Introduction to the Special Issue on Sensor Technologies and Applications

JAIME LLORET\textsuperscript{1} AND PETRE DINI\textsuperscript{2, 3}

\textsuperscript{1}Polytechnic University of Valencia, Camino Vera s/n, 46022, Valencia (Spain)
E-mail: jlloret@dcom.upv.es
\textsuperscript{2}Cisco Systems Inc., San Jose, CA, USA
E-mail: pdini@cisco.com
\textsuperscript{3}Concordia University, Canada
E-mail: petre@iaria.org

Sensors and sensor networks have become a highly active research area because of their potential of providing diverse services to broad range of applications, not only on science and engineering, but equally importantly on issues related to critical infrastructure protection and security, health care, the environment, energy, food safety, and the potential impact on the quality of all areas of life. There is a great variety of topics and scientific areas related with sensors. The First International Conference on Sensor Technologies and Applications, SENSORCOMM 2007, organized by IARIA (www.iaria.org), appeared to become a primary reference on all research topics related with sensors. It has covered the following subjects:

- Architectures, protocols and algorithms of sensor networks
- Energy, management and control of sensor networks
- Resource allocation, services, QoS and fault tolerance in sensor networks
- Performance, simulation and modelling of sensor networks
- Security and monitoring of sensor networks
- Sensor circuits and sensor devices
- Radio issues in wireless sensor networks
- Software, applications and programming of sensor networks
Introduction

- Data allocation and information in sensor networks
- Deployments and implementations of sensor networks

This issue contains extended versions of seven selected papers, after a peer-review process, of the best papers presented to the conference covering a wide range of topics. Some of them present research and practical results, specific proposals, while others address particular key problems and solutions.

The paper “Algorithms for Relay Node Selection in Randomly Deployed Homogenous Cluster-based Wireless Sensor Networks”, authored by Nauman Aslam, William Robertson and William Phillips, proposes a three-tier architecture for randomly deployed homogeneous WSNs, that allows further energy savings by employing relay nodes, without making any assumptions about mobility and placement of nodes at desired locations. They also propose and evaluate two simple heuristic-based algorithms for relay node selection thus providing a viable and energy efficient topology for cluster-based WSNs.

Miguel Ardid presented the paper “ANTARES: an underwater network of sensors for neutrino astronomy and deep-sea research”. ANTARES is formed by three-dimensional array of photomultipliers used to detect the Cherenkov light emitted by neutrino-induced muons. It has been installed in the Mediterranean Sea, near the Southern French coast. It is at present the largest neutrino telescope in the northern hemisphere and the largest underwater neutrino telescope in the world.

The paper “Introducing a Sensor Network for Advanced Driver Assistance Systems Using Fuzzy Logic and Sensor Data Fusion Techniques”, presented by Mahdi Rezaei Ghahroudi, Mohammadreza Sarshar and Reza Sabzevari, shows an implementation of a network of sensors for advanced driver assistance on some driving tasks such as following and overtaking a vehicle with a safe speed and distance. They introduced a novel deployment for a network of multi-sensors such as Radar, Laser, Ultrasound and Vision. The sensors are mounted on a host vehicle integrated with a logical and multi-sensor data fusion technique using fuzzy method to reduce the driver’s workload and to help lessen the danger of road incidence.

The authors Stephan Mank, Reinhardt Karnapke and Joerg Nolte presented the paper “MLMAC – An adaptive TDMA MAC Protocol for MobileWireless Sensor Networks”. MLMAC is a TDMA based MAC protocol for mobile wireless sensor networks that can react on changing radio neighbourhoods in mobile networks. They also present the results of real experiments with a group of mobile sensor nodes based on RCX robots.

In the paper “Routing Protocols for Wireless Sensor Networks that have an Opportunistic Large Array (OLA) Physical Layer”, authors Lakshmi V. Thanayankizil, Aravind Kailas and Mary Ann Ingram, propose a survivable network protocol that detects a network partition and triggers the creation of a large enough OLA to overcome the partition. The OLA-based protocols presented in this paper are energy efficient, scalable, and simple and have
many attractive features. Cooperative routes can be formed, without the need for an existing multi-hop route or explicit node location information, through simple decisions that nodes make on their own.

