

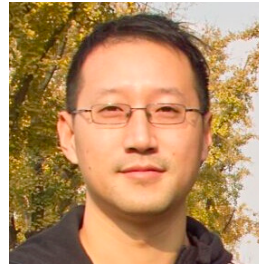
## AMBIENT ASSISTED LIVING



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The cost of formal health care and the caregiver burden introduced by the increasingly aging population pose a drastic challenge to our society. The efforts to find solutions to address this issue have fostered Ambient Assisted Living (AAL) as a novel technology discipline, the aim of which is to exploit the potentials provided by the emerging information and communication technologies to help the aged and recovering people keep an active, independent and safe lifestyle in their daily routine. In recent years, the progress in health sensing, wireless communication, smart home, cloud computing, and assistive robotics has essentially helped the vision of AAL to become a reality. Many research efforts in AAL have been carried out and made significant advances in the development of AAL systems, services, and applications in the areas such as the daily task facilitation, mobility assistance, and the rehabilitation. The goal of this Feature Topic is to explore the recent research activities related to AAL and attract the attention of the academic and industrial communities for developing advanced and innovative methodologies and techniques of AAL.

In particular, this Special Topic Issue contains a collection of papers that will provide both theoretical advances and practical experiences for AAL application. We have accepted 6 papers for this special issue after peer reviewing. We regret that we were not able to accept the many other good papers due to the limited number of papers

that can be published within this Special Issue.

The first article, “Semantic Region Estimation of Assistant Robot for the Elderly Long-Term Operation in Indoor Environment” proposes a novel region estimation approach for the assistant robot with long-term operation tasks. The algorithm firstly adopts particle filter to update weights of the symbols, then uses the Viterbi algorithm to estimate the region the robot stays in based on those weights. The experiments with the service robot are conducted to verify its effectiveness in the real-world AAL application.

The second article, “A measure system of zero moment point using wearable inertial sensors” utilizes inertial sensors to develop an adaptive algorithm and a wearable system to detect zero moment point (ZMP), which is very important for the measurement and estimation of body balance. The system is complete and easy to understand and the overall structure is clear. The experiments prove that the system can achieve real-time detection of body posture and ZMP during walking.

The third article, “Precise Transceiver-free Localization in Complex Indoor Environment” proposes an RF-based localization approach in different complex environments, which is able to accurately localize target without carrying any device. The real-world experiments in different indoor environments are performed based on

telosB sensor nodes, which shows that the proposed approach outperforms the traditional methods significantly.

The fourth article, “DS-MMAC: A Delay-Sensitive Multi-Channel MAC Protocol for Ambient Assisted Living Systems”, proposes a delay-sensitive multichannel MAC protocol for distributed AAL systems. By combining the distributed time slot scheduling and channel assignment together in the process of route establishment, it ensures minimized delay for data transmission in the network, which is verified by the simulation results.

The fifth article, “A coverage-aware unequal clustering protocol with load separation for Ambient Assisted Living based on wireless sensor networks” proposes a coverage-aware unequal clustering protocol with load separation (CUCPLS) to resolve the problem of energy hole and the cluster heads failure during data gathering of AAL applications based on WSNs. To validate the proposal, CUCPLS is realized in the simulation platform and the comparison study results are discussed.

The final article, “Heuristic Virtual Machine Allocation for Multi-tier Ambient Assisted Living Applications in a Cloud Data Center” proposes a hybrid multi-tier queueing model to analyze the relation between virtual machine (VM) allocation and requests’ performance. Based on this model, a heuristic VM allocation algorithm (HVMA) is proposed to optimize resource provisioning for a multi-tier AAL application. To demonstrate the proposal, a cloud-based prototype AAL system is implemented and the corresponding results are presented.

We really appreciate all people who contributed to this special issue, especially those reviewers. Their professional opinions are very important for us to select the high quality papers.

### Biographies

**Jianqiang Li**, received his B.S. degree in Mechatronics from Beijing Institute of Technology, Beijing, China in 1996, M.S. and Ph.D degrees in Control Science and Engineering from Tsinghua University, Beijing, China in 2001 and 2004, respectively. He worked

as a researcher in Digital Enterprise Research Institute, National University of Ireland, Galway in 2004-2005. From 2005 to 2013, he worked in NEC Labs China as a researcher, and Department of Computer Science, Stanford University, as a visiting scholar in 2009-2010. He joined Beijing University of Technology, Beijing, China, in 2013 as Beijing Distinguished Professor. His research interests are in Petri nets, enterprise information system, business process, data mining, information retrieval, semantic web, privacy protection, and big data. He has over 40 publications and 37 international patent applications (19 of them have been granted in China, US, or Japan). He served as PC members in multiple international conferences and organized the IEEE workshop on medical computing 2014-2015.

**Yongcai Wang**, is an associate professor at Renmin University, Beijing. He got his BSc degree from Tsinghua University, China in 2001; PhD degree from Tsinghua University China in 2006. He worked as an associate researcher in NEC Labs. China from 2007 to 2009. From 2009 to 2011, he was a post doctor at Institute for Interdisciplinary Information Sciences (IIIS). In 2011-2015, he was an assistant researcher at IIIS. He was a visiting scholar in Cornell University from Feb. 2014 to August 2014. His major research interests lie in the broad area of sensor information fusion, network measurement, wireless locating algorithms, and systems. He received the best paper awards at UbiComm2009 and CWSN2011.

**Junyu Lai**, received his PhD in Computer Science department, University of Hamburg, Germany in 2012. He was an associate researcher / project manager at NEC Labs China in 2012 and 2013. Since Jan. 2014, he started to work as an associate professor in the University of Electronic Science and Technology of China, and his research interests focused on Software Defined Networking (SDN), Wireless Communications and Cloud Networking, specially emphasizing on the QoS and user QoE improvement.

**Haisheng Tan**, is currently an Associate Professor at the Department of Computer Science, Jinan University (JNU), Guangzhou, China. Previously, he worked as a Postdoctoral Fellow at the Institute for Theoretical Computer Science(ITCS), IIIS, Tsinghua University, Beijing. Before that he got his PhD in Computer Science at the University of Hong Kong (HKU), under the supervision of Prof. Francis C.M. Lau. In his undergraduate studies, he received the B.Eng. in Software Engineering (major, with the highest honor) and B.Sci. in Business (minor), both from the University of Science and Technology of China (USTC). His research interests include distributed algorithms, network algorithms etc.