Guest editorial

Expert environments: machine intelligence methods for ambient intelligence

The ideas put forward by Donald A. Norman (1999) in his monograph entitled *The Invisible Computer* can be considered the main source of inspiration of a new research area, called ambient intelligence. Ambient intelligence, commonly abbreviated as AmI, is primarily concerned with human–environment interactions. An environment is seen anthropomorphically, as an intelligent agent able to interact with users, creating for them processes to interpret, inform, communicate and dialogue (Abowd & Mynatt, 2000; Remagnino & Foresti, 2005).

The history of ambient intelligence starts in Europe in 2001 with the Fifth European Framework Program. At that time, the IST Program Advisory Group (ISTAG) of the European Commission (Directorate General on Information Society and the Media) introduced the concept of ambient intelligence by publishing the report *Scenarios for Ambient Intelligence in 2010* (Ducatel *et al*., 2001). Since then, ambient intelligence has been recognized in Europe as one of the key concepts related to the information and communication technology society. An updated version of the report was published in 2003 under the title *Ambient Intelligence: from Vision to Reality* (Ducatel *et al*., 2003).

Ambient intelligence's emphasis is on support to human interactions with the environment, user-friendliness, ubiquitous accessibility etc. and requires competences from many research areas, ranging from computer vision, machine learning, distributed computing and middleware, context awareness systems, sensor networks etc. Enticing illustrative scenarios have been published, in which the user wears technology that communicates with systems and devices present in the environment in order to provide information and receive services.

Since its inception, ambient intelligence has inspired the design and implementation of system prototypes for intelligent spaces, developed and tested in controlled environments. The scope of this special issue is to publish innovative ideas on a selection of topics related to ambient intelligence.

Cameras and computer vision algorithms, for instance, can be used to unobtrusively acquire awareness of the environment. In the paper entitled 'A multi-camera vision system for fall detection and alarm generation', Cucchiara *et al*. propose a system for using cameras to detect people's falls. The use of cameras is preferred in ambient intelligence to accelerometers or other devices because they are not intrusive, people tend to get used to their presence and people's actions are less affected. In this paper, a system of multiple cameras is used to monitor people's movements in house environments and detect changes in people's posture with the specific goal to identify falls.

In the paper entitled 'Understanding intention of movement from electroencephalograms', Lakany and Conway analyse people's intentions, using electroencephalogram waves. Their method is non-intrusive and it uses a brain–computer interface. Support vector machines are used to select features and perform classification of intentions, and tests are performed to detect the direction of users' movements.

While the previous papers address ambient intelligence from the point of view of sensing

technologies and algorithms, the following two papers are mainly focused on knowledge representation for context awareness. The paper entitled 'Knowledge representation for ambient security' by Snidaro and Foresti proposes an ontology-based methodology for representing the interaction between the user and the environment with specific reference to security scenarios. Similarly, in the paper entitled 'Context-aware environments: from specification to implementation' Reigner *et al.* are concerned with the problem of implementing a context model for a smart environment. Their paper proposes interesting approaches based on 'networks of situations', introducing a comparison of the use of Petri nets and hidden Markov models.

Finally, in the paper entitled 'Collection, storage and application of human knowledge in expert system development' Balch *et al.* propose an analysis of the knowledge engineering flow, encompassing knowledge acquisition, representation and inference. This flow analysis is presented and applied to the petroleum industry application domain, and specific software tools that use fuzzy logic are utilized.

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