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Introduction to the thematic issue on Reflections and advances in Ambient Intelligence

Boris de Ruyter [a,*], Achilles Kameas [b] and Irene Mavrommati [b]
[a] *Philips Research & Radboud University Nijmegen, Netherlands*
[b] *Hellenic Open University, Greece*

Abstract. During the past decade, researchers from humanities, design, science and engineering, have been collectively working towards the realization of the Ambient Intelligence vision. This thematic issue records the evolution of the field and fosters scientific debate on research issues and reflection on the progress of Ambient Intelligence and its future.

Keywords: Ambient Intelligence, vision, advances

1. Introduction to reflections and advances in Ambient Intelligence

Introduced as a human – centric approach towards technology development [2], Ambient Intelligence (AmI) is a research area with a broad and interdisciplinary character [5]. Since its introduction AmI has influenced different research fields such as persuasive technologies [3] and has sparked innovative research directions [1]. The possibilities that Ambient Intelligence technology and its applications have realized to this date, and the outlook of the field into the future, are the prime foci of this Thematic Issue of the Journal of Ambient Intelligence and Smart Environments, which focuses on recording Reflections & Advances in Ambient Intelligence. The issue brings together research reflecting in Ambient Intelligence advances from the perspective of science, engineering, and design, working towards the vision of Ambient Intelligence, in several of its sub-research areas, such as theoretical foundations, historical progress and future outlook, aging and wellbeing, privacy, identification, use of augmented reality in AmI, games and entertainment, to mention but a few.

*Corresponding author. E-mail: boris.de.ruyter@philips.com.

The Thematic Issue features 4 articles, which address challenges of Ambient Intelligence vision and approach, applications, heterogeneity, scaling, quality of experience, and its sociocultural impact and implications. These papers are elaborated versions of papers that were presented during the 12th European Conference on Ambient Intelligence (AmI 2015) that took place in Athens, Greece [4].

2. Outline of the thematic issue

The first article ***"Ambient Intelligence: Vision, research, and life"*** provides a broad and inspiring retrospective of research in the area of AmI together with a vision for possible future directions of the field. It provides a critical view of the progress made in the field of Ambient Intelligence since its early days and discusses the degree to which the early AmI vision has materialized. The paper argues that to a large extent that we already live in the AmI era, yet "true" intelligence appears to remain elusive. The various reincarnations of the vision are explained from a historical and societal perspective, together with some of the critiques levelled against it. As many research challenges still remaining open the author continues to dis-

cuss how Ambient Intelligence research can be aligned to contemporary societal needs, stressing as particularly important the need to create mechanisms that will enable people to interact and benefit from the envisioned technological infrastructure avoiding some of the dangers that embedding computational intelligence in our physical environment brings about. Observing the diversification of research to address different application areas, it is denoted that the impetus towards Ambient Intelligence needs to be renewed with a uniting challenge that transcends the mere development of technological infrastructure.

Over the past few years, augmented reality (AR) has been increasingly included in location-based applications. A situation often encountered in AR applications is the partial or full occlusion of – physical or virtual – objects by physical obstacles. Existing outdoors AR applications overlook this issue by displaying visual indicators about nearby annotated objects even when those are out of the users' field of view (FoV). The article ***"Augmented reality in cultural heritage: Field of view awareness in an archaeological site mobile guide"*** presents a geolocative raycasting technique that enables real time building recognition towards the device's pointing direction, thereby estimating the FoV of the users, in order to improve their perception of surrounding space. The paper concludes with field trials that provide preliminary evidence of the efficiency, effectiveness and utility of KnossosAR, an AmI-AR application developed for the ancient site of Knossos in Crete.

The article ***"Augmented paper maps: Design of POI markers and effects on group navigation"*** investigates the projection of Points of Interest (POIs) on images generated with a smartphone camera, applying AR techniques over printed maps, to expand the information space available during navigation by overlaying POIs and routes. Two aspects critical to the use of augmented paper maps are addressed: appropriate visualization of POIs to facilitate selection and augmentation of paper maps with route instructions. The paper concludes with assessing the affective state and user experience during navigation.

The final article ***"From interactive surfaces to interactive game pieces in hybrid board games"*** addresses interactive surfaces and Tangible User Interfaces (TUIs) that provide new opportunities for hybrid board games, by mixing the social affordances of traditional board games with the interactivity of video games. The paper proposes an approach centered on the concepts of tokens, constraints, spatial expressions and interaction events, which relies on physical manipulation of interactive, computer-augmented game pieces on conventional surfaces. An extensive literature review of hybrid board games is provided, together with a real game developed for training emergency workers, offering useful feedback and highlighting design opportunities and further challenges.

3. Epilogue

The guest editors of this thematic issue would like to thank the authors who contributed articles to the AmI 2015 conference and to this issue. The diversity of the articles proves that the AmI field has now become widespread in almost every sector of society, able to encompass technological advances in diverse disciplines (i.e. AR) and to permeate seemingly unrelated domains (i.e. board games). We note with pleasure that the people/users have now become the common driving force behind AmI research – all papers have a strong user focus. We are looking forward to more decades of fruitful AmI research, with and for society!

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