Special theme: ambient assisted living for mobility: safety, well-being and inclusion

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The ageing of the population worldwide is one of the major social and economic issues facing modern society. With age, the risk of frailty increases, including dementia and reduced mobility, and with it, functional dependence to perform activities of daily living. Ambient assisted living (AAL) aims at seamlessly integrating information and communication technologies (ICT) within homes and residences to increase the quality of life and autonomy of older adults.

This special issue focuses on developments in AAL to address mobility challenges among frail older adults, due to physical and cognitive impairments. Among these challenges are an increase risk of falls, inability to independently perform daily activities and difficulties navigating the environment. Ambient technologies can assist automatically detecting falls or relevant activities performed by the older adult, providing augmented cues to assist in mobility and motivating older adults to remain active and autonomous.

Ten papers have been selected to be included in this special issue. The first two papers deal directly with the problem of frailty and the risk of falls.

The paper by Planinc and Kampel entitled ‘Introducing the use of path data for fall detection’ presents an approach based on a depth sensor to detect falls, which are becoming pervasive as their cost decreases. The approach is compared to the use of audio and 2D video exhibiting better performance.

In ‘Elderly frailty detection by using accelerometer-enabled smartphones and clinical information record’, Fontecha et al. describe the use of accelerometer data captured by a mobile phone for gait analysis and frailty estimation. The approach was evaluated with 15 elders, and they identified the strong and weak points of the approach to be used for the design of future systems.

The next two papers are closely related with the former: an important aspect of AAL technologies aimed at assisting in activities of daily living is the recognition of the activity being performed by the user.

In ‘Activity Recognition with Hand-worn Magnetic Sensors’, Maekawa et al. propose the use of magnetic sensors worn in the hand to detect the presence of electrical devices and infer the activity performed by the user. The evaluation performed with real data sets achieved high accuracies even with a small number of sensors.

Bravo et al. present in ‘RFID breadcrumbs for enhanced care data management and dissemination’ an approach that uses RFID and NFC technologies to gather information in data-intensive working environments such as assisted living facilities. They introduce the RFID breadcrumbing interaction metaphor for efficient data management and dissemination.

Once AAL systems are able to recognize the current activities of users, the task is now to help them in performing them. For this reason, one of the more active areas in ambient assisted living is the support for activities of daily living of the cognitive impaired. Two papers deal with this topic.

People with Alzheimer’s have difficulties recognizing objects in their environment and navigating through it. In ‘Augmented reality annotations to assist persons with Alzheimer’s and their caregivers’, Quintana and Favela describe the use of computer vision to create digital tags in

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the home of the person with dementia and discover them when the person wanders. The evaluation of the system, implemented on a mobile phone, showed adequate performance to be used in real-time and found audio notifications to be more efficient than vibrating notifications to alert the user of the presence of tags.

Gomez et al. present in ‘Adaptive manuals as assistive technology to support and train people with acquired brain injury in their daily life activities’ how mobile devices and QR codes can guide users with brain injury while performing supervised activities as part of their rehabilitation process. The system was evaluated with a patient who had suffered a cranioencephalic trauma and exhibited severe deficit of executive operation. With the use of a QR code, the patient reduced the time it took him to prepare breakfast by 30 % while increasing self-confidence performing the activity.

Motivating people (elderly or else) to acquire healthy habits is an important aspect of e-inclusion. In this special issue, we present three experiences in this direction.

‘CAMMInA: A Mobile Ambient Information System to Motivate Elders to Exercise’ by Rodriguez et al. studies the role of persuasion in motivating older adults to maintain an active lifestyle and exercise on a regular basis. The paper describes a user study performed with 10 elders and the design that resulted from these findings. Through a formative evaluation with 15 elders, the authors identify how the persuasion strategies used by CAMMInA may positively and negatively influence on the elders motivation for exercising.

Meza and Morán discuss in ‘UCSA: A design framework for usable cognitive systems for the worried-well’ the issues that need to be considered in the design of applications for cognitive stimulation for the elderly. They introduce a design framework developed from their own experience developing this type of applications. The framework is illustrated through the design of the application Abueparty.

In ‘Ubiquitous monitoring and assessment of childhood obesity’, Zaragoza et al. present ETIOBE, a ubiquitous platform aimed at promoting healthier habits among children under clinical treatment for obesity. An evaluation performed with 20 children provide evidence of that the platform can provide accurate estimates of energy expenditure. In addition, a pilot test with five children for one week showed that there was no resistance to adopt the system.

Finally, the last paper deals with architectural issues. In ‘Self-configuring agents for ambient assisted living applications’, Ayala et al. describe an agent-based platform for AAL systems. The system applies autonomic computing to support the self-configuration of tasks. A performance evaluation is conducted to validate the approach.

With these ten papers, this special issue presents a broad view of the issue of ambient assisted living for mobility, with a particular emphasis on safety, well-being and inclusion.

We would like to thank the reviewers of the manuscripts for their insightful comments, which allowed the authors to improve the papers presented in this special issue.