Chapter 4
Developing Augmented Reality Applications Using Branded Authoring Environments

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ABSTRACT

In this chapter, we present the main interaction design issues that arise during the development of edutainment scenarios through the use of branded augmented reality (AR) authoring environments. Most proprietary AR systems offer limited interaction features within their entry-level version, while licensing unlocks the desired advanced features. In order to overcome this problem we employ experimental multimedia development methods for the design of content for those platforms, enabling the development of fully featured case studies where interaction is implemented both physically and virtually. The introduction and literature research sections are complemented by selected experimental case studies that explore the interaction capabilities. It is shown how these may be implemented using limited AR resources. The chapter concludes with the presentation of the social software perspective of the communication process, as the application areas and the content domain presented in this work feature clear collaborative potential that needs to be addressed by system design.

INTRODUCTION

The interest for the development of augmented reality (AR) applications has increased in the last few years, mainly due to the replacement of earlier QR-code technologies (Rowles, 2013) with natural visual tracking recognition (Kerdvibulvech). This feature clearly offers multiple potential uses as it removes the need for visible markers: images, drawings, items and physical spaces can be used as markers that initiate the augmentation. In addition, the wide availability of handheld multimedia-enabled mobile devices (mobile phones, PDA's), combined with their increasing processing power and Internet con-

DOI: 10.4018/978-1-4666-8659-5.ch004

nectivity offer a developmental platform featuring all the technological characteristics that may support augmentation. The most interesting characteristic of augmented reality applications using visual tracking technologies is the fact that everything around the user may potentially be used as an information trigger (Van Krevelen & Poelman, 2010). Furthermore, multiple users may be presented with different types of content, within the same information space, as marker-to-content-mapping is identified uniquely under each AR system. Typical application areas range from advertising campaigns (Stoyanova, Gonçalves, Brito, & Coelho, 2013) and product catalogues (Patil, Balar, Malviya, & Prasad) to art-based applications (T. Song & Jiashan, 2013), museums (Ramirez et al., 2013), tourism (Casella & Coelho, 2013) and educational systems (Cheah, Quah, Wong, & Zainon). An important feature of this technology is its potential connectivity and interoperability with different platforms. Clearly, the development of wearable technologies that include Google Glasses, Microsoft HoloLens and other competing systems that are bound to complement or replace mobile phones and tablets is the targeted technology. These offer a number of features which renders them ideal for navigation in real-life spaces as they provide a new platform for development, permitting the display of augmented content (Paszkiel, 2014).

However the majority of AR platforms used to recognise, retrieve and deliver the content are bound by limitations in various forefronts (Kerdvibulvech). These include poor system performance in varying hardware specifications, reduced artifact recognition in variable lighting conditions, various user-positioning issues as they can only recognise a specific perspective and poor support for the development of systems featuring complex game-like interaction. In this work we particularly focus on the final issue of interaction as it poses a significant limiting factor evident in the majority of AR systems. In order to study and overcome the limitations introduced for each scenario, we developed with our student teams a number of case studies using freely available branded AR authoring environments as experimentation platforms. Various design issues of the systems developed are presented and discussed in this work where we particularly focus on interaction capabilities and the methods developed in order to overcome and implement the end-system.

From the software development perspective, augmented reality multiplexes the processes of creation, integration, encoding, transmission identification and presentation of content containing various media types. Interaction with multimedia content often introduces simultaneous interaction of multiple content types across multiple users in systems referred as "dynamic" (Nardelli, 2010; Trifonova, Ahmed, & Jaccheri, 2009; Trifonova, Jaccheri, & Bergaust, 2008). As interactive multimedia enable the development of customized computer systems and applications, we can safely assume that within a few years this research-field will continue to play a key role at the forefront of developments. In Greece this major shift impacts the sector of new-media arts and more particularly interactive multimedia art. Artists combine multimedia technologies and push sensing systems to the limit in their attempts to discover new possibilities of creation and dissemination of content to their audiences (Deliyannis, 2012; Ioannis Deliyannis, 2013; I. Deliyannis, 2013; Deliyannis, 2014, 2015; Deliyannis, Giannakoulopoulos, & Oikonomidou, 2013; Deliyannis & Papaioannou, 2014). Experimental multimedia technologies excite the imagination of developers and supports their creativity demands, as they offer a palette of new tools for creativity and user-content interaction, while they allow digital delivery of their content over the Internet (Deliyannis, 2012). Devices such as radio, television, computers and sensors are often used as tools to create and present innovative works of art. During this process, various experiments have resulted in challenging the boundaries of art and technology. Typical areas of application of experimental multimedia technology are not only limited to interactive-art performances, happenings and installations that enjoy growing interest and popularity, but they also extend to everyday applications and services