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Future and Challenges in the Key Enabling Technologies of Smart Cities and Homes and Samples of Our Related Research Efforts

Distinguished Keynote Speaker:
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Abstract:

Smart homes and cities have become an important research and development area in the 21st century due mainly to their significance to national and international health, economy, safety, transportation, and security, among others. ICT Systems have played a vital role in the emergence and development of smart cities and homes. The impressive advances in areas of information and wired and wireless communications technology have brought with them the prospect of embedding different hierarchies of smartness and intelligence in modern home and cities. Offering comfort and safe and healthy living with an intelligent form of collaboration with their residents has been the prime goal of smart and digital homes and cities. Contingent upon the settings, the communications may be multifaceted such as mobile agent based and context-aware services or they may be uncomplicated such as controlling the room temperature or its humidity level. Sophisticated situations include the delivery of position/location-aware info content of the resident of the digital home as well as his/her activities.

The availability of inexpensive low-power sensors, the RF IC chips, and the embedded microprocessors/microcontrollers have made tremendous impact on digital homes and cities; with large quantity of sensors, which jointly manage and make the inferences from the collected data on the state of the home and city as well as the actions and behavior of the inhabitants.

As the worldwide life expectancy, especially in developed countries and newly industrialized counties is increasing, the percentage of senior/elderly citizens is increasing at an accelerated pace and most projections suggest that this increase worldwide will reach about 10 millions in the coming decade. Senior citizens usually live in care centers, hospitals or their own homes with some relative supervision/care. Smart homes and cities can be used efficiently and economically in order to accommodate the needs of this population.

The increase of worldwide population, especially in populous countries and cities and the increase migration of citizens to cities have also brought with it challenges in transportation systems, health care, utility's supplies, learning & education, sensing city dynamics, computing with heterogeneous data sources, managing urban big data, and environmental protection including pollution and others.

In this keynote, we will shed some light on the key enabling Information and Communications technology to smart cities and homes. We will also investigate the advances, current trends, challenges and future in the research and development in smart homes and cities.

Some of our recent research results, especially the ones related to the use of wireless networks and security for smart and digital homes will be presented. Among these, we present or advanced Internet of Thing based Security Alert System for Smart Home in order to detect an intruder or any unusual event at home, when nobody is available there. This low-cost home security system utilizes a small pyroelectric Infrared (PIR) module and raspberry pi for minimizing the delay during process of e-mail alert.

Moreover, we will introduce an adaptive MAC protocol for distributed wireless LANs that is capable of operating efficiently under bursty traffic conditions. According to the proposed protocol, the mobile station that is granted permission to transmit is selected by means of a neural-based algorithm. Another new protocol for dynamically setting 802.11 wireless LAN waveforms and transmission power levels based on the wireless channel's signal to noise ratio will be introduced. Our method, known as Signal-to-Noise Ratio-Waveform Power Adaptation (SNR-WPA), changes the power in discrete steps matched to each of the 802.11 data rate-waveform steps.

We present an energy-efficient ad hoc on-demand routing protocol that balances energy load among nodes so that a minimum energy level is maintained among nodes and the network life increases. Other related wireless research efforts by our group will be presented.

Short Bio of The Distinguished Keynote Speaker:

Professor Mohammad S. Obaidat is an internationally known academic/researcher/scientist/scholar. He received his Ph.D. degree in Computer Engineering with a minor in Computer Science from the Electrical and Computer Engineering (ECE) Department, The Ohio State University, Columbus, USA. He has received extensive research funding and published over 840 refereed technical articles-About half of them are journal articles, over 60 books, and over 60 Book Chapters. He is Editor-in-Chief of 3 scholarly journals and an editor of many other international journals. He is the founding Editor-in Chief of Wiley Security and Privacy Journal.

Among his previous positions are Advisor to the President of Philadelphia University for Research, Development and Information Technology, President of the Society for Molding and Simulation International, SCS, Senior Vice President of SCS, Dean of the College of Engineering at Prince Sultan University, Chair and tenured Professor at the Department of Computer and Information Science and Director of the MS Graduate Program in Data Analytics at Fordham university, Chair and tenured Professor of the Department of Computer Science and Director of the Graduate Program at Monmouth University. He is now a Full Professor at Nazarbayev University, Astana, Kazakhstan, a Full Professor at King Abdullah II School of Information Technology, University of Jordan, The PR of China Ministry of Education Distinguished Overseas Professor at the University of Science and Technology Beijing, China and an Honorary Distinguished Professor at the Amity University- A Global University.

He has chaired numerous (Over 160) international conferences and has given numerous (Over 150) keynote speeches worldwide. He founded or co-founded four international conferences. He has served as ABET/CSAB evaluator and on IEEE CS Fellow Evaluation Committee. He has served as IEEE CS Distinguished Speaker/Lecturer and an ACM Distinguished Lecturer. Since 2004 has has been serving as an SCS Distinguished Lecturer. He received many best paper awards for his papers including ones from IEEE ICC and IEEE Globecom international conferences. He also received many worldwide awards for his technical contributions including: SCS prestigious McLeod Founder's Award , Presidential Service Award, SCS Hall of Fame –Lifetime Achievement Award for his technical contribution to modeling and simulation and for his outstanding visionary leadership and dedication to increasing the effectiveness and broadening the applications of modeling and simulation worldwide. He was awarded in 2017 the IEEE CITS Hall of Fame Distinguished and Eminent Award. He has been awarded with the Amity University Distinguished Honorary Professor Award. He also received the Distinguished Professor Award from University of Science and Technology-Beijing, China, and the SCS Outstanding Service Award.
He is a Life Fellow of IEEE and a Fellow of SCS.