Game Wizard

Pedro Bueno
Dept. of Electrical Engineering (DEE), Universidade Nova de Lisboa (UNL)
Campus FCT/UNL, 2829-516, Caparica, Portugal
p110243@campus.fct.unl.pt

Tiago Cardoso
Dept. of Electrical Engineering (DEE), Universidade Nova de Lisboa (UNL)
Campus FCT/UNL, 2829-516, Caparica, Portugal
tomfc@uninova.pt

João Delgado
Dept. of Electrical Engineering (DEE), Universidade Nova de Lisboa (UNL)
Campus FCT/UNL, 2829-516, Caparica, Portugal
jrfdelgado@gmail.com

ABSTRACT

Nowadays there is a clear increase of products or tailored solutions with the goal of better adept to the needs of clients. In another context there is a wide growth of computers' presence in the class rooms, in order to assist the teacher to captivate and motivate the students using educational games. However not all teachers have the advanced computer knowledge that would allow them to personalize games, which would benefit children by providing tailored solutions to their specific needs. Having this problem into consideration it was designed/idealized a system that relies on a framework of game creation that allows a user with less informatics skills to create a game based on a model. Although there are many games of this type it would be useful and innovative for a teacher to be able to create a game that is personalized to the students' needs and according to the skills that they wish to develop. This system consists in an interface where the user has to follow some established steps, in order to achieve a file containing all the game features, which is later imported to a framework. That system allows the creation of different games, as long as these games come under the same game mechanics.

Author Keywords
Wizard, Game engine, Educational game.

INTRODUCTION

According to Riedl, the demand for custom solutions is rapidly becoming an important factor in education. In spite of these customized interactive experiences is in its beginning, the capability of creating unique experiences that take advantage of personal abilities, such as tastes, preferences or limitations, is compelling.

Coupling this fact with the introduction of computers into the school is justified by the motivational rising that it creates to students. Computers make them feel excited and focused while solving special and unique problems. These problems are achieved through educational games, offering a critical environment so the students achieve their objectives improving their reasoning, or their motor capability, solving pleasant problems [1, 2].

It's desired to contribute to this particular area by offering the ability to create customized games to specific targets, to a common computer user, without previous knowledge of specialized tools or any advanced knowledge in computer science. This goal will be reached with an integrated application built over a game engine, in which the user has to follow a set of previously defined steps for its creation. This system is defined as Wizard, and it intends to replace the developer team, transforming the game concept in its finished work.

This project will be applied to a game called Reino dos Fonemas, developed by DIFERENÇAS – Centro de Desenvolvimento Infantil, providing a valuable tool to a center with this purpose, having the ability to create different games to distinct targets [3].

Children and teenagers are introduced to technological world through videogames, and how they interact with games is changing the way they learn. The students' enrolment and commitment with videogames are interesting benefits, but not all of the games have an educational purpose. The content of a game may represent a simplification of reality, and many of them have violent or sensitive subjects. This fact brings up the controversy in introducing computers in the scholar environment, as they are usually related to violent behavior. However, it's conclusive that videogames contribute to sociability among teenagers, and improve their leadership and decision making ability, apart from offering a complex environment of abilities and attitude improvement [4, 5].

Games are active experiences and have the ability to motivate people. This way, they excite and motivate a player to learn through an appealing and pleasant manner, getting a mean to learning with a positive experience. The players are put in situations they have to solve, forcing them to think and to use tool and resources, trying to solve complex problems. It is normally used some data processing terminal, usually a computer or a video console [6].

Videogames are regarded as useful elements for teaching particular strategies and to knowledge gathering. Furthermore it also develops the characteristic knowledge of the information society that should bring long term

benefits, as children interaction with videogames approach them in a playful way with computers, and it eases the using of technology [4].

An ability embodied in videogames is the need of multitasking, as players have to constantly keep track of a large number of actions happening in the screen. A study made by Greenfield explored the effects of videogames in visual attention division, studying a group of students. The participants that were expert video gamers scored much better and had better response times than the others. Moreover, while playing action games, students developed strategies to keep track of different events occurring at various places [7].

