Chapter 12
Information Overload in Augmented Reality: The Outdoor Sports Environments

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ABSTRACT
This chapter explores the benefits and challenges of using augmented reality (AR) technology in outdoor sports environments. Questions emerge about the presentation of information more appropriate to give a user without being excessive. The aim is to assess the problems related with information overload before implementing an AR system to be used in outdoors environments. Solutions are listed to manage and interact, the best way, with the information on the mobile device of AR, and achieve social acceptance. The Solutions and Recommendations answer through an empirical research about what data are more appropriate without information overload for outdoor sports. Finally, to better understand, an AR Mockup example frame AR components of information and possible features, which represent the ideal display for sportsman, without information and communication overload.

INTRODUCTION
This chapter presents the implications of using the augmented reality (AR) and identifies the benefits of this new media technology when applied to the sports outdoor environments. AR is receiving increased interest from industry, e.g., the
new Samsung Galaxy 7, which offers the ability to use new AR applications for a richer end-user experience. However, the use of AR generates too much data, usually named as big data problem, which must be computed before presenting contextualized information to an outdoor sports end-user. If too much contextualized information is given, then, AR applications will lose its purpose. For instance, which practical value can be extracted from an advanced interface (Craig, 2013). Furthermore, issues arise about the presentation of information, and what are the most appropriate to give an user without being excessive? In addition, this paper presents an evaluation of the AR technology benefits, grounded in the following research question: the dangers of information overload, and that should be considered before implementing a system specifically to use in outdoors (Azuma, 1999; You, Neumann, & Azuma, 1999; Azuma el al., 2001). This research question is considered essential for sports and competition technology.

The AR mobile applications in mountain biking and trekking, or other outdoor sports such as athletics and tourism are very recent and didn’t evolved very significantly yet, e.g., to inform end-users about their health condition, weather state, geolocation, path distances and time measures, events and wise advices personalized. They can also need communicate and take a picture or film.

AR is technology, but should not be categorized as mere technology. Instead, AR is an advanced computer interface (Craig, 2013) being developed more than forty years ago. Still, has not been implemented in a significant way in society and is increasingly closer to its overall improvement, e.g., there is a strong requirement to be adopted to people, being required usability of technology (Sawyer, Finomore, Calvo, & Hancock, 2014; Chi, Kang, & Wang, 2013), in various areas of society. Therefore, to be socially acceptable, it is essential to balance the amount of information without neglecting the quality that is displayed to an AR user.

Specifically, AR is an user interface to interact with the information displayed and perform tasks more intuitively and efficiently. It increases the user’s perception about the real world by adding virtual information to it. The AR images are generated by devices and can be designed in transparent glasses, most suitable in the case of outdoor sports or using a monitor, in the indoor case. AR is a specific example of what Fred Brooks¹ calls “Amplification Intelligence” (AI): use the computer as a tool to perform human tasks in an easier way. Or like Alan D. Craig has defined on his book, augmented reality is a medium in which digital information is overlaid on the physical world that is in both spatial and temporal registration with the physical world and that is interactive in real time (Craig, 2013).

Thus, AR can be defined as a combination of a real environment with the virtual environment, creating a mixed reality. According to Paul Milgram² augmented
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