Enhancing the educational value of video games

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Video games are usually perceived and appreciated as highly dynamic personal challenges

Abstract

Lowering the barrier between education and real entertainment is an important challenge in order to better exploit the potential of computers and reach a demographic that is traditionally averse to learning. To this end, it is important to investigate how to exploit the appeal of video games (VGs) to also favor and induce learning via playing video games. Achieving this goal is not only a matter of content, since simply "superimposed" educational content risks being perceived as boring. Hence we believe that the game should feature mechanisms for acquiring knowledge and skill that are smoothly embedded in a meaningful, homogeneous, and compelling whole. Thus, there is a need to compartmentalize components of a game engine so that it becomes easy and efficient to integrate the graphics/interface—which has already been done very well by state-of-the-art successful video games and the educational aspect which is typically poor in those same games. Hence we have defined a general set of mechanisms and modules that can be inserted in state-of-the-art VG environments and are aimed at promoting various kinds of knowledge and procedural skill acquisition. In order to investigate and validate this concept, we have built an educational game, SeaGame , using a state-of-the-art commercial game development approach, and enriched the environment with instances of developed educational modules. Analyzing user test results, we conclude that SeaGame is perceived quite similarly to commercial VGs, which suggests that the proposed mechanisms do not compromise the overall enjoyability of the game, which is key to attracting a wide demographic that is not currently involved in educational activities during their leisure time. The results of this research can be generalized, since the standards of commercial games and the proposed educational enhancements can be instantiated in a variety of educational contexts and applied to different types of content.

Study subjects

64 students

We proposed to each school a one-day workshop on video games and on the educational potential of serious games. **We selected a total of 64 students, ranging in age from 16 to 19 (mean 17,4; stadev 0,64)**. There were 13 females and 51 males; 35 from a technical school, 24 from a scientific one, and 5 from a school with a humanities focus

Scholarcy Synopsis

> ***The challenge is to make education more entertaining by incorporating educational content into video games without making them boring, and the research suggests that this can be achieved by integrating educational modules into video game environments, as demonstrated by the success of SeaGame.***

Francesco Bellotti and colleagues (2009) reported on enhancing the educational value of video games. The research community is interested in using video games for learning.
The proposed mechanisms and modules can be integrated into video game environments to promote knowledge acquisition.
Sandbox games are a good context for applying these mechanisms.
The goal is to support learning through an entertaining experience.
Educational games are often perceived as boring and lack state-of-the-art effects.
The aim is to enhance popular games with educational mechanisms without compromising their appeal.
Evaluation sessions were conducted at selected schools.
Video games are usually seen as personal challenges that encourage competition and collaboration.
This aspect can be applied to educational games to motivate players to acquire knowledge and improve skills.
Commercial games generally do not have educational value.

There were 64 students involved in the study.

Scholarcy Highlights

- The research community has become ever more interested in investigating tools and methodologies to support learning through video games (VGs) [Zyda 2007]
- We saw the need for compartmentalizing components of a game engine in a way that makes it easier and more efficient to integrate the graphics interface and the educational aspect, which is poor in successful video games

- We have defined a general set of mechanisms and modules (e.g., conversational virtual humans (CVHs), mGs) that can be inserted in state-of-the-art video game environments and are aimed at promoting various kinds of knowledge and procedural skill acquisition
- The proposed mechanisms and modules lend themselves well to application in the context of sandbox games, where the player is encouraged to freely explore the knowledge contained in the virtual world
- Reaching a statistical similarity with successful commercial video games along several dimensions shows that it is possible to support learning through an entertaining experience, which is key to attracting a wide demographic that is currently not involved in educational activities during leisure time
- It is important to stress three points: (1) we made a comparison to high-quality commercial video games; (2) the evaluation concerned dimensions elicited from the players' experience with successful commercial VGs only; (3) test takers were very familiar with the world of commercial VGs, and were experts on the mechanisms of such successful games

Scholarcy Summary

Introduction

The research community has become ever more interested in investigating tools and methodologies to support learning through video games (VGs) [Zyda 2007].