Educative games are also typified for a visually attractive environment, with music and animation, raising interest on exploring the game and captures player's attention. They're usually executed in real time, giving the player an immediate feedback of his actions, and also the existence of a simple interaction between player and the system. This type of game is played in order to explore a particular knowledge area, besides the development of some abilities, such as dexterity, reflexes, logical reasoning, among others [1, 8].

The choice of a game is dependent of the target player and the desired reality. It's important to understand the player's ability to learn, as differences may exist in the way different people processes information and their emotions when presented to the same problem. This deviation may result of many factors, such as their social reality or their age. The abilities which are intended to develop, such as physical or cognitive, are also important to keep in mind [9].

GAME ENGINE
The difference between game engine and game sometimes is very confusing and vague, and many times is arguable too, such as the game engine itself. Some game engines have a clear distinction from its game while others the difference between one and the other can hardly be seen. Possibly an object oriented architecture is what marks the difference between the game engine and a software that is a pure game. When a game has its own rules or logic programmed in large scripts, or that applies specific scripting events to render exclusive objects, it turns out to be very hard, or even impossible to reuse that software to any other case besides the game itself. The term game engine should be reserved to extensible software that can be reused as base for different games with no major changes [10].

Nowadays games are developed in a modular way, so the game engine refers to a collection of modules. Game engines are formed of modules that are responsible for inputs, outputs and generic world's game dynamic, as shown, as a simpler model, in Figure 1.
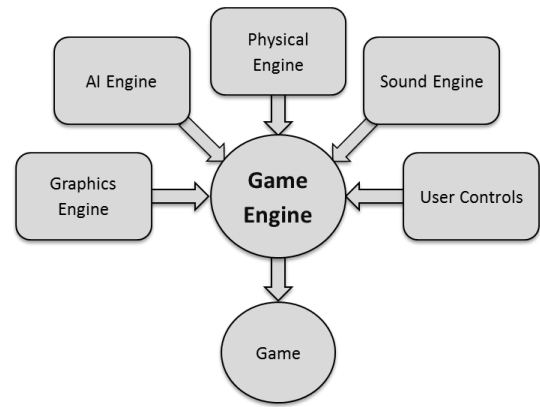

Figure 1 – Game Engine Model

The choice of a game engine is a relevant question for the development of a game, as it has to be suitable for the desired game. Thus, considering among various tools, the game engine chosen is Unity®, that is a system used for multiplatform games using 2D or 3D.

Unity® is the chosen game engine as it provides an easy use, it is multiplatform and it has a huge community.

GAME MODEL
The game model is based on a mini game that is part of an imaginary universe, developed by DIFERENÇAS, called Reino dos Fonemas. The game's objective is to teach children the letters, how they look like and their sound.

This mini game is a 2D game, in which the player controls a hero, moving horizontally, and he has to travel across scenery collecting floating targets so he can finish the mission successfully. The player can move to left, right or jump, depending of the keyboard's input. The whole level is considered a mission, and the mission is composed of multiple scenes. Each scene has three floating targets. These targets can be considered positives, negatives or neutral. The positive targets are the ones the player has to catch to complete the mission, the negative are there to try to trick the player, and the neutral are considered power-ups.

For example, if the objective is to teach a kid the "a" letter, all the positive targets have the "a" letter in it, in all its forms.

The player starts the level with a health bar full of health points, and he can lose up to two of them while playing and at the third the players loses and has to restart the level. While playing an example level as before, if the player catches a "b" target he loses a stack of life (a third), and he catches three wrong targets he has to restart the game.

The neutral targets are optional and don't affect the outcome, but it can heal the player for a small amount of health points, or a shield that avoids a negative target.

The player has an assistant on his side during the entire mission that interacts with him. This assistant can warn the player for certain situations, such as a wrong target, or an extra life.

During all the mission there's a background music associated with the specific theme the player is at. There are also some occasional sounds, also related to the theme.

