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Modeling storytelling to be used in educational video games

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ABSTRACT

Including storytelling in educational video games is currently a highly studied field as it is one element with which to maintain students' motivation. From previous studies, we have confirmed that including changes in the story changes the way in which students perceive the video game. In this paper, we present an extension of our previously defined VGSCL (a reference model for educational game development incorporating collaborative activities), in which balanced ludic and educative contents were designed. With this extension we focus on the storytelling itself, highlighting elements included in the story composition, attributes to be defined and relationships to be specified in order to integrate this proposal in the existing model. In addition, due to our target group being aged from 3 to 7, we have introduced some considerations to adapt the general rules to these children. Finally, we present the process followed to incorporate digital storytelling in the educational videogame "Ato's Adventure", the educational goal of which is to train grapho-motor skills.

1. Introduction

One of the most important factors in enabling students to learn through educational videogames is the maintenance of high levels of motivation throughout the game. For several years, the use of new technologies in classrooms and the introduction of video games into learning processes have been proposed as suitable mechanisms to achieve these levels of motivation. In order to further improve the results observed, elements which could have been omitted from these mechanisms are currently being studied. One of the main problems found in this sense is explained in (Padilla-Zea, 2011), which states that current video games, or at least those to which teachers have easy access, are not as fun as students expect. This causes educational video games (EVGs) to be more educational than video games. Moreover, one of the most important problems arises when the EVG design starts. It is a complex process which needs to integrate goals and tasks from two points of view: teaching a specific educational content and hiding it in a set of ludic goals to efficiently motivate students. Although specific methods and tools to develop video games exist, most of them are strongly oriented to the educational process (for example, SAVIE (Sauvé, 2009)) or to a specific type of video game (for example, EDoS, (Tran, George, and Marfisi-Schottman, 2010)).

Consequently, results obtained from using these video games could be improved.

In some cases, teachers have chosen to use commercial video games as part of their educational program, which ensures, to some extent, that motivation is maintained (a set of experiences can be seen in (Padilla-Zea, 2011)). The Manual for Teachers by Felicia (2009) explains how to make these sessions part of the lesson plan, so that the outcome of these sessions is satisfactory to both the students and the teacher. However, using commercially successful video games in the classroom requires a significant effort on the part of the teacher because they are not typically designed to fit within the content and time constraints of classrooms (Moreno-Ger, Burgos, Martínez-Ortiz, Sierra, & Fernández-Manjón, 2008) (Grove, Bourgonjon, and Van Looy, 2012).

To confront this problem, we have proposed a systematic method to designing EVGs that allows teachers to hide the educational content under the fun content (Padilla-Zea, 2011). This process requires, amongst other things, maintaining a balance between the educational and the fun content, in such a way that the EVG is neither a boring game for students nor an unproductive game for teachers. In addition, this proposal facilitates the assessment of learning achieved. Some guidelines to designing EVGs exist (Padilla-Zea, González-Sánchez, Gutiérrez, Cabrera, and Paderewski, 2009) (Ibrahim, Gutierrez, Paderewski, González, and Padilla-Zea, 2012) but they are focused on the elements that define the video game (mechanics, interaction...) rather than on the very important issue of introducing the storytelling into the design process. However, some authors suggest that the interaction processes and their integration into a good story can determine the success or failure of the game (Göbel, de Carvalho Rodrigues, Mehm, and Steinmetz, 2009).

In this article we highlight the importance of maintaining the balance between fun and education and, in particular, we focus

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on the introduction of the narrative as the basis of fostering the students' motivation in learning processes mediated by EVGs. To do so, we propose a set of models to be added to our methodology, including storytelling as a priority element in the modeling and development of an EVG. We start by integrating the specific models of educational and ludic aspects of an EVG in the story. These models specify elements to be defined and restrictions between them, as well as how to connect them with educational and ludic content previously defined by our methodology.

Including storytelling in a video game fosters and maintains the motivation students feel when they are using that video game as an educational tool. There are several proposals which, with nuances, refer to motivation in EVGs. Thus, (Law & Kickmeier-Rust, 2008) cites the strengths of EVG according to (Prensky, 2001): high level of intrinsic motivation to play and advance in the game, clear rules and objectives, a rich and attractive learning environment, a story with elements to foster immersion and surprise, instant feedback, a high level of interactivity, challenges and competition. These features are supported by the successful model of learning by (Merril, 2002): (1) focused on the problem: the student is involved in solving real-world problems, (2) activation: learning is promoted when activating prior knowledge, (3) demonstration: learning is promoted when what is going to be learnt is proved rather than when it is said, (4) application: students use their new knowledge to solve problems; (5) integration: students apply what they have learned in their daily lives.

