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## **EDITORIAL**

### **Editorial for the special issue on Heterogeneous Sensors Based Object Identification and Information Fusion**

Huansheng Ning, Didier El Baz, Laurence T. Yang and Rui Wang

With the fast development of computing, communication, control technologies, the proliferation of heterogeneous sensors with data communication capability can provide a wide variety of data for our daily life, such as road monitoring, health-care systems, structure health checking, military applications etc. However, there are still many interesting open research problems left to be explored as well as many issues to be addressed. In this special issue, we plan to focus on various research and application issues in heterogeneous sensors based object identification and information fusion.

The first paper, ‘A novel distributed air index for efficient spatial query processing in road sensor networks on the air’ by Yanhong Li et al., explores the problem of spatial query processing in road sensor networks by means of wireless data broadcast. In addition it presents an efficient method to partition the record-keeping information about the underlying road sensor network and its associated objects, by which develops a fully distributed air index, called integrated exponential index, based on an extended version of the Hilbert curve. Besides, this paper also proposes efficient client-side algorithms to facilitate the processing of several kinds of spatial queries, including kNN query, CkNN query, and range query.

The problem of enforcing the integrity of the outsourced data remotely is addressed in the paper, ‘Parallel checking of content integrity in multi-cloud storage of heterogeneous sensor systems’ by Jian Mao et al.. They propose a parallel cloud data possession checking scheme for the multi-cloud environment, which utilizes the homomorphic verification tag created by the Paillier cryptosystem to support unlimited query challenges and introduces the error-correction encoding method to ensure error localization and data correction.

The paper, ‘Subscribing to fuzzy temporal aggregation of heterogeneous sensor streams in real-time distributed environments’ by J. Medina et al., presents an approach for distributing and processing heterogeneous data based on a representation with fuzzy linguistic terms, to solve the problems of the data fusion of sensors and the design of processing information. What’s more, in order to illustrate the usefulness and effectiveness of this proposal, the authors present the results of the fuzzy temporal aggregation of sensor streams with alpha-cut subscriptions in a case study where an

inhabitants performs an daily activities in an intelligent environment.

A comparison between algorithms (Oriented FAST and Rotated BRIEF (ORB) and Aruco) has been present in the paper, ‘Comparison of fiducial marker detection and object interaction in activities of daily living utilising a wearable vision sensor’ by C. Shewell et al., for the detection of fiducial markers placed throughout a smart environment . This paper presents the results from a investigation, detailing performance measure for each object detected under various lighting conditions, motion blur and distance from the objects. Furthermore, an intelligent system was developed to specifically consider distance estimation in order to aid with the filtering out of false interactions.

The paper in ‘Adaptive time delay estimation algorithm for indoor near-field electromagnetic ranging’ by Peng Wang et al., proposes a new adaptive time-delay estimation algorithm based on maximum correntropy criterion (MCC) and received signal strength indication (RSSI), abbreviated as RSSIMCC. Simulation results show that, the proposed RSSIMCC algorithm can estimate the time delay with small steady-state error in near-field electromagnetic ranging application. Then the time delay estimated by RSSIMCC algorithm can be exploited based on the near-field behavior of radio signals for ranging in an indoor environment.

In the paper, ‘A universal QoS scheme for web applications’ by Hangxing Wu et al., a good universal QoS scheme named  $E^2$ FXCP, was proposed by extending EFXCP, which needs to change the standard IP protocol. Moreover, simulations in Network Simulator 2 (NS2) have validated that  $E^2$ FXCP is a universal QoS scheme, which can simultaneously satisfy multiple common QoS metrics for various web applications while maintaining good network performance.

As the guest editors of this special issue, we would like to thank the authors, and reviewers for their excellent efforts. Thanks are also due to the editorial staff of the International Journal of Communication Systems for their fine support. Finally, our special thanks go to Professor Mohammad S. Obaidat (editor-in-chief) for his valuable support throughout the preparation of this special issue.

#### *Guest Editors 'Bios*

**Huansheng Ning** received the PhD. degree in Beihang University in 2001. From 2002 to 2003, he worked in Aisino Co. From 2004 to 2013, he worked as a post-PhD, and then an associate professor in School of Electronic and Information Engineering, Beihang University. From 2013, he worked as a professor in School of Computer & Communication Engineering, University of Science & Technology Beijing.

He presided over many research projects including Natural Science Foundation of China (NSFC), National High Technology Research and Development Program of China (863 Project), etc. He published more than 30 journal papers at Computer, IEEE Transactions on Parallel and Distributed Systems, IEEE Intelligent Systems, IEEE Transactions on Information Forensics and Security, IEEE Transactions on Information Smart Grid, IEEE Communications Letters, and IEEE Sensors Journal,

etc. One paper from Computer, "Cyber entity Security in the Internet of Things (April, 2013)" is archived as one theme article by Computing Now, and the other paper, "Human-Attention Inspired Resource Allocation for Heterogeneous Sensors in the Web of Things", ( IEEE Intelligent Systems, Nov, 2013), is archived as one of the Web of Things theme articles by Computing Now

(<http://www.computer.org/portal/web/computingnow/archive/march2014>). He authored 2 books on Internet of Things. He proposed the 'Internet of Thinking' which was selected as one of the TOP10Qi questions at Memorial Alan Turing Year (2012)/Open Forum on Top 10 Questions in Intelligent Informatics/Computing.