Educational games are still a niche market and are not widely successful, since they are often perceived as boring.

They rarely use state-of-the-art effects and techniques, and/or are quite specialized.

This last case is typically one of the serious games [Zyda 2005] that provide highly realistic 3D simulation environments and are successfully employed in training for areas such as government [Raybourn et al 2005]; health [Sliney et al 2008]; the army [Losh 2005]; science [Mayo 2007]; and corporations [Michael and Chen 2006]

Objectives

Our aim is to understand how state-of-the-art popular and successful games can be enhanced with educationsupporting mechanisms without compromising their appeal to their current audience.

With this approach we aim to define an architecture on which to build successful games that support learning

Results

Evaluation SessionWe ran one RGT session at each of the selected schools; the RGT session consisted of the following steps: 1. Pretest questionnaire: users were asked to fill a questionnaire that serves to express their experience playing video games.2.

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Pretest questionnaire: users were asked to fill a questionnaire that serves to express their experience playing video games.

2. Element selection: we asked users to think about their favorite video games and provide a list of VGs of various genres.

3. Construct elicitation: we applied the "triad" method.

Users had to identify how two of the elements are similar but different from the third one.

4. Rating video games: for each elicited construct, users rated all the selected elements on a 5-grade scale

Conclusion

CONCLUSIONS AND FUTURE WORKVideo games are usually perceived and appreciated as highly dynamic personal challenges.

Users play by competing and cooperating to advance their names on the scoreboard

This aspect of competition/collaboration with peers encourages players to explore all the game's features and perform well at the related tasks so as to increase their scores and advance in the game levels.

Such a powerful incentive in any good game would, if effectively applied to educational games, have the key effect of exposing players to a growing learning content embedded in various game activities, motivating them to acquire further knowledge and continuously improve skills.

Commercial games seldom provide specific educational value

Builds on previous work

SeaGame stresses the importance of game believability to create a "sense of place" (through use of photorealistic 3D models, weather effects, surround audio, graspable virtual objects, natural lighting system, and so on) [Cartelli 2006], in which players can interact with the learning topic in a natural way [Fullerton et al 2004]. The OpenSIM project attempts to develop a **similar environment, which can be run on any server and would be free of any "for-profit" commercial control.3 Our approach is more specific**: SeaGame is a credible 3D model of a learning situation and is developed on top of a commercial game engine enhanced with several learning tools (microgames, conversational virtual humans, events generator; described later).

All such bipolar constructs (each one with a different weight) are thus shown as the proper dimensions (or classification modes) along which the domain elements are evaluated by the

user. **Although this technique was initially developed to understand personality differences in the construction of social perceptions, it has been applied to a wide variety of areas, including evaluation of user experience** [Mandryk et al 2006], and for research on the evaluation of video games [Steed and McDonnell 2003; Boyd et al 2004]

Differs from previous work

In fact, games have always been a powerful mediator for learning [Rieber 1996], and computers can provide added value in terms of real-time interactivity, immersiveness, personalization, and knowledge-basis. **However, analyzing the VG market—one of the most flourishing industries in the world [Carless 2005]— we see that successful games offer complex experiences for players, feature beautifully rendered characters and landscapes, and show ever more realistic animations, but have very little, if any, educational purpose and value**

Contributions

CONCLUSIONS AND FUTURE WORKVideo games are usually perceived and appreciated as highly dynamic personal challenges. Thus they can be key tools to stimulate and enhance user attention and involvement in useful tasks. In online games, users play by competing and cooperating to advance their names on the scoreboard. This aspect of competition/collaboration with peers encourages players to explore all the game's features and perform well at the related tasks so as to increase their scores and advance in the game levels. Such a powerful incentive in any good game would, if effectively applied to educational games, have the key effect of exposing players to a growing learning content embedded in various game activities, thus motivating them to acquire further knowledge and continuously improve skills. Despite this potential, commercial games seldom provide specific educational value.