Chapter 5

An Initial Framework to Develop a Mobile Five Human Senses Augmented Reality System for Museums

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ABSTRACT

The Mobile Five Senses Augmented Reality System for Museums (M5SAR) project aims to development an Augmented Reality mobile system for museums. Museums are amazing places, where it is important to sensorial augment as much as possible the visits, permitting to see, ear, touch, smell, and taste all the interesting objects there exist. Also fundamental is that visitors with different profiles (child, adult, expert, etc.) can have different experiences when visiting the same object. In the M5SAR system, the visitor uses its smartphone to select the object(s) to explore, and the user interface adapts on-the-fly to the object(s) and user’s profile. Simultaneously, when integrated, a paired hardware device allows the extension of the augmented reality system to the human five senses, complementing the visual and auditory information about the objects. This chapter presents the initial framework to develop a five senses mobile adaptive museum system.

INTRODUCTION

The Mobile Five Senses Augmented Reality System for Museums (M5SAR) project aims at the development of an enhanced Augmented Reality (AR) system, to be a guide in cultural, historical and museum events, complementing or replacing the traditional orientation given by tour guides, directional signs, or maps. The system consists of a (i) smartphone/phablet application (APP) and a (ii) hardware device (referred as HDevice) to be integrated with smartphones/phablets, in order to explore the five human senses: sight, hearing, touch, smell, and taste. Both components, (i) and (ii), can work in stand-alone or integrated fashion.

Nowadays, many personal and context-aware tourism and cultural experiences are constructed based on mobile APPs (Jung, Chung, & Leue, 2015), including the ones that use AR. Those APPs are increasing in number due to the popularity of built-in cameras, global positioning systems, and with the massive availability of Internet connections. On the other hand, most of the present User Interfaces (UI) still traditionally follow a one-size-fits-all model, typically ignoring the needs, abilities, and preferences of individual users. However, past research pointed out that visualization performance could be improved by adapting some of its aspects to the individual user (Steichen, Conati & Carenini, 2014). Conati, Carenini, Toker, and Lallé (2015) state that intelligent adaptive user interfaces (AUI) and/or visualizations, that can adapt on-the-fly to the specific needs and abilities of each individual user, are a long-term research goal. This is due to two main difficulties: (a) the extraction of information about the users’ needs and abilities and (b) the implementation of UIs that can adapt/change “themselves” on-the-fly.

Reinecke and Bernstein (2013) refer that a modular UI that allows a flexible composition of various interface elements increases the number of variations of the interface element to the power of the number of adaptable elements. Thus, instead of designing each interface from scratch, a modular user interface approach is possibly a better solution, once it allows achieving many more versions with less design effort. Therefore, the requirement changes to the creation of different designs for all those parts of the interface that are subject to user or cultural preferences. Equal importance should be given to the UI adaptation to users with different impairments. Unfortunately, because of the great variety of existing impairments, it is expectable that manually and, probably, modular designing interfaces, for each one of those impairments, is impractical and not scalable (Gajos, Wobbrock, & Weld, 2008; Rodrigues, Lessa, Gregório, Ramos, & Cardoso, 2016). Nevertheless, the modular and/or adaptive generation of