As an example, in a forest themed mission there is a background sound defined for that specific environment, and the sound of monkeys or birds can occasionally be heard.

GAME WIZARD

This game model is chosen because it serves the purpose of education and is part of the proposed objective, aiding the DIFERENÇAS team to create customized games according to specific targets, so they can be entertained with a videogame and learning without knowing it. Since this Diferenças center is specialized in aiding "different" children, they wish they can adapt the game to each child.

The existence of a system such as a Wizard is worthwhile as it simplifies the slow process and the steps that are part of the development of a game. This is achieved with easy-to-use, simple, and user-friendly interface software, capable of creating a game without the need of a full development team or specific and complex tools.

With a model identified it can be created a variety of games, since they all keep the same mechanism while having a different storyline or global objective.

A group of features were identified and is important they are defined in the Wizard. It's important that the system has the ability to define the level's dimension, the main character (the hero), the assistant, the good, bad and neutral targets, and all the graphical features. It's demanding the software is user-friendly, and that the user is aware of all his steps and his action result, so he can use it independently since his first usage. The user's options should be exported to a file that is later imported to the selected framework.
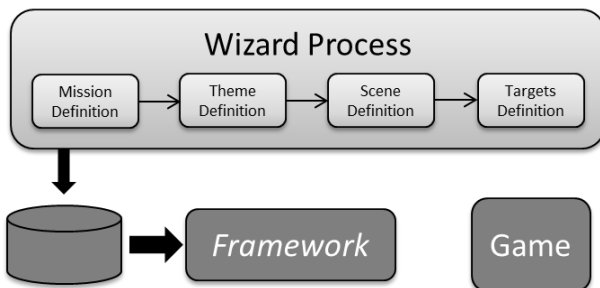

Figure 2- Wizard Process

As shown in Figure 2, the first step is defining the mission. The mission is the group of all objects of the level, and all the interactions between the player and the other objects of the game. The player has to refer the number of desired scenes and the scene name that is stored so it can be reused. It's also required to choose the Instructions files, audio and graphical, that inform the player of the game's rules and its objectives to successfully complete the mission. The character is the element the player controls and the assistant is a non-playable character that accompanies the player throughout the mission warning the player of its actions. All this process is show on Figure 3.
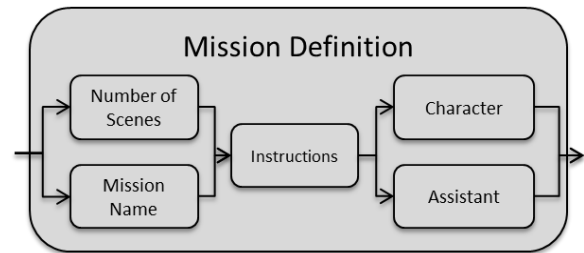

Figure 3 - Mission Definition

In the next step, Figure 4, the user has to define the audio features of the theme. It has to be chosen the background audio and the atomic sound that must be a short clip.
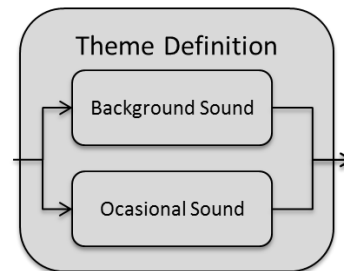

Figure 4 - Theme Definition

In the third step the user has to define the scenes, shown in Figure 5. These scenes are composed by a background image that must agree with the selected theme and three targets. The targets have to be one of three types, good, bad or neutral. The good target is the one that the player is supposed to catch according to the instructions and the game objective. The bad targets are the ones the player should avoid, and the neutral are not demanded nor bad, but optional targets that may have some special abilities to the player.
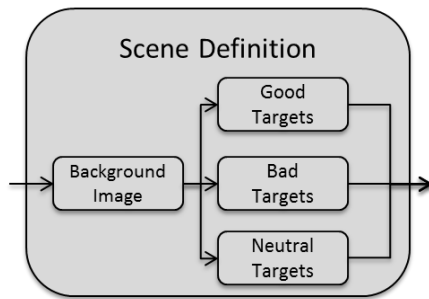
Figure 5 - Scene Definition

