori Yoshida and Masato Tsuru present a relational approach to optimality in resource allocation in ‘Relational approaches to resource-aware multi-maxmin fairness in multi-valued resource sharing tasks’. Here, the formal concept of maxmin fairness is generalised to the case of multi-resource sharing, as well as the sharing of multi-valued resources. The approach is demonstrated to be more efficient in resource utilisation than recent other approaches.
- The article ‘Learning-based p -persistent CSMA for secondary users of cognitive radio networks’ by Sarena Bao and Takeo Fujii represents the rapidly expanding field of cognitive radio, where secondary users can utilise idle times in radio channel transmission of primary users. An approach based on Q-learning to handle the trade-off between channel idle time and collision costs is proposed.
- The main theme of the article ‘Structured design concept for cross-layered protocols; applying to near field communication (NFC)’ by Akira Arutaki, Hiroshi Sakai and Akira Matsumoto is the design of cross-layered protocols. In situations where the standard internet protocols appear to be too complex, the need arises for more efficient and lightweight protocols. The authors demonstrate the design of a number of near field communication protocols based on their new design concept of cross-layer protocols.

The editors of this special issue want to express their thanks to the authors for their continued effort to make the selection of these five papers possible. But thanks also go to the anonymous referees for their critical comments and discussions, allowing for a selection of contributions of highest quality. Last but not least, a special thanks to Fatos Xhafa and Liz Harris for all their support and help during the preparation of the special issue. We hope that the selection of this issue will find a broad and interested readership and can give a humble contribution to the further progress in the touched research disciplines.