He serves as an associate editor of IEEE Systems Journal, IEEE Internet of Things Journal and International Journal of Communication Systems, Leading Guest Editor for Internet of Things Special Issues of Computer Journal, Science China Information Science, Journal of Universal Computer Science and IEEE Sensors Journal. He served as chairs for IEEE International Conference on Internet of Things (iThings), e.g. Executive Chair (iThings2013, [www.china-iot.net/ithings2013.htm](http://www.china-iot.net/ithings2013.htm)), Program Chair (iThings 2012), Workshop Chair (iThings2011). He hosted the 2013 World Cybermatics Congress (WCC2013/iThings2013/CPSCom2013/Greencom2013) as the joint executive chair ([www.china-iot.net](http://www.china-iot.net)). He gained the IEEE Computer Society Meritorious Service Award in 2014.

His current research focuses on Internet of Things, Electromagnetic Sensing and Identification.

**Didier El Baz** was born in Toulouse, France in 1958, he received the Doctor Engineer degree in Control Theory from INSA Toulouse in January 1984. Dr. El Baz was visiting scientist in the Laboratory for Information and Decision Systems, MIT Cambridge Massachusetts, USA, in 1984. He received the HDR in Computer Sciences from INP Toulouse in 1998. He is founder and head of the team Distributed Computing and Asynchronism at LAAS-CNRS. His fields of interest are in communication protocols, IoT, parallel and distributed computing, peer to peer computing, GPU computing and optimization.

**Laurence T. Yang** graduated from Tsinghua University, China and got his Ph.D in Computer Science from University of Victoria, Canada. He joined St. Francis Xavier University in 1999. His current research includes parallel and distributed computing, embedded and ubiquitous/pervasive computing.

He has published many papers in various refereed journals, conference proceedings and book chapters in these areas (including around 100 international journal papers such as IEEE Transactions on Computers, IEEE Journal on Selected Areas in Communications, IEEE Transactions on System, Man and Cybernetics, IEEE Transactions on Very Large Scale Integration Systems, IEEE Transactions on Industrial Informatics, IEEE Transactions on Information Technology in Biomedicine, IEEE Transactions on Parallel and Distributed Systems, IEEE Transactions on Circuit and Systems, IEEE Transactions on Service Computing, ACM Transactions on Embedded Computing Systems, IEEE Systems Journal, ACM Transactions on Autonomous and Adaptive Systems, IEEE Transactions on Vehicular Technology,

IEEE Intelligent Systems, etc).

He has been involved actively in conferences and workshops as a program/general/steering conference chair (mainly as the steering co-chair of IEEE UIC/ATC, IEEE CSE, IEEE HPCC, IEEE/IFIP EUC, IEEE ISPA, IEEE PiCom, IEEE EmbeddedCom, IEEE iThings, IEEE GreenCom, etc) and numerous conference and workshops as a program committee member. He served as the vice-chair of IEEE Technical Committee of Supercomputing Applications (TCSA) until 2004, was the chair (elected in 2008 and 2010) of IEEE Technical Committee of Scalable Computing (TCSC), the chair of IEEE Task force on Ubiquitous Computing and Intelligence (2009- ). He was also in the steering committee of IEEE/ACM Supercomputing conference series (2008-2011), and the National Resource Allocation Committee (NRAC) of Compute Canada (2009-2013).

In addition, he is the editors-in-chief of several international journals. He is serving as an editor for many international journals. He has been acting as an author/co-author or an editor/co-editor of many books from Kluwer, Springer, Nova Science, American Scientific Publishers and John Wiley & Sons. He has won several Best Paper Awards (including IEEE Best and Outstanding Conference Awards such as the IEEE 20th International Conference on Advanced Information Networking and Applications (IEEE AINA-06), etc); one Best Paper Nomination; Distinguished Achievement Award, 2005; Canada Foundation for Innovation Award, 2003. He has been invited to give around 30 keynote talks at various international conferences and symposia.

**Rui Wang** received the Ph.D degree in pattern recognition and intelligent systems from Northwestern Polytechnical University, Xi'an, China, in 2007. He is currently an Associate Professor with the Department of Computer Science and Technology, School of Computer and Communication Engineering, University of Science and Technology Beijing, Beijing, China. His research interests include Wireless Sensor Networks, Internet of Things, Self-organization, and Information Fusion.