The targets are defined at last, and it's shown in Figure 6. The user has to choose an image to the target, a sound of success and a sound of failure. The success sound is played when the player catches this target as supposed. The failure sound plays when the player catches this target when it is considered to be a bad target.
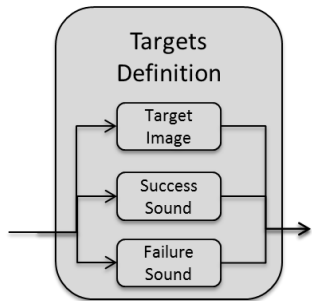

Figure 6 - Targets Definition

When all this process is finished it is created a XML file storing all the selected information that can be later imported in Unity®.

VALIDATION

Once implemented the described platform it was made a group of tests in order to improve the system and to understand the features that could be added or improved. These tests are based on the execution of Wizard and the evaluation of the outcome.

To test the solution's outcome all the steps of Figure 2 were made, inserting components in some fields and leaving some blank on purpose, as they are not functional requirements of the system. While audio involves the player in the game, it's not a key element and it shouldn't be demanding for the execution of the game, so its fields were left blank.

As this whole process is finished is supposed to have a XML file as output of the system looking as the one shown in figures 7 and 8.

```xml
<?xml version="1.0"?>
<etapa>
        <nome>teste</nome>
        <n_cenas>2</n_cenas>
        <instrucoes>
                <inst_audio></inst_audio>
                <inst_graf></inst_graf>
        </instrucoes>
        <personag>berto.jpg</personag>
        <ajudante>aguia1.jpg</ajudante>

        <tema>
                <amb_fundo>teste.wav</amb_fundo>
                <amb_atom></amb_atom>
        </tema>

        <cena>
                <cena_n>1</cena_n>
                <img_fundo>img_fundo1.jpg</img_fundo>

                <bal_bom1>balao1</bal_bom1>
                <bal_bom2>balao6</bal_bom2>
                <bal_bom3></bal_bom3>

                <bal_mau1>balao2</bal_mau1>
                <bal_mau2></bal_mau2>
                <bal_mau3></bal_mau3>

                <bal_neut1></bal_neut1>
                <bal_neut2></bal_neut2>
                <bal_neut3></bal_neut3>
        </cena>
```

Figure 7 - XML Output 1

```xml
        <cena>
                <cena_n>2</cena_n>
                <img_fundo>img_fundo2.jpg</img_fundo>

                <bal_bom1>balao6</bal_bom1>
                <bal_bom2>balao1</bal_bom2>
                <bal_bom3></bal_bom3>

                <bal_mau1></bal_mau1>
                <bal_mau2></bal_mau2>
                <bal_mau3></bal_mau3>

                <bal_neut1>balao3</bal_neut1>
                <bal_neut2></bal_neut2>
                <bal_neut3></bal_neut3>
        </cena>

        <balao>
                <nome_bal>balao1</nome_bal>
                <img_bal>balao1.jpg</img_bal>
                <som_suc>bom.wav</som_suc>
                <som_insuc></som_insuc>
        </balao>
        <balao>
                <nome_bal>balao2</nome_bal>
                <img_bal>balao2.jpg</img_bal>
                <som_suc></som_suc>
                <som_insuc></som_insuc>
        </balao>
        <balao>
                <nome_bal>balao3</nome_bal>
                <img_bal>balao3.jpg</img_bal>
                <som_suc></som_suc>
                <som_insuc></som_insuc>
        </balao>
        <balao>
                <nome_bal>balao6</nome_bal>
                <img_bal>balao6.jpg</img_bal>
                <som_suc></som_suc>
                <som_insuc></som_insuc>
        </balao>
</etapa>
```

Figure 8 - XML Output 2

Following the Wizard's process it's expected to have a XML file like the figures 7 and 8 shows. It shows a mission

called "teste", having two scenes, and no instructions files. The main character is called "berto" and his assistant is "aguia1". The background sound is called "teste" and it doesn't exist any occasional audio file.

