Journal of Universal Computer Science, vol. 18, no. 9 (2012), 1069-1071
submitted: 18/4/12, accepted: 28/4/12, appeared: 1/5/12 © J.UCS

Internet of Things

J.UCS Special Issue

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The Internet of Things refers to a networked interconnection of everyday objects (including users), thus enabling objects not only for beings to interact and cooperate with each other anytime and anyplace. It extends the Internet into the physical world such that objects can be managed remotely and act as physical access points to Internet services. The Internet of Things transforms the manner we perform everyday activities by real-time tracking physical objects. Correspondingly, it opens up tremendous opportunities for economy and individuals, accompanying immense technical challenges and risks.

The Internet of Things systems find direct applicability in a wide range of areas and disciplines. The two typical areas of the Internet of Things are:

- wireless and mobile sensing, tracking and networking, enabling distributed system of numerous sensors, actuators, mobile devices and RFID to identify and manage things and satisfy application requirements
- intelligent transport systems that embed communication and computation capabilities with tracking and controlling vehicles in physical world to handle various challenges imposed on efficient, green and safe transportation

This special issue aims to provide a comprehensive overview of the state-of-the-art development in technology, application, and standardization in the field of Internet of Things, and presents an insight of future research directions and challenges in the Internet of Things. It also provides an opportunity for the researchers in IoT to know their counterpart work, thus facilitating further communication and cooperation. This special issue totally got 22 submissions, and only accepted 8 papers. The acceptance rate is around 36%. It initiated a three-round review process for each submission lasting for seven months, in which each submission was reviewed by at least three reviewers. The selected submissions cover a variety of perspective about Internet of Things. Contributions of these submissions are summarized as follows.

Huang et al. investigated the vehicular ad hoc networks and their applications for Internet of Things. They took the movements and behaviors of vehicles into consideration, and then extracted a mobility model for vehicles from a large amount of real taxi GPS traces data collected in metropolitan scenarios. With this mobility model, the authors further reproduced the synthetic traces and validated their usage in intelligent transport systems.

Lin et al. at Jönköping University, Sweden, regarded that context-awareness was a key technique to enable Internet of Things to serve users without their knowledge about underlying technologies. They incorporated the context modeling and matching into automatic ontology matching process, and proposed a context-based ontology matching scheme. They demonstrated the efficiency of the proposed scheme across a series of cases.

Ning et al. emphasized their work on the authentication problem in the shift from the Unit Internet of Things to Ubiquitous Internet of Things. They come up with an authentication scheme based on directed paths (DPAS) to achieve confidentiality, integrity, anonymity and forward security. DPAS consisted of a directed path descriptor, cross-network authentication and the proof mapping. The experimental results showed that DPAS was appropriate to applications in Internet of Things, yet accompanying moderate communication overheads and computation workloads.

Chen et al. at Waseda University, Japan, proposed a framework to facilitate individualized learning through sharing successful learning processes in Internet of Things. The proposed framework was built on top of the dynamic Bayesian Networks that adapts to the targeted student's requirements. It identified that most students exhibited strong preference to some certain learning patterns in several learning activities. With the findings, the authors infer the students' goals, and reported a goal-driven navigation of individualized learning process.

Predic and Stojanovic at University of Nis, Serbia, conducted a research on the crucial traffic event detection in Internet of Things. They firstly explored the usage of a great many of anonymous mobile and embedded devices involved in the road navigation. Then, they proposed a scheme using the acceleration sensors integrated into mobile devices to detect crucial traffic events and disseminate the events to other drivers with proactive traffic information systems in an efficient and timely manner.

Xingang Liu et al. studied the intraframe video coding in wireless multimedia services provided in Internet of Things. They put forward an intra mode decision algorithm so as to reduce the computation complexity of intraframe H.264/AVC encoders, which determined the candidate modes and skipped the rest of modes according to the smoothness and directional similarity of MB. Evaluation results showed the 18% up to 70% improvement in computation complexity, compared with the conventional methods.

Qiang Liu et al., proposed a network planning process for WiMAX-R network, which could be regarded as a typical application of Internet of Things. The proposed process consists of: WiMAX-R network architecture analysis, railway communication applications QoS parameters analysis, DL/UL link budget calculation, BS coverage calculation, capacity planning and network simulation validation. Simulations demonstrated that the proposed planning process achieved good performance in WiMAX-R networks with respect to QoS and communications.

Qian et al. identified the new challenges raised in Internet of Things owing to the large-scale searching space, the movement of things, the locality of searching behaviors and the cross-domain authentication requirements. These challenges initiated five research thrusts - architectural design, search locality, real-time, scalability and divulging information. On top of these challenging issues, the authors further reported their undertaking work - a security-enhanced search engine for Internet of Things. For each identified challenge, they introduced some mechanisms to ensure the solution to that challenge. For example, they extended the Eliptic Curve Cryptography to achieve security in cross-domain applications in Internet of Things. Finally, the authors reported their preliminary experimental results.

We would like to take this opportunity to thank the Editor-in-Chief for making the possibility of this issue. We also thank Ms. Dana Kaiser for her guidance in terms of camera ready preparation and the review process. We would also like to thank the authors for their excellent contributions. Finally, we express our deepest gratitude to the invited reviewers for their valuable and timely reviews. With their comments, we could make the selection and decision.

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