Preface

Living and working in smart buildings: Past, present and future

Stefan Poslad [a] and Andrés Muñoz [b]

[a] *Queen Mary University of London, UK*
E-mail: *stefan.poslad@qmul.ac.uk*
[b] *Universidad Católica San Antonio de Murcia, Spain*

Abstract. Buildings are becoming more intelligent as physical environments, whose operations can be more intuitively and automatically tagged, sensed and controlled to adapt to changing physical environment conditions and the human behaviour of its inhabitants. We can imagine that 10 years in the future, workplaces and habitats will be even more sensor-driven, automated and adaptive. Not only can smart environment improve the present and future buildings but they can also be used to catalog physical elements and their context such as the location and spatial view of objects in a bounded space to better understand the use of historical buildings too.

Keywords: Smart building, context-aware, automation, localization, future industry

1. Introduction to smart buildings: Past, present and future

Smart buildings tend to focus on increasingly automating the monitoring and control of its core operations such as lights, heating, doors and window shutters and security, for these to become more optimally managed and controlled, minimising the ICT and energy resources consumed [5]. It is logical to extrapolate this trend to optimise buildings' operations further through adding more sensors and actuators to adapt a wider range of operations [6]. This issue seeks to go beyond such approaches and to think more outside the box at envisaging how the inhabitation of smart buildings could be more richly sensed and to think about how the sensed state of the building can be translated into richer contexts, e.g., that can adapt to location [4] and to the inhabitants [1] to more intelligently adapt their services. The enabling technologies that tag, sense and visualise objects, applied to better utilise and understand buildings in the present and future, can also be applied in the past too, to historical buildings and archaeological sites [2].

This Thematic Issue features 3 articles, which address the challenges of smart buildings. These papers are elaborated versions of papers that were presented during the 12th International Conference on Intelligent Environments (IE 2016) that took place in London, UK [3].

2. Outline of the thematic issue

The indoor location problem is one of the current main research lines related to smart buildings, since such location information is considered as an essential part of the user's context. In this issue, Fet, Handte and Marrón study in their paper entitled **'Autonomous adaptation of indoor localization systems in smart environments'** the challenge posed when locating people and objects in dynamic indoor environments. Changes in the configuration of such spaces (e.g., movement of furniture) can cause significant errors in determining positions. This paper proposes an autonomous recalibration process in a self-monitoring system based on a fingerprint indoor localization mechanism. The resulting proposal relies on a software-based solution using off-the-shelf hardware, being cost-effective to deploy and with a localization performance up to 93%.

Another important topic in smart building is related to object size and movement estimation. Falomir addresses this question in her paper **'Qualitative descriptors applied to ambient intelligent systems'**

by introducing different systems capable of providing qualitative descriptions of images, 3D scenes and movements. Such systems extend the Qualitative Image Description (QID) approach by modelling the descriptions through first-order logic to enable reasoning about the qualitative sizes of the objects as a new feature, their positions and their relations in 3D space along with their movement relations. The paper shows the results of several real tests that positively validate the flexibility and applicability of the proposed qualitative descriptors and their logic-based representation.

Finally, Kymäläinen et al. in their paper **'A creative prototype illustrating the ambient user experience of an intelligent future factory'** situate the reader in the year 2025 by presenting a user experience research performed through a video-illustrated science fiction prototype for process control workers. The authors examine the Industry 4.0 concept by means of user experience design research, explicitly targeted at process control workers in future process plants. The idea of an inclusive approach through interface design experience using 'fiction prototyping' provides the potential of a powerful methodology for creating participatory and community-led engagement. This approach is proposed to assist in achieving early participation of the users and thus in gaining a better insight into their needs and enabling the development of a co-design methodology for the future smart autonomous systems.

3. Epilogue

The guest editors of this thematic issue would like to thank the authors who contributed articles to the 12th International Conference on Intelligent Environments, 2016, and to this issue. The diversity of the articles showcases the research and development of smart buildings that are now becoming widespread in almost every sector of society, able to encompass technological advances in diverse disciplines (i.e. Internet of Things, context-awareness, image processing and HCI) and to permeate seemingly unrelated domains (e.g., archaeology). We look forward to more decades of fruitful research for smart buildings with and for society!

References

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