



Address Classifier: A Game-Based Educational Application for Computer Networks

Lizzie Narváez*

Facultad de Matemáticas
Universidad Autónoma de Yucatán
Mexico

Victor Chi

Facultad de Matemáticas
Universidad Autónoma de Yucatán
Mexico

Erika Llanes

Facultad de Matemáticas
Universidad Autónoma de Yucatán
Mexico

Maximiliano Canché

Facultad de Matemáticas
Universidad Autónoma de Yucatán
Mexico

Abstract— *In education, the concept of "learning through play" has had a great impact on how we teach because of the many benefits it provides. Currently it is considered that the development of game applications contributes positively to the learning process of students of different levels. Because of these identified advantages, educators have considered using game-based teaching methods in order to develop the learning skills of students by replacing traditional learning tools with newer and more innovative ones. In this paper we describe the design of a video game developed with Blender tool to be implemented in the area of computer networks, which aims to help students improve their ability to identify the class of an IP address*

Keywords— *Videogame, Blender, Design, Computer Networks, Networks Addressing*

I. INTRODUCTION

To meet the ever-changing challenges encountered in the sphere of education and stimulate a country's growth and contribute to the continued development of our society as a whole, it has become more and more necessary to make use of new technologies and creative methodologies as they offer opportunities to revolutionize course content and teaching methods at all academic levels and thus achieve better results in the teaching-learning process. The use of educational games undeniably aids the task of teaching/learning [1]. The unstoppable march of technology progress has affected almost every aspect of life in general and in education particularly. For technology to be incorporated effectively into education it is essential that meaningful learning take place and that course content be relevant and significant for the students and that they be able to link new content with the knowledge stored in their minds [1].

In this regard, students must be motivated by activities that awaken and maintain their curiosity without causing anxiety and preventing visual distractions from interfering negatively on learning [2].

Based on the above, there has been an inevitable increase in analysis of the relationship between information technology and the field of education, in order to tap the maximum potential of the former within the teaching-learning process [3].

Teachers have to find ways to provide students with meaningful experiences through which they can learn skills in the context of a given subject; educational software, in this sense, can provide students with the opportunities to develop these skills [4].

An educational application in the form of a video game can be the starting point for a progressive approach to an issue, a problem, a point of shared interest or as part of a topic that the teacher wants to address.

This approach should be based on the initial concepts that the students have, and should pave the way for the construction of solutions, theories and research practices, which are each more elaborate. Video games facilitate these practices by bringing us closer to the issues that we want to work with and enabling progressive questioning through a visible discussion of the challenges, theories, scientific facts and research reports [4].

Video games are the XXI-century games which are becoming increasingly present in social and cultural environments of different types [5].

For this reason this paper presents a piece of educational software in the form of a game that supports computer networking students by allowing them to practice concepts relating to the classification of IP addresses within a visually attractive gameplay interface. This game will be part of a set of video games.

Currently a large number of researchers are working on the development of graphical tools to help students understand certain concepts within the various areas of learning.

In [6] a 3D educational application is presented and the themes addressed aim to help the computer networking students to enjoy more meaningful learning.

In [7] a picture of the current education situation in Mexico is presented and the ways technology can improve the overall delivery of higher education are examined. Two digital tools are described, both developed to support teaching of topics corresponding to the bachelor's degree in Computer Sciences.

II. EDUCATIONAL SOFTWARE

Educational software is defined as software intended for teaching and autonomous learning, allowing for the development of cognitive abilities. Just as there are profound differences between educational philosophies, so there is a wide range of approaches to creating educational software depending on the different types of interaction that can exist between the actors of the teaching-learning process: teacher, learner, knowledge and computer.

Examples of educational software range from learning-oriented programs to complete operating systems for education. Educational software can encompass many different subjects such as mathematics, languages and geography as well as many others, and it can in turn provide information to the students in many ways while being sensitive to the circumstances of students and rich in interaction possibilities.

In [8] the essential characteristics of educational software are mentioned. Among these are the following:

- Materials should be developed with a didactic purpose.
- The computer should be used as a medium in which students complete their proposed activities.
- They should be interactive, able to answer respond immediately to student actions allowing a dialogue and an exchange of information between the computer and the learner.
- Users should continue to produce individualized work.
- The software applications should adapt their activities according to the actions of the students.
- They must be easy to use.

III. DESIGN OF ADDRESS CLASSIFIER

Simulation is a much cheaper and easier to use method. Obviously, this leads network and application developers to use simulation in order to evaluate different simple or complicated and innovative solutions before implementing them [9]. Our design involved the simulation of an attractive environment (specifically a game-based application in form of casino) to the student in learning of network issues.

One of the factors involved in the evolution of game design is the constant advancement in capability of the very technology that supports the videogames. You can easily illustrate this by following the evolution of design alongside the evolution of graphics in videogames: they started out by being extremely simple, text-based or with very low resolution (highly limited vector graphics); they evolved over time to be capable of expressing two-dimensional shapes and increasingly complex animations, and gradually they begin to express interesting three-dimensional forms and make a progression in terms of the complexity of these forms [10]. Seen from a design perspective, this can be understood as the release of creative restrictions: initially all games were limited in their expression to the use of certain kinds of forms, the use of more expressive but still simple forms was introduced later, later still we saw the use of more complex forms but still dimensional, then the use of three-dimensional but still not very realistic forms, until reach stage where graphics can express almost photorealism [10]. The traditional way of teaching students in the area of networks, specifically the issue of converting decimal numbers to binary and vice versa, identifying the class of an IP address, identifying the type of IP address (public or private), and determining the network type of an IP address (host, network or broadcast) can frustrate the student and make him/her feel overwhelmed by handling many numbers in order to understand the various concepts simultaneously. On the other hand, we know that educational software in the form of videogames can be a great tool to promote learning by providing alternative methods to help overcome the barriers imposed by traditional learning. Studies in Chile, Mexico and Spain show the results of applications of this type of technology applied to the learning process [11]. Bearing this in mind, we decided to make use of technology; particularly proposing the design of games to help the student find the learning of these subjects more entertaining and dynamic, the central purpose being that the student should practice, identify and carry out the implementation of the various activities that lead to mastery of the subjects mentioned above.

