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Preface

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This issue of JAISE is a regular issue consisting of 8 articles. These articles handle the various aspects of the design and operation of a Smart Environment and in particular a Smart Home. Reviews of these articles were supervised by our associate editors Carles Gomez, Ahmad Lotfi, Stefano Chessa, Irene Gu, Matjaz Gams, Michel Vacher, Michael Lew, and Andres Muñoz Ortega, whom we thank for their work.

1. This issue

One of the emerging application domains in the general field of Ambient Intelligence and Smart Environments is Smart Homes. There is a plethora of possibilities for research and development in this domain. One of them is related to activity monitoring and behaviour recognition, with the final objective of either assisting the elderly or disabled people, or collecting contextual information and statistics about the home occupants and using that for home automation.

The paper **"Low-cost Indoor Localization Using Cameras – Evaluating AmbiTrack and its Applications in Ambient Assisted Living"** by Braun and Dutz presents AmbiTrack, a solution which allows marker-free localization and tracking of multiple people inside an indoor environment by using a camera-based approach. AmbiTrack has been designed to be cost effective and applicable in Ambient Assistent Living (AAL) settings. In fact, in order to participate in the 3rd EvAAL competition in 2013, the system has been adapted to be more reliable by exploiting contextual information. In the EvAAL competition, AmbiTrack resulted second, among a total of seven participants, being third in overall accuracy and first in ease of integration.

Localization and tracking of people in Smart Homes is just the first step. The paper **"A Supervised Learning Approach for Behaviour Recognition in Smart Homes"** by Chua et al. presents a method that can accurately recognise the inhabitant's activities, such as washing hands, cooking, toasting bread, taking plates or cups, etc. In this way, the system (and the smart home as a whole) can support the inhabitant by alerting about possible risks, detecting anomalous behaviour, adapting the home for environmental conditions or even inducing behavioural change. The behaviour recognition problem is approached by using a set of Hidden Markov Models (HMM) that each recognises a behaviour. The accuracy of the developed algorithm is demonstrated on sensor data from real smart homes.

Instead of being used for supporting generic inhabitants, Smart Homes can be designed for specific users. For instance, the paper **"Automated in-home gait transfer time analysis using video cameras"** by Baldewijns et al. focuses on assisting the elderly as primary users. A system consisting of multiple wall-mounted cameras is used to automatically measure the time an older adult needs to cross a predefined transfer zone in the home environment. This can help in detecting changes in gait speed which could be predictive of health changes of the monitored person. Trends in the measured transfer times are visualised and subsequently compared with the results of clinical assessments obtained during the acquisition period.

However, Smart Home applications are not only addressing the users of the Smart Home, but also the Smart Home itself. For instance, the paper **"Mining**

sequential patterns to efficiently manage Energy Storage Systems within smart home buildings" by Botón-Fernández et al. introduces a smart energy management system capable of controlling energy and smart home devices to optimize the power consumption. The proposed model consists of two main systems: the energy storage units and the central energy management system. The strategy consists of a set of semantic rules, based on sequential patterns, which aim to avoid peaks by shutting down low-priority devices and properly using the stored energy.

On the same research direction, the paper **"A smart university platform for building energy monitoring and savings"** by Stavropoulos et al. is related to energy monitoring, management and savings. However, in this case, the buildings to be monitored are public spaces belonging to the local university, which present additional requirements and challenges. This paper presents a platform which integrates an intelligent, rule-based agent that enforces savings, while a variety of applications offers user interaction with the system and the means for monitoring and management. A pilot deployment of the agent with expert-formulated policies has produced a reduction of the total daily consumption of a typical university office by approximately 16%.

Smart Homes, and Smart Environments in general, can be also locations where collaborative work takes place. The paper **"Analyzing multi-agent approaches for the design of advanced interactive and collaborative systems"** by Badeig et al. has the main objective to determine a set of requirements and proposals for the design of a collaborative interactive system working under distributed tangible environments, such as tangible tables. A wide range of human-machine, human-human, and human-environment interactions has to be considered, which can be suitably modelled using multi-agent architectures. Moreover, this design would require an in-depth analysis of four main properties (autonomy, proactiveness, context awareness, situation-based). The potential interest and complementarity of two main design approaches (holonic and normative) are discussed.

Multi-agent architectures are also used in the paper **"Fly4SmartCity: a Cloud Robotics Service for Smart City Applications"** by Ermacora et al. but for a completely different application. Here, small Unmanned Aerial Vehicles (UAVs) are employed for emergency management operations within a smart city scenario. The system exploits the emerging cloud-robotics paradigm which considers robots as simple agents connected to a remote network infrastructure. Simulated and real experiments show the feasibility of the approach. Legal and operational issues which at present still prevent a practical application of these techniques are also addressed.

Finally, the paper **"Gaussian Process based IAQ Distribution Mapping using an Interactive Service Robot"** by Qian et al. addresses the problem of monitoring Indoor Air Quality (IAQ). Instead of using wireless sensor networks or wearable sensors, this paper proposes the use of interactive service robots as a natural way to learn the environmental map as well as the distribution of Volatile Organic Compounds (VOCs). The robot is equipped with a tailored sensor board for sampling a number of VOC measurements. A key problem is to deal with uncertainties brought by mobile sensing with co-existing people. For solving this, the paper proposes to apply Gaussian processes combined with Monte Carlo sampling method for modeling VOC distribution as well as querying concentration at uncovered locations.