Chapter 1.1

Human–Computer Interaction and Artificial Intelligence:
Multidisciplinarity Aiming Game Accessibility

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ABSTRACT

Nowadays, efforts in computer game development have been concerned to overcome entertainment objectives. In fact, there has been much effort aiming at finding, in Computer Science, resources to improve games in order to allow their application into education, business or politics processes. The effective introduction of these products in society requires that they are designed as accessible as possible to all individuals, including those ones belonging to minorities with special needs. In order to reach accessibility requirements, it is desirable to attend adaptability and usability requirements to provide products with higher quality and acceptance rate. In this chapter, we discuss the potential of combining the Human-Computer Interaction and the Artificial Intelligence areas aiming at promoting accessibility in games and, as a result, making them more democratic and useful for society, particularly for people who depend on the assistive technology resources.

INTRODUCTION

Accessibility and, in particular, adaptability and usability are desirable features for any type of computer – hardware or software – resource, since they universalize the benefits of its proper use. Accessibility means the incorporation of properties to allow using a computer resource by people with some type of intellectual disability or sensorial/ physical impairment, as well as the inclusion and extension of its use to all sectors of society. Adaptability is defined as the capacity of a computer resource to operate in different environments by changing its configuration – which could be made by end users, or else its capacity to learn with user interaction and adapt itself to fit its users. Finally, usability is related to the facility to learn and use a computer resource. These concepts reinforce the full promotion of accessibility, adaptability and usability features as a user option, and not as an imposition of the resource design process. In order to promote a better legibility, the term accessibility is used hereafter as a general term for accessibility, adaptability and usability.

Defining what, how, when and why to build computer resources with accessibility features is one of the main concerns of the Human-Computer Interaction (HCI) area. The interaction between a user and the resource is characterized by a two-way route, in which each side affects the behavior or the results produced by the other one. The computer resource design process needs to consider the relevant effects produced by such interaction, and meeting accessibility requirements involves the development of special strategies to improve this user interaction.

In the game context, such strategies depend on the game category, its use purpose and, mainly, the special needs of the potential users. Regarding the game category, action games require attention to different features than those ones seen in Role-Playing Games (RPG), for example. If the game is used for training purpose, attention is necessary on features different from those ones

relevant when its use purpose is focused on learning assessment. Finally, if users are deaf or suffer from Parkinson's disease, for example, different features related to their special needs should be added into the game.

Providing games with computational capabilities necessary to address the operational shortcomings due to the limitations of users with special needs means changing the classical software design process and the classical user interaction. This new design process calls for new interaction perspectives, which must be centered on the user's special needs. Some examples of needed changes are: communication by natural languages, including voice commands recognition in spoken language or gestural commands recognition in sign languages; user interaction via screen readers, screen magnifiers or conversation with avatars; and, adjustment of the game speed (or rhythm) and complexity according to players' performance. Pattern Recognition, Natural Language Processing and profile discovery are examples of tasks closely linked to these mentioned changes and commonly accomplished by Artificial Intelligence (AI) techniques.

In general, users' special needs are related to human beings abilities, such as vision, hearing, physical mobility and reasoning. Historically, some AI branches have worked to build computer resources with such capabilities. Therefore, one of the natural applications of AI is to provide mechanisms to aid HCI in its efforts to adjust the user interaction to gamers with special needs. However, in spite of its potential, the use of AI in this context is not so common. In fact, the frequent use of AI to insert some intelligence level in game engines is related to attend ordinary users and not the ones with special needs.

Aiming at addressing the discussion presented above, this chapter provides a brief review on:

- which type of resources can be modified to make the user interaction in the game

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