

Συνέδρια της Ελληνικής Επιστημονικής Ένωσης Τεχνολογιών Πληροφορίας & Επικοινωνιών στην Εκπαίδευση

Τόμ. 1 (2018)

11ο Πανελλήνιο και Διεθνές Συνέδριο «Οι ΤΠΕ στην Εκπαίδευση»



Learning about dinosaurs through an electronic visual serious game

Athanasios Smyrnakis, Michail Kalogiannakis, Kostas Vassilakis

Learning about dinosaurs through an electronic visual serious game

Athanasios Smyrnakis¹, Michail Kalogiannakis², Kostas Vassilakis³
smyrnakisath@gmail.com, mkalogian@edc.uoc.gr, k.vassilakis@teicrete.gr

^{1,3}Technological Education Institution of Crete, Department of Informatics Engineering
 Stauromenos, 71410, Heraklion, Greece

²University of Crete, Faculty of Education, Department of Preschool Education
 University Campus - Gallos, 74100 Rethymno, Greece

Abstract

Games in education have always been a tool for increasing motivation and interest of the students. What is presented here is a serious game with a purpose to motivate the student to learn about paleontology. The game is developed for Android OS, which nowadays is the most well established platform for mobile devices. Through a virtual world with visual dinosaur models students are able to move around and “meet” with some of the most known species of Mesozoic era by using various interaction abilities of the game such as moving, eating, sleeping and even attacking that probably make these models more realistic. The actual purpose of this game is not just the interaction of the students with the dinosaurs but the knowledge that would be obtained through the interaction.

Keywords: Serious Games, Education, Dinosaurs, Learning through play.

Introduction

Gaming has always been a fun way for the people and especially for the students to learn new things and acquire skills (Koster, 2013; Papadakis, 2018). Towards the end of the past century, video games become a worldwide phenomenon and are still taking an important place in various cultures. Serious games are considered as an excellent way to deal with motivational enhancements so they can be used for learning (Hamdaoui, 2014). Serious gaming is, thus, games that engage users in their pursuit and contribute to the achievement of a defined purpose other than pure entertainment. Serious games also help in adapting the teaching process according to students’ interests and capabilities (Breuer, 2010). Additionally, serious games must integrate pedagogical and learning objectives and that is a challenging task for the development of this kind of games (Gros, 2015).

A game engine is a software framework designed for the creation and development of video games. Developers use them to create games for consoles, mobile devices and personal computers. Visual game engines usually provide a rendering engine for 2D or 3D graphics. Physics are also provided as well as collision detections. Moreover the sounds, the artificial intelligence, the animation and other techniques come to complete the whole package (Trenholme, 2008).

This work concerns the development of a serious game that gives the ability to the students to get some basic knowledge about dinosaurs by combining both knowledge and entertainment. Learning through fun could be the actual description of this project which is trying to meet some of the educational standards of learning and educating such as basic information’s of these ancient animals and also through gaming the appearance, the body

anatomy, and the way these dinosaurs used to move and react. For the creation of this game, a visual game engine has been used in order to be developed and tested on Android devices.

In the next section information on the development of the game is presented. The landscape has been designed in a known engine game and the necessary dimensions where given in order to be able to have enough space for the animals to be and move in it. In the last section of the article discussion and concluding remarks are presented.

The Dinotopia Game - Construction info

The scenario of the game takes place in an ancient exotic world where no human beings exist, and the ground and the surroundings were designed with lively colors and tall trees in order to be more attractive to the eyes. The educational part of the serious game is implemented through buttons that provide information about the animals and quizzes. The entertainment part of the game is achieved by including a game within the serious game. The information for the ancient animals was taken from various scientific well-established documents and sites, while the scenario had to be in line with known learning theories.

The ADDIE model (Allen, 2006) is used for the creation of the game. The ADDIE acronym stands for Analysis, Design, Development, Implementation and Evaluation phases. These phases describe a series of procedures that addressed decisions about exactly what, where, how, and when to teach the skills, knowledge, and attitudes needed to perform every task selected for instruction.

In the analysis phase of the ADDIE model the instructional problems, the objectives and the learning environment should be clarified. The game should be simple enough but not boring since it addresses to younger ages and the content provided should be simplified and accurate (Gee, 2007). The models of the dinosaurs and the sounds ought to be as realistic as they could be, the landscape (ground, tree etc.) should be rich enough, and models' movements should be believable. Pedagogical limitations and supporting learning theories are two other elements of major importance. The learning objectives of the game is learning about paleontology and dinosaurs through a 3-D virtual environment. Design phase is referring on how the game is to support the requirements in analysis phase. The game engine which has been used for the implementation of the game is called "Unity" (2018). Unity is a cross-platform game engine developed by Unity Technologies and used to develop video games for PC, consoles, mobile devices and websites. In Figure 1, the developing environment of Unity is demonstrated.