Finished the global mission aspects definition, it's then defined each one of the scenes that compose the mission. The first scene has a background image called "img_fundo1" and it should contain three targets. Two of them must be good targets, called "balao1" and "balao6" and one is a bad target, with the name of "balao2".

The second scene has a background image with the name of "img_fundo2" and it contains two good targets, called "balao6" and "balao1" and a neutral target called "balao3".

As shown in **Erro! A origem da referência não foi encontrada.** the target "balao1" is defined with an image "balao1.jpg" and a success sound "bom". All this process was repeated to the other targets, leaving the sound fields blank.

Figure 1 - Wizard's Output Print screen

This XML file was later imported in Unity® in order to create a game with the features and referred components, as shown in Figure 1.

The result is a fully functional game, with a player and an assistant corresponding to what was expected, as the targets and the background images. In the same image is visible a light rupture between the scenario near the letters "E" and "O". This is due to the fact the different images have a slight difference in its size. It's also possible to confirm the existence of two good targets and a bad on the first scene, and a neutral target followed by a good target on the second scene.

CONCLUSION AND FUTURE WORK
The presented solution operates as an assistant in the process of creation of videogames, passing the obstacle that a common user faces when coming across a development environment. This system makes it possible to a simple computer user to create a videogame based on the presented model, without the need of a numerous development team, or scripting knowledge. This approach is achieved with an integrated application over a game engine, and the user simply has to follow a serious of pre-defined steps.

To the educational purpose of this project, this solution represents a huge advantage for Diferenças center, as it allows them to customize videogames accordingly to the needs of the target child. The need for an educational game is justified by the motivational increase among the children and the development of cognitive abilities while having fun.

"Reino dos Fonemas" is as very extensive game, and it has various and different types of missions, but this solution is focused in the development of one of those types. This system allows the customization of some attributes but it's not possible to change the games' mechanism. Therefore, this system could be expanded to implement the entire game and all its mini-games. This could benefit a wider variety of children, and could bring a storyline to the game.

Another good improvement could be an approach to change the game's mechanism. It could be interesting to create or edit its objects and its challenges or even the character's actions. This way it could be possible to create a totally different game from the presented one.

REFERENCES

1. Moratori, P.B., *Por que utilizar jogos educativos no processo de ensino aprendizagem.* UFRJ. Rio de Janeiro, 2003.

2. Riedl, M.O., *Scalable personalization of interactive experiences through creative automation.* Computers in Entertainment (CIE), 2010. **8**(4): p. 26.

3. Diferenças. *Centro de Desenvolvimento Infantil.* Available from: www.diferencas.net.

4. Gros, B., *Digital games in education: The design of games-based learning environments.* Journal of Research on Technology in Education, 2007. **40**(1): p. 23-38.

5. Johnson, S., *Tudo o que é mau faz bem: como os jogos de vídeo, a TV ea Internet nos estão a tornar mais inteligentes.* Lisboa: Lua de Papel, 2006.

6. Squire, K., *From content to context: Videogames as designed experience.* Educational researcher, 2006. **35**(8): p. 19-29.

7. Greenfield, P.M., et al., *Cognitive socialization by computer games in two cultures: Inductive discovery or mastery of an iconic code?* Journal of Applied Developmental Psychology, 1994. **15**(1): p. 59-85.

8. Chan, T.S. and T.C. Ahern, *Targeting motivation-adapting flow theory to instructional design.* Journal of Educational computing research, 1999. **21**(2): p. 151-164.

9. Rapeepisarn, K., et al., *The relationship between game genres, learning techniques and learning styles in educational computer games*, in *Technologies for E-*

Learning and Digital Entertainment. 2008, Springer. p. 497-508.

10. Anderson, E.F., et al. *The case for research in game engine architecture*. in *Proceedings of the 2008 Conference on Future Play: Research, Play, Share*. 2008. ACM.