This article was developed with support in the learning process of students in the area of computer networks, specifically for the Bachelor of Computer Science at the Tizimín Multidisciplinary Unit at the Autonomous University of Yucatán. The intention was that the students find it as attractive as possible so we created an application modeling a target shooting game. Hence, the game-based educational software called Address Classifier will allow the learner to decide the class that corresponds to an IP address by means of shooting game.

A. Software Description

The software interface is loosely based on a shooting gallery, as shown in figure 1. The menu of this game maintains the same theme as bullets are used to represent the various options, as shown in figure 2.



Fig. 1. Interface.



Fig. 2. Menu

For the design of this stage the Blender tool was used (figure 3) and with which different objects were modeled such as the ball, the vase, the can, the bottle and the glass, as well as the cabinet where they would be placed.



Fig. 3. Blender tool

We used a sphere, a cylinder and bezier curves for modeling each of the objects that were placed on the base to be aimed at and shot. Also we modeled the gun and we added drawings to form the walls and floor, finally we added an appropriately sized text displaying the IP address at the base of the cabinet so that the player may view it correctly (figure 1).

The images used were added to make colors and textures more eye-catching, transparencies were applied to some objects to simulate the material and normal texture was applied to the walls to obtain realism (figure 4). Finally bright lights were added to this game which helped create extra realism.

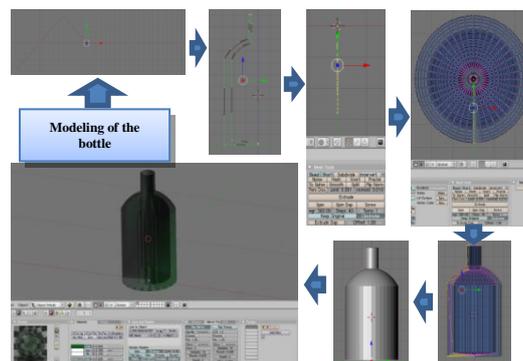


Fig. 4. Modeling a bottle

Having completed the design the necessary scripts were programmed to run throughout the game. The objects like the ball, jar, can, bottle and glass became active players because when making contact with the bullet they had to simulate a falling motion (figure 5).



Fig. 5. Simulation of a fall.

A brief part of the game code is shown as an example, this code allows users to choose a scene from the menu; there are four of these scenes: Game, Help, About, and Exit, each menu item is a different scene that prompts the user to choose an option.

```
import Blender
import GameLogic as g
control = g.getCurrentController()
local = control.owner
sensor = control.sensors["eleccion"]
keycode = sensor.key
```

```
estado = sensor.getKeyStatus(keycode)
pistola = Blender.Object.Get("e2-pistola")
baja = pistola.getProperty("baja")
sube = pistola.getProperty("sube")
Juego = control.actuators["Juego"]
Ayuda = control.actuators["Ayuda"]
Acercade = control.actuators["Acercade"]
Salir = control.actuators["Salir"]
if estado == 1:
    if g.e2opcion == 1:
        control.activate(Juego)
    elif g.e2opcion == 2:
        control.activate(Ayuda)
    elif g.e2opcion == 3:
        control.activate(Acercade)
    else:
        control.activate(Salir)
    g.e2opcion = 1
    baja.setData(1)
    sube.setData(1)
```

B. Software Operation

The game works as follows: once the menu is presented the user can choose one of four options:

- Game
- Help
- About
- Exit

Selecting the Game option leads straight to play and the Enter key is selected to display an IP address, at which the user will shoot a bullet trying to break the item corresponding to the class of the address presented (class A = ball, class B = jar, class C = can, class D = bottle, class E = glass), once this is done a sign of right or wrong is presented, then the user has the option to continue playing or return to the last menu. Figure 6 presents the address 101.173.099.137 to which the user should shoot the ball to get a correct answer.



Fig. 6. Option Game with the address 101.173.099.137.

The Help option explains the procedures that players need to know in order to use the game (figure 7).



Fig. 7. Help option.

The About option displays information relating to the application's developers. The Exit option allows the user to leave the game.

IV. CONCLUSIONS

By playing video games the student acquires the necessary skills to function successfully in digital environments that are predominant in all fields of our society. This puts gamers at an advantage over non gamers when faced with the interfaces of the different technological artifacts found in everyday life, enabling them to be more successful in the tasks they face and thus making them more competitive [2].

This research presents the Address Classifier game developed with Blender tool. We have aimed to show how video games have become involved in the teaching/learning process making it more fun and consequently more effective.

The use of video games in education is helpful for both teachers and students, however during the development process there are several options that we must consider when we creating software that will best suit our needs.

Applying technology in the teaching / learning process and exploiting the fact that most young people like video games we can gain a valuable advantage than can in turn help to better teach and learn a specific topic as in this particular that deals with the Computer Networks field.

This game will be provided in the near future to students of the Bachelor of Computer Science based in the Networks area to support them in their learning process as part of a set of game-based applications called Casino.

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