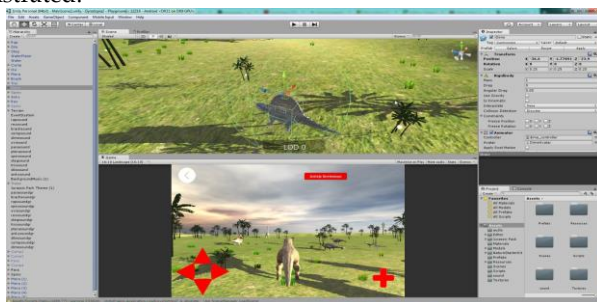


Figure 1. The developing environment of Unity Engine

As most of the game engines Unity supports the creation of virtual environments and provides a variety of assets that are various visual elements to be imported in virtual worlds.

The camera is another important tool as the players can see the view angle of the objects imported in game and get that way verisimilar perception of the environment. Forming the virtual environment, trees planted and water element added in the scenery in order to make it looking more realistic. Specific procedures were applied that took into account the details about dimensions of various elements in order to be fitted at the scenery. More complicated procedures were applied on dinosaur models. C# code is used in order to make these virtual animals walk, sleep, eat and attack in other words make them look alive.

Some of the Nielsen's usability heuristics (Nielsen, 1994) were applied in order to make this game as user friendly it could be. A screenshot of the starting page of the game is shown in Figure 2. The language buttons have been designed to be seen easily to any screen size. Generally, the start menu kept as simple as possible so students won't have any difficulty on familiarization with this application.



Figure 2. Screenshot of the starting menu

At the starting menu there is a quiz where ten multiple choice questions with four possible answers were given. The colors and the background of this user interface were chosen carefully in order to apply at the following usability heuristics: efficiency of use, minimalistic design and also helpful and easily understandable. After entering the game there is an option menu for every dinosaur available and the student can choose the dinosaur of his choice. The user has various options to interact with these animals: (a) just play and move the animal without playing any game, (b) playing the game, (c) read information and (d) comparison of dinosaur sizes.

The included game is actually a race against time. The player should consume or eat (depending on chosen dinosaurs-avatar: herbivorous or carnivorous) as many plants or herbivorous dinosaurs as he can in a limited period of time. Another characteristic of this game is that gives the students the option to compare the dinosaur sizes in order to understand better the sizes of these ancient animals. When the student is getting information about a dinosaur a camera is turning around the model giving the sense of moving while text is appearing on the screen about the specific dinosaur (Figure 3). Finally, user performance statistics are provided.



Figure 3. The interface of the given information about the dinosaurs

Conclusions

A serious game for providing knowledge about dinosaurs is developed. The purpose of this game is, hopefully, to motivate the students to learn more about this ancient period of our planet. For the creation of the game Unity engine have been used and Nielsen's usability heuristics were applied. The game does not include all the species of dinosaur, nevertheless the game should be interesting with just twelve species as there much for the students to learn. Bringing back even virtually these animals which ceased to exist sixty five millions years ago is quite fascinating by itself. The next step of the work is the evaluation of the game from the students and teachers. Further work will be done on teacher's intervention for adding knowledge and tracking students' progress, multiplayer usage through internet and enrichment with more dinosaur models.

References

- Allen, W. C. (2006). Overview and evolution of the ADDIE training system. *Advances in Developing Human Resources*, 8(4), 430-441.
- Breuer, J. S., & Bente, G. (2010). Why so serious? On the relation of serious games and learning. *Eludamos. Journal for computer game culture*, 4(1), 7-24.
- Unity (2018). *Unity Technologies*. Retrieved 10 February 2018 from <https://unity3d.com/>
- Gee, J. P. (2007). *Good video games+ good learning*. New York: Peter Lang.
- Gros, B. (2015). Integration of Digital Games in Learning and E-learning Environments: Connecting Experiences and Context. In T. Lowrie, R. Jorgensen (Eds.) *Digital Games and Mathematics Learning. Mathematics Education in the Digital Era, Vol 4*. Dordrecht: Springer.
- Hamdaoui, N., Idrissi, M. K., & Bennani, S. (2014). Serious Games in Education Towards the standardization of the teaching-learning process. *Advances in Educational Technologies, Vol. 174. International Conference on Education and Modern Educational Technologies*, 18-20 July 2015, Santorini, Greece: Educational Technologies Series.
- Koster, R. (2013). *Theory of fun for game design*. USA, Gravenstein, Sebastopol: O'Reilly Media, Inc.
- Nielsen, J. (1994). Enhancing the explanatory power of usability heuristics. In *Proceedings of the SIGCHI conference on Human Factors in Computing Systems* (p. 152-158), New York: ACM.
- Papadakis, St. (2018). The use of computer games in classroom environment. *International Journal of Teaching and Case Studies*, Forthcoming Article, DOI:10.1504/IJTCS.2018.10011113
- Trenholme, D., & Smith, S. P. (2008). Computer game engines for developing first-person virtual environments. *Virtual reality*, 12(3), 181-187.