The author Ciro Bigongiari presented “The KM3NeT project for a Very Large Submarine Neutrino Telescope”. The solution requires the installation of thousands of photon detectors with their related electronics and calibration systems several kilometres below the sea level. It will be built to study many astrophysical objects, including supernova explosions, active galactic nuclei, gamma-ray bursts and possibly also dark matter. A great number of photon detectors, hydrophones, compasses, tilt-meters, etc. will be connected through electro-optical cables, needed for real-time, to form a cubic kilometre-scale network of sensors operating in a deep sea environment.

The paper “Trade-off Between Power Consumption and Performance in Bluetooth”, presented by Juan-Carlos Cano, Jose-Manuel Cano, Carlos T. Calafate, Eva Gonzalez and Pietro Manconi, shows the investigation of the power characteristics of the Bluetooth technology when supporting low-power operating modes. They validated their study in a Bluetooth-based wireless node designed to support spontaneous and ubiquitous computing. They also examine the trade-off between power-delay and power-throughput trade-off and performance offered by a commercial off-the-shelf Bluetooth device using the sniff mode.

We hope that this selection brings interesting solutions to the reader and stimulates advanced research on sensor technologies. It is our intent to promote such achievements via specialized events (www.iaria.org/conferences) and publications (www.iariajournals.org), as well as other specialized journals.

Jaime Lloret Mauri

Prof. Jaime Lloret received his M.Sc. in Physics in 1997, his M.Sc. in electronic Engineering in 2003 and his Ph.D. in telecommunication engineering (Dr. Ing.) in 2006. He is a Cisco Certified Network Professional Instructor. He worked as a network designer and as an administrator in several enterprises. He is currently Associate Professor in the Polytechnic University of Valencia and he is the leader of the “communications and remote sensing” research line of the Integrated Management Coastal Research Institute. Until 2008, he around 60 scientific papers published in national and international conferences, he had more than 30 papers about education and he had around 30 papers published in international journals (several of them with Journal Citation Report). He has been the co-editor of 12 conference proceedings and guest editor of several international journals. He is editor and the associated editor of several journals. He has been involved in more than 50 Program committees of international conferences and in several Organization and steering committees until 2008. He has been the chairman of SENSORCOMM 2007 and UBICOMM 2008 and he is the chairman of ICNS 2009 and ICAS 2009.
Petre Dini

Prof. Dr. Petre Dini (pdini@cisco.com) is now with Cisco Systems, as a senior technical leader and principal architect, being responsible for policy-based strategic architectures and protocols for network management, QoS, SLA, and performance, programmable networks and services, provisioning under QoS constraints, wireless networks and protocols, and consistent service manageability. He’s applied industrial research interests include instrumentation software agents, performance, scalability, autonomic computing, wireless and mobile networks, constraints in wireless networks, adaptive networks, sensor networks, and policy-related issues in adaptable networks.

Until 1990 he worked as a project director on the development of various industrial applications including CAD/CAM, nuclear plant monitoring, and real-time embedded software. From 1991 he led various Canadian projects related to object-oriented management applications for distributed systems, and to broadband services in multimedia applications, until early 1996. In 1996 he joined Computer Science Research Institute of Montreal and coordinated many projects on distributed software and management architectures. In this period he was an Adjunct Professor with McGill University, Montreal, Canada, and a Canadian representative in some European projects. Since 1998 he was with AT&T Labs, as a senior research manager, focusing on distributed QoS, SLA, and performance in content delivery services. He was the Co-Chair of Policy-Based Management Work Group in Telemanagement Forum, a Rapporteur for ITU-T/SG4, and actively involved in IEEE industrial initiatives. He has been an invited speaker to many international conferences, a tutorial lecturer, and chaired several international conferences. He published more than 100 papers in prestigious conferences and journals, and has more than 20 granted or pending patents.

Petre received his M.Eng. from Polytechnic Institute of Timisoara, Romania, in Computer Engineering, and a Ph.D. in Computer Science from University of Montreal, Canada. He is the president of the non-for-profit association IARIA [International Academy, Research and Industry Association], www.iaria.org. He is currently an Adjunct Professor at Concordia University, Montreal, Canada, a Senior IEEE member, and an ACM member.