PEOPLE-CENTRIC INTERNET OF THINGS


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People can now be viewed as an integral part of the Internet of Things (IoT) ecosystem. Although considerable work has been done in the recent past regarding IoT, many challenges remain. In fact, most technologies and solutions for accessing real-world information are either closed, platform-specific, or application-specific. This Feature Topic intends to present, explore, and discuss societal aspects, scenarios, opportunities, risks, and uses of innovative people-centric IoT-based applications, which will undoubtedly be a key piece in the future and emerging people-centric society.

The emphasis of this Feature Topic was put on discussion about state-of-the-art research and development activities contributing to all aspects of people-centric IoT, which include, but are not limited to, people-IoT interactions, social network applications to mobile computing, context-aware applications and services, human in the loop, big data analysis in people-centric IoT, cloud-based people-centric IoT applications and environments, security and privacy, and prototypes, field experiments, and testbeds.

The Call for Papers resulted in 54 submitted high-quality papers, of which we have selected seven papers for publication, a 13 percent acceptance ratio. The topics addressed by these papers include aspects such as vendor-independent cross-platform architectures for mobile apps, cognitive systems for smart homes and energy management, smart city cloud platforms, user behavior classification, assessment and prediction, and human-device cooperation for security and privacy.

Currently, an increasing number of applications for personal mobile devices provide the ability for people to monitor, control, and interact with a variety of sensors and actuators. Nevertheless, the vast majority of these apps resort to vendor-specific application programming interfaces (APIs), thus preventing portability. The article "COIN: Opening the Internet of Things to People's Mobile Devices," by Maria Laura Stefanizzi, Luca Mottola, Luca Mainetti, and Luigi Patrono, proposes the COIN software architecture, an open, vendor-independent, runtime substrate that allows developers to flexibly run arbitrary IoT device tasks, implemented as loosely coupled components.

The article "Butler, Not Servants: A Human-Centric Smart Home Energy Management System," by Siyun Chen, Ting Liu, Feng Gao, Jianting Ji, Zhanbo Xu, Buyue Qian, Hongyu Wu, and Xiaohong Guan, discusses human-centric smart home energy management systems. The authors propose systems that use sensing to discover user patterns of power usage, cognitively understand the behavior of human beings, and optimally schedule home energy systems.

In the article "Smart Home: Cognitive Interactive People-Centric Internet of Things," Shuo Feng, Simon Haykin, and Peyman Setoodeh explore the cognitive IoT paradigm in the context of smart homes. The authors argue that by using the notion of cognitive dynamic systems, which build on perception-action cycles, memory, attention, intelligence, and language, it is possible to engineer IoT applications that cover a wide spectrum of tasks with minimum human intervention.

The article "The Experience of Using the IES Cities Citizen-Centric IoT Platform," by Stefanos Vatsikas, Georgios Kalogridis, Tim Lewis, and Mahesh Sooriyabandara, describes a city-scale IoT platform, covering the system's design principles and underlying capabilities. The IES Cities platform has been deployed in four cities and used for a number of different apps, yielding key insights into citizen-centric IoT application development.

In the article "Exploiting Density to Track Human Behavior in Crowded Environments," by Claudio Martella, Marco Cattani, and Maarten van Steen, the authors propose and discuss a system of mobile sensors augmented with low-cost, fixed proximity sensors to track and understand the behavior of crowds of participants. Through a deployment at a multi-story museum with 3000 daily visitors during the deployment period, the system was validated, and behavior trends of users were discovered.

The article "Gesture Detection of Passive RFID Tags to Enable People-Centric IoT Applications," by Raúl Parada Medina and Joan Melià-Seguí, presents an approach for detecting and classifying human gestures using accelerometer-enabled passive RFID tags and unsupervised machine learning. The proposed approach is expected to contribute to better authentication and personalization in IoT applications and services.

Last but not least, the article "Human Neuro-Activity for Securing Body Area Networks: Application to People-Centric Internet of Things," by J. F. Valenzuela-Valdés, M.A. López-Gordo, P. Padilla, J. L Padilla, and J. Minguillón, presents a really creative idea for securing the communication within wireless body area networks (WBANs). In IoT, applications for frequent automatic renewal of encryption keys are required. However, WBANs are typically built out of low-power-consumption and low-performance hardware. Therefore, such devices cannot generate the required secure random numbers for encryption. The novel idea presented in the article is to generate these numbers from the brain waves of the user (EEG) via a brain-computer interface.

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NICOLAS C. LIEBAU is chief product owner at SAP SE and responsible for the IoT big data functionality within the SAP IoT application enablement cloud service. He joined SAP six years ago, focusing on strategy and product management for Internet of Things applications. He received his Ph.D. from the Multimedia Communications Lab of the Technical University of Darmstadt in the area of accounting in peer-to-peer systems. There he also led the peer-to-peer networking group before joining SAP SE.

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