

Chapter 10

Mobile Augmented Reality: Evolving Human–Computer Interaction

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ABSTRACT

Users who have access to a mobile device have increased in recent years. Therefore, it is possible to use a mobile device as a tool which helps to users in their daily life activities, not only for communication. On the other hand, augmented reality is a growing technology which allows the interaction with real and virtual information at the same time. Mixing mobile devices and augmented reality open the possibility to develop useful applications that users can carry with them all the time. This chapter describes recent advances in the application of mobile augmented reality in automotive industry, commerce, education, entertainment, and medicine; also identifies the different devices used to generate augmented reality, highlights factors to be taken into account for developing mobile augmented applications, introduces challenges to be addressed, and discusses future trends.

INTRODUCTION

Mobile devices with high computing capabilities, communication modules, high-resolution cameras, and several integrated sensors, have changed the way of communication between individuals. Applications developed for those devices allow users to access Internet for searching information, making purchases, performing banking transactions, sharing photos, or just chat. This growing market of devices and applications provides to augmented reality an open field to generate a better user experience, at the same time that new challenges on mobile computing emerge.

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Mobile Augmented Reality

The interaction with virtual information over the real world extends the user perception and increases the skills to perform complex tasks. These tasks include: manufacturing a product while specific instructions to assemble it correctly are displayed, playing games composed by real objects or persons, learning by visualizing extra information of objects that are being observed through the camera of a mobile device, performing a surgery while the surgeon is aware of other anatomical relationships in the body of patient, sampling garments before physically try them on, perceiving traffic conditions while driving without lose the attention on the road, among others. To get an increase on knowledge, entertainment, and communication of users, all these forms of interaction need to be directed toward the development of well-designed and useful applications; therefore, emphasis has to be put in the content production, by verifying that the content is helpful and not distracting in order to avoid accidents.

With the aim to get the best of this growing technology, it is important to identify the factors which guarantees the effectiveness of proposed solutions; those factors are dependent on the activity to be performed and the devices available for each activity. The development process should consider adaptation to different kinds of mobile devices to increase portability, moderate the interaction to increase usability, and protect personal information to ensure security. A compilation of recent advances in the inclusion of augmented reality in areas like automotive industry, commerce, education, video games, and medicine, is summarized here, the factors to consider for the development of mobile augmented reality applications are described, and finally challenges to be addressed are discussed.

BACKGROUND

Augmented Reality (AR) is an extension of reality by means of the addition of virtual information that complements the reality perceived by the user. This extension can be composed of 3D virtual objects, textual information, sounds, odors, holograms, and any other artifact with which the user can be in contact. Mobile devices, being carried by a vast majority of users, make possible to talk about mobile augmented reality. Mobile augmented reality can be defined as the perceived augmented reality via devices that users always carry with them. Technology used in augmented reality has been evolved during many years. A brief historical review is presented below to give a wide conception of the evolution of the human-computer interaction through augmented reality, and before to close this section, current technology, that makes possible the mobile augmented reality, is described.

1929 was the year when Edwin Link introduced “The Link Flight Trainer” (Committee, 2000); the first flight trainer used with the intention to train pilots at the same time of avoiding accidents and reducing costs. Through this mechanical airplane, the pilot could acquire skills to manipulate all the instruments without risks. Three years later, in 1932, Sir Charles Wheatstone invented the Stereoscope (Bowers, 2001); with this device, it was possible to observe the first 3D scene generated from two slightly different pictures. The possibility to interact with a 3D world was a motivation for researchers to develop new ways of human-computer interaction. Morton Heilig, in 1962 (U.S. Patent No. 3050870, 1962) creates the “Sensorama”; a machine that incorporates stereoscopic images, sounds, movements of the viewer, and odors to produce a feeling of immersion in the virtual scene. Following the idea of generate a virtual world within which the user can interact, Ivan Sutherland in 1965 thought about “The

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