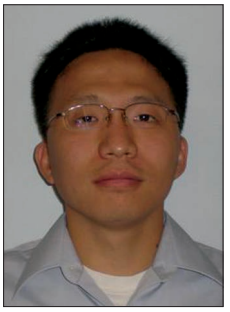
AMBIENT ASSISTED LIVING COMMUNICATIONS



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Nowadays taking care of elderly people and the disabled has become a very important but challenging task. Although the elderly have wisdom and wealth gathered from their life experiences, they require special assistance, higher health insurance costs, and even constant monitoring. By utilizing information process and communications technology, ambient assisted living (AAL) communications open up a new way to address such needs for the aged and the sick. Specifically, AAL uses ambient technologies, including data sensing, processing, transmission, and artificial intelligence, to enable new products, services, and processes that help to provide safe, healthy lives for the aged and disabled. It also supports improved social connections and accessibility to the external world. With the growth of AAL environment, the accessibility gets more challenging for the complex data structure.

In a typical AAL system, ubiquitous computing and sensing integrates microprocessors with common everyday objects, and inter-object communications are enabled via wireless and ad hoc networking. The artificial intelligence empowered by the cloud significantly improves system efficiency. Presently, AAL communications technologies are expected to be transferred first to industry and then to commercial markets. This vision has motivated a voluminous amount of research activities in the field. This Feature Topic intends to capture and expose these activities to the *IEEE Communications Magazine* readership. Through an open call for papers, we received 36 submissions. Eight papers were accepted for final publication after two rounds of highly competitive reviews. The final papers were selected on the basis of originality and significance of the technical work, as well as relevance to the theme topic.

The first article, "A Smart Communication Architecture for Ambient Assisted Living" by J. Lloret, A. Canovas, S. Sendra, and L. Parra, presents an intelligent communication architecture for AAL. It uses artificial intelligence to process the information gathered from several types of communication (e.g., wireless sensor networks, wireless ad hoc networks, wireless mesh networks) over any type of communication technologies (e.g., device to device, machine to machine, sensor-actuator), to know what is happening in the network and detect whether the elderly need to be assisted.

I. Bisio, F. Lavagetto, M. Marchese, and A. Sciarrone contribute an article describing a specific solution called smartphone-centric architecture where smartphones are employed not only as sinks of the health information but also as sensing, processing and transmitting devices. This article is "Smartphone-Centric Ambient Assisted Living Platform for Patients Suffering from Co-Morbidities Monitoring" addresses the case of co-morbidities that indicates the need to acquire a heterogeneous set of data from patients and from their environment. The article also focuses on the information processing capabilities of the smartphone-centric platform.

The article "Overcoming the Challenge of Variety: From Metric-Space Indexing to Big Data Abstraction, the Next Evolution of Data Management for Ambient Assisted Living Communication Systems" by R. Mao, H. Xu, Y. Li, and M. Lu deals with the concept of big data abstraction, using the metric space as the universal abstraction for AAL data types. They show that the metric space is more universal than the conventional multidimensional space and can cover most AAL data types effectively.

The fourth article, "Bayesian Coalition Game for the Internet of Things: An Ambient Intelligence-Based Evaluation," is presented by N. Kumar, N. Chilamkurti, and S. C. Misra. It analyzes a performance evaluation of the Bayesian coalition game among these objects in an IoT environment by using the concepts of game theory and learning automata (LA). In comparison to the available solutions, LA are assumed to be the players, having variable learning rates in the coalition game.

In "LDPA: A Local Data Processing Architecture in Ambient Assisted Living Communications," K. Wang, Y. Shao, L. Shu, G. Han, and C. Zhu present an LDPA on a local server to analyze collected data from ambient sensors. They demonstrate that LDAP disperses the stress of remote centralized processing and data storage, and decreases the workload of a remote health care provider.

Meanwhile, their results indicate that the network load can be reduced and the processing speed improved.

The article "Asynchronous Flow Scheduling for Green Ambient Assisted Living Communications" by D. Wu, Y. Cai, and M. Guizani designs a simple but efficient asynchronous flow scheduling scheme aiming to sense, predict, and realize the AAL applications. They come up with a scheduling architecture by analyzing various device characteristics and user activities, and they also classify the corresponding applications from the aspect of user needs. Their results show that the proposed asynchronous flow scheduling scheme can take energy efficiency into account.

In "Authentication Protocol for Ambient Assisted Living System," He and Zeadally propose a secure, robust, and efficient authentication protocol for ambient assisted living. They present a detailed security analysis of how their proposed protocol meets the various key security requirements (mutual authentication, anonymity, forward secrecy, etc.) for an AAL system based on intra, inter, and beyond body area networks. Finally, they analyze the computational costs of their authentication protocol, compare its performance results with two recently proposed authentication protocols, and demonstrate the improved performance obtained with their proposed protocol.

The last selected article, "Reliable MAC Design for Ambient Assisted Living: Moving the Coordination to the Cloud," is motivated by the recent advances in cloud computing. The authors, E. Kartsakli, A. Antonopoulos, A. S. Lalos, S. Tennina, M. Renzo, L. Alonso, and C. Verikoukis, studied the possibility of transfering the network coordination to the cloud while maintaining the data exchange and storage at a local data plane. Then they designed a general framework for the development of cloud-assisted protocols for AAL applications, and proposed a high-performance and error-resilient MAC scheme with cloud capabilities.

To conclude, we would like to express our heartfelt gratitude to the great support and help from Sean Moore, the Editor-in-Chief of *IEEE Communications Magazine*, Charis Scoggins, Administrative Aide to the Editor-in-Chief, Jennifer Porcello, Production Specialist, and Joseph Milizzo, Assistant Publisher, as well as all the other IEEE Communications Society publications staff. We also thank all the authors who have contributed with their strong articles to the success of this Feature Topic, and all the reviewers that did a professional and timely job of reviewing the papers carefully and offering us the opportunity to publish very high-level articles on the timely topic of ambient assisted living communications.

BIOGRAPHIES

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