The rest of the paper is organized as follows: In Section 2, research related to the inclusion of digital storytelling in EVGs is commented on; in Section 3 we present a brief analysis of some educational games for mobile devices that currently exist, to explain, in Section 4, the lessons learned about narrative and the state of current EVGs. In Section 5, the proposed extension to design storytelling for EVGs is presented and, in Section 6, the design performed for the EVG "Ato's Adventure" is shown. Finally, in Section 7, our conclusions and future work are outlined.

2. Digital storytelling as a motivational element

The scientific community recognizes that activities in a video game need to be inserted into a game story to get a proper degree of immersion. We think that this statement is also applicable to EVGs since immersion encourages motivation and, therefore, learning.

However, digital storytelling can also be utilized as a reward, revealing certain parts or details of the story as the player overcomes the game's challenges (Bopp, 2008). In both cases, a good story supports what is known as a parasocial phenomenon, related to the feelings generated in the player about game characters: the feeling that the player has to protect the protagonist and thwart enemies. These parasocial feelings have a motivational function to encourage the educational process contained within the game.

Therefore, the game's story and actions developed within it should encourage these behaviors (Bopp, 2008). To do this, video games must: (1) define a goal in the game, (2) divide the main goal into sub-goals, (3) ensure that the player can relate the actions taken in the game to any of these sub-goals and to the video game's final goal, and (4) ensure that the player finds tasks which provide him/her with experiences of success and reward in order to maintain motivation.

Various researchers have studied the importance of introducing digital storytelling into EVGs as a key element in maintaining motivation. In (Law, 2008) it is proposed that the story be adaptable in order to customize the personal experience as well as to adapt this story to each player's goals, needs, abilities and preferences. In particular, the terminology used in e-learning is adapted to the EVG. Thus, the term Macro-adaptation is proposed for traditional adaptive techniques (presentation and navigation), against the term Micro-adaptation, which is related to actions occurring within learning situations, not around them.

Other authors (Göbel et al., 2009) include digital storytelling as an essential part of EVGs, considering three fundamental elements: learning, play and story. These aspects are complementary and a balance must be found between them in order to improve motivation. These authors have proposed a scheme which achieves this balance and it has been used in the first demonstration of the 80 days project.[1] This scheme consists of an introduction, in a cinematic style, to introduce the story; an interactive tutorial to introduce the theme of the game; and a set of missions which make up the game's levels. Related to this approach is that proposed in (Bopp, 2008), which uses a system similar to that developed in Hollywood movies. Thus, the story is presented as a series of events that occur around a protagonist, the hero, who can be a single character or a set of them. This hero tries to overcome all obstacles to achieve a final goal. Furthermore, they propose to include videos as an introduction to the game or in the transitions between levels.

Moreover, other studies have suggested a new term of motivation to refer to that which occurs when playing an EVG which incorporates proper storytelling (Bopp, 2008). Traditionally, we have distinguished intrinsic (caused by the action being performed) and extrinsic motivation (on the consequences of such action in the real world). However, the authors in (Bopp, 2008) propose the term virtual extrinsic motivation: In an EVG, extrinsic motivation comes from consequences that acts have in the virtual world.

Within EVGs, we find a special sub-type called serious games (Michael & Chen, 2006). In these games, the motivating element has traditionally focused on simulation, ignoring the inclusion of a story that supports the activities undertaken. Currently, in the state of the art of video games, motivation is not only bound to the desire to win against the computer or in a competition, but to take part in the story of the protagonist (Bopp, 2008). Therefore, the motivation of players, i.e., of students, would improve if elements of storytelling were included in such a way that parasocial feelings could easily emerge, as far as possible, both for boys and for girls.

Admitting that the introduction of digital storytelling encourages a sense of fun, other authors have proposed specific mechanisms to introduce storytelling into EVGs (Champagnat et al., 2010). In this regard, two groups have been identified:

(1) The emergent narrative, where the player is free to do whatever he/she wants and the quality of the game depends on the player's skills and the actions taken during the game.
(2) Story-based games, where the player cannot influence the course of the game. In this work, the authors propose the use of interactive digital storytelling as a tool to promote freedom in the game and allow the player's actions to control their own story.

Specifically, this latter proposal is based on the design of emerging stories ((Cavazza et al., 2002; Lugri & Cavazza, 2006), for example), wherein the game contains a rich and complex world in which the characters can evolve freely and autonomously. Thus, the authors believe that a story is a partially ordered set of events that occur around a character, an object or a topic. In this way, the story begins from a starting point to solve some problems that lead to the final state, which is an acceptable conclusion to the problem.

Considering these previous works, we propose an EVG modeling method based on a structure learning-play-story, where we establish a relation between elements at each of these levels. This model

[1] http://www.eightydays.eu/