Chapter 62
New Forms of Interaction in Serious Games for Rehabilitation

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ABSTRACT

This chapter addresses up-to-date research development regarding the adoption of more natural forms of interaction in the Serious Games for Rehabilitation domain of application. The chapter starts by presenting fundamental concepts on Serious Games illustrated by relevant applications. It describes the main problems involved and how Serious Games can benefit the process of rehabilitation. A comprehensive literature survey is presented and accompanied by a proposed set of classification criteria towards a taxonomy. From this study, a main research opportunity the authors identified is the potential benefits of the adoption of natural interaction modalities. The remainder of the chapter presents the authors' recent work on this subject, including the description and design of game prototypes using alternative and natural interaction modalities. The chapter presents experiments and the results of a user study in order to make it possible to conclude about the benefits of the newer forms of interaction. From this study, it was concluded that the introduction of the natural interaction modalities has increased the attractiveness and intuitiveness of the prototyped Serious Game. This important result is a motivating factor to improve the interaction mechanisms and conduct studies with distinct tasks and larger samples of users/patients. Lastly, the authors report identified research opportunities and open problems.

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INTRODUCTION

Serious Games is an emergent field of research that focuses in the use of games with other purposes than mere entertainment and that can have applications in many diverse areas. Nowadays this concept is largely used in respect to computer games. In this chapter we will use Serious Games to refer to computer games (also referred as video games by some authors in the literature). Their popularity is growing so fast that we are assisting to the arising of new audiences of players such as women and older people, as we can see by the growing use of the Nintendo Wii system (Nintendo, 2011), the Microsoft Kinect system (Microsoft, 2010) or the Sony Playstation Move System (Sony, 2011) by people of all ages and/or entire families. A notorious example of a domain area where the field of Serious Games is assuming a relevant role is the rehabilitation area. We can point several advantages of its use in this area. Computer games are becoming more motivating to the patients than traditional therapy solutions: games have a story, a set of challenges and they motivate the patient to accomplish the defined goals, by the use of tasks that were designed for rehabilitation. Besides enabling to accomplish the final "top-level" goal that is rehabilitation, the game offers the patient the possibility of being immersed in a different situation where he tries to accomplish the goals proposed in the game and is distracted from his disability condition and from the fact that is in a rehabilitation activity. Apart the serious goal of the patient recovery, the game gives also to the patient: immersion, challenge, motivation, enjoyment, sensations that he could not feel if he was only repeating a sequence of tasks that were part of his rehabilitation plan.

Additionally, games are becoming more accessible to people in general. Computer systems are becoming more disseminated and affordable to users in general, in the form of several devices: game consoles, portable personal computers, large display TV sets, etc. At the same time, people tend to have more literacy about information systems and computer technologies, and this promotes the accessibility to computer games.

On the other hand, we are assisting to the arising and development of more natural user interfaces that are changing the traditional interaction paradigm of mouse and keyboard to other new forms of input: gestures, forces feedback, balance feedback, facial expression recognition, and voice recognition, to name some of the more relevant modalities of input. These new forms of interaction can be used to create applications that tend to be more natural and free, as they foster the elimination of artificial input devices in the human-computer interaction. These new forms of interaction can be used in order to increase the quality and efficiency of the rehabilitation process.

Another important aspect that can favor Rehabilitation Serious Games is the fact that people are connected to the internet using more bandwidth, which enables network rehabilitation games and the fulfilling of rehabilitation plans at home, without having to move the patient to the clinic/hospital. The rehabilitation plans can be adjusted in some cases by the therapist, at distance, which contributes to a greater comfort, time economy and autonomy development to the patient. Additionally, as patients can be connected by the web, this promotes the introduction of social components in the games, which can be used in the creation of new scenarios of rehabilitation where patients can cooperate and compete at distance.

This chapter reviews relevant work described in the literature concerning natural forms of interaction. It also presents a proof of concept serious game that can be used in a therapy session in order to study how more natural forms of interaction can be used to augment motivation in a rehabilitation session. Another important result is concerned with the identification of research opportunities and open problems.

The rest of the chapter is structured as follows. The next section presents an introduction to Serious Games, including fundamental concepts

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