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Editorial

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Internet of things for health and well-being applications

The Internet of Things (IoT) has become one of the most disruptive revolutions since the advent of the Internet. The IoT brings a shift from a network of personal computers towards a network of systems and devices of a diverse nature which touches upon many aspects of daily life and affects most industries globally. IoT has the capability of augmenting our lives by completely reshaping the world and our interactions with it as we know them. IoT arrives at a time where healthcare and well-being needs are a rising demand, with a growingly ageing society in seek of care. Given this demand, IoT technologies have been applied to this domain to increase the quality of health care and overall well-being while reducing related costs and overheads. Examples of this include: IoT-enabled residential environments to provide assisted living for dementia suffers, well-being monitoring and intervention powered by low-cost sensing devices, and quantification of the self.

This special collection accepted eight articles submitted by authors from Chile, Mexico, Slovakia, Spain, and the United States of America after undergoing a rigorous peer-review process. These articles bring together the latest experiences, findings, and developments on IoT for the provision of personalised health and well-being services.

IoT infrastructures are of great interest because some of them can facilitate obtaining data about potential users or patients unobtrusively. This is particularly true in settings where users must go by their day-to-day activities without much interference. In this direction, López-Nava and Muñoz-Meléndez[1] proposed the use of wearable inertial sensors in combination with machine learning models to detect a set of activities of daily living, such as functional mobility, and instrumental activities of daily living, like preparing meals. These activities are performed by test subjects in their homes in naturalistic conditions, thus transcending from standard in-the-lab studies.

González et al.[2] developed and validated a wearable IoT infrastructure for characterising gait in older adults in elderly care homes, in which they used inertial sensors positioned on the upper back of older adults. They validated the proposed infrastructure by carrying out a cross-sectional study with 81 older adults in two nursing homes in Spain. This very problem is also approached by Kessler et al.[3] through the use of similar sensors but embedded directly into the floor. Instead of measuring the inertia of the body, the authors characterised the walking patterns by measuring and analysing the vibrations generated on the floor by the users' footsteps.

López-Medina et al.[4] produced a solution which aims to detect falls in at-risk populations. This involved the use of privacy-preserving, low-resolution, thermal vision sensors intended to be mounted to the ceiling of a domiciliary area. Data from these sensors were processed in real-time using a variety of convolutional neural network architectures which were turned to detect a representation of a fallen individual within a perceived area. This was evaluated and was shown to perform with a high level of accuracy.

Smartphones stand out as possibly the richest IoT sensor ecosystems to date. These devices are standardly instrumented with a wide spectrum of hardware and software sensors that can be used in multiple applications. Remarkable efforts have been devoted in recent years to develop frameworks to facilitate the widespread use of smartphones in health and well-being studies as mobile sensing infrastructures. Felix et al.[5] presented a novel tool that leverages mobile phones not only to collect data via their sensors but also to process them on the device as soon as they are gathered. The framework allows researchers to easily configure the required processing routines on mobile phones remotely. In doing so, this work proposes a new approach for rapid deployment of sensing campaigns targeted at scientists with basic technical knowledge and requiring low effort.

One major goal of a relevant number of IoT-based health solutions is to change behaviour effectively. Rossel et al.[6] devised, developed, and evaluated a wearable system which assists with the cessation of smoking particularly. The solution developed a low-cost device that may be worn on the body or affixed to the clothing. This device detects levels of atmospheric factors indicating smoke or secondhand smoke. The device is integrated into an application which is used to promote smoking cessation. In evaluation, this approach showed promise in the quantification of smoke exposure.

The application of IoT technologies to mental well-being has also attracted a lot of attention just recently. Cupkova et al.[7] studied how intelligently controlled lighting can positively influence people. The proposed solution uses video-based emotion recognition to infer the affective state of the user. This information is then used to adjust the lights of the setting according to the emotional result using the principles of colour psychology.

Still, in many infrastructures like the ones mentioned above, one of the prime concerns is privacy. This is addressed by Robles et al.[8] who devised a new personal data protection mechanism for well-being services based on blockchain networks mainly characterised by transparency, accuracy, accountability, and others. This new architecture follows the PbD principles and edge computing paradigm. The proposal was experimentally validated showing that user experience is not affected by the use of this new architecture and even sometimes is improved.

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