



Guest editorial: the Italian perspective of AAL services and technologies

Giovanni Diraco¹ · Alessandro Leone¹

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This special issue presents the best papers selected from the 9th Italian Forum on Ambient Assisted Living (ForItAAL-2018), Lecce, Italy, July 2–4 2018. The ForItAAL is the annual event during which academics, researchers, students, practitioners, as well as companies and policymakers meet to discuss on the challenges of aging population and demographic change, aiming to promote innovation, knowledge, and opportunities in the context of the ambient assisted living and related fields (e.g., active and healthy aging, and smart living).

The papers included in this special issues were selected in two stages. In the first stage, the 47 full-papers presented at the conference were ranked by a committee of academics and researchers, selecting 20 best papers that were invited to contribute to this special issue. In the second stage, the contributed papers, extended from their original versions, underwent two or three rounds of rigorous peer-reviewed process. The 12 finally accepted papers cover extremely interesting issues emerging on the path of ambient assisted living research, ranging from psychophysical condition monitoring to human-assistive robotics, passing through ambient assisted rehabilitation, user-centred design and technology co-design.

The first paper by Zanetti et al. (Multilevel assessment of mental stress via Network Physiology paradigm using consumer wearable devices) proposes a procedure for classification of three different mental states (i.e., rest, sustained attention, and stress) using minimally invasive wearable devices, able to simultaneously record ECG (electrocardiogram), EEG (electroencephalogram), BVP (blood volume pulse) and respiration signals. The novelty of their stress

detection approach lies in the use of the new paradigm of Network Physiology, in which each organ system is seen as a node of a complex network of physiological dynamical interactions.

The second paper by Radogna et al. (Exhaled breath monitoring during home ventilo-therapy in COPD patients by a new distributed tele-medicine system) presents a smart breath analyser (SBA) for telemonitoring of exhaled air in patients suffering of chronic respiratory failure and home-assisted by mechanical ventilation. The preliminary functional tests demonstrate the concrete possibility to use the SBA in-home ventilo-therapy protocols allowing a clinical interpretation of the monitored parameters from a physiological point of view.

The third paper by Esposito et al. (Elder user's attitude toward assistive virtual agents: the role of voice and gender) investigates the role of specific attributes, in particular gender and voice, of humanoid virtual agents during the interaction with elderly users. The findings of this research study indicate that elderly users, independently from their gender, prefer to interact with female agents, especially when they can talk to them, revealing the role played by the voice.

The fourth paper by Meriggi et al. (From AAL to ambient assisted rehabilitation: a research pilot protocol based on smart objects and biofeedback) presents an innovative paediatric rehabilitation protocol based on “smartified” objects and biofeedback, administered to children with unilateral cerebral palsy. The findings of this feasibility study suggest that “smartified” objects have a great potential in rehabilitation, not only in terms of appeal and engagement but also from a quantitative and personalized perspective.

The fifth paper by Pierleoni et al. (Biological age estimation using an eHealth system based on wearable sensors) presents a non-invasive methodology for the estimation of the biological age in elderly people. The biological age, unlike the chronological age which simply depends on the birth date, represents the age based on the biological quality and functioning of tissues, apparatus, and organs of an

✉ Alessandro Leone
alessandro.leone@cnr.it

Giovanni Diraco
giovanni.diraco@cnr.it

¹ CNR - National Research Council of Italy, IMM - Institute for Microelectronics and Microsystems, Lecce, Italy

individual. It, therefore, plays an important role, more than chronological age, in forecasting the course of diseases and the mortality rate.

The sixth paper by Pierleoni et al. (Real-time smart monitoring system for atrial fibrillation pathology) presents an Android application capable of detecting atrial fibrillation which is a common cardiac pathology that, due to its unpredictability, often remains undetected. The authors' application is able to process raw data in real-time from wearable sensors, which provide information about stress level, calorie consumption, sinus arrhythmia, sinus rhythm classification, and apnoea condition. The novelty of their application is the implementation of a support vector machine-based algorithm designed to detect atrial fibrillation episodes by handling electrocardiogram and heart-rate sequences.

The seventh paper by Cavallo et al. (Mood classification through physiological parameters) presents a physiological wearable sensor system able to recognize different moods elicited by social interaction. The authors' system is composed of three different physiological sensors able to monitor electrodermal, electrocardiogram and electroencephalogram signals. Mood monitoring is useful for people suffering from mild cognitive impairment, for which rapid mood changes might indicate worsening of cognitive function.

The eighth paper by Mekuria et al. (Smart home reasoning systems: a systematic literature review) presents a comprehensive literature review aiming to systematically examine, characterize and evaluate reasoning systems of smart homes and their utilized reasoning techniques. The automatic adaptation of a living environment, towards achieving comfort and efficiency goals of inhabitants, is mainly determined by the reasoning system: the brain of a smart home system.

The ninth paper by Andó et al. (A smart inertial system for fall detection) proposed a new fall detection and ADLs classification paradigm suitable for battery-powered operations, with specific focus to low power embedded systems. The authors' approach exploits the maximum value of the correlation between two signals, and it is implemented in an ad-hoc developed embedded system based on a microcontroller to support sensing and communication.

The tenth paper by Umbrico et al. (Towards intelligent continuous assistance) presents some relevant results of a research initiative aiming at developing an intelligent control architecture for assistive robots that take advantage of the continuous flow of information provided by a sensor network. The contributions of this paper are twofold: (1)

starting from the analysis of requirements coming from the real world, it envisages a conceptual cognitive architecture highlighting the functional requirements and the key capabilities characterizing an "ideal" intelligent assistive robot; (2) it presents a prototype of a testbed architecture called KOaLa (Knowledge-based cOntinuous Loop) which integrates sensor data representation, knowledge reasoning and decision-making capabilities showing its novelty in a realistic scenario.

The eleventh paper by Freddi et al. (Development and experimental validation of algorithms for human–robot interaction in simulated and real scenarios) presents an architecture for human–robot interaction towards assisted daily living environments. The issues faced by the authors are threefold: (1) the development of a simulator for the robot arm in order to test the implemented algorithms; (2) the development of a gesture recognition algorithm for the object selection; (3) the interaction between robot and user during object transferring from the robot manipulator to the user's hand.

The twelfth paper by Cortellessa et al. (Co-design of TV-based home support for early stage of dementia) describes the creation process of an innovative system specifically designed to support people with mild cognitive impairment or mild dementia, exploiting a simple and extremely familiar technology to older people, as surely is the television. In particular, the authors deeply describe the co-design approach of the prototype pursued during the project which required a constant and repeated involvement of potential users over time. The contribution of this paper is twofold: (1) the description of the co-design approach used to build the system, that involved around a hundred users for user need elicitation and long-term assessment of initial prototypes; (2) the realization of a complete system for both older adults and their relatives that has been deployed in 15 homes for a month.

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