Nanotechnology Videogame for Middle School Students

Bryan Mitchell, Tahiri Fuentes, Gil Reyes, Héctor Jiménez
Diva Mockford, Yamil Gonzalez, and Lianne Sánchez
Advisor: Nayda G. Santiago

University of Puerto Rico, Mayagüez Campus
Department of Electrical and Computer Engineering

Abstract

1. Introduction

The UPRM CREST: Nanotechnology Center of Biomedical, Environmental, and Sustainability Applications has been working in increasing the number of high school students interested in nanotechnology. We are exploring the use of videogames for this purpose.

2. Problem & Hypothesis

Some middle school students in Puerto Rico, whose economic status is limited, experience a lack of interest to continue college studies in science and engineering [1]. UPRM CREST seeks to reach those middle school students in order to motivate them to pursue careers in STEM fields.

It has been found that video games has significantly increased the interest of high school students in the fields of nanotechnology [3]. Although this approach is not effective for all students; in general, video games create a comfortable learning atmosphere for them.

3. Objectives

Develop Nanotechnology Game

Accessible to students

Tech concepts and applications of nanotechnology

Spark interest in pursuing a career in STEM fields

Figure 1: Project Objectives

4. Methodology

The first task was to find a game engine to develop the video game. Unity was chosen to develop this video game since it provided the necessary tools to make a completely functional 2D game. Unity provides a physics engine and scripting in languages such as JavaScript and # [4].

The game was designed to be a platformer [6]. A platformer is a video game which involves guiding a character to jump between suspended platforms, over obstacles, or both to advance the game.

A storyline was developed in which an engineer builds a machine that transforms him or herself into nano scale in order to find a way to fight cancer [5]: he or she discovers that ferrofluids can help cure certain types of cancerous tumors. With that, he transforms into Nanito and must go through different stages, each one representing a different concept of nanotechnology, in order to reach the final stage and defeat the cancerous tumor.

5. Prototype

The goal for the first prototype, or level, was for the character to jump from and to different moving platforms, simulating real physics, and receive damage when in contact with a cancerous cell, which can be destroyed with ferrofluid which is a liquid polarized in the presence of a magnetic field, forming a pattern with many peaks [2].

What happens to the character during or after it collides with an object is controlled using scripts. For example, a health script is used, where each time a collision is detected, a life is subtracted until a life counter reaches zero, returning the character to the beginning of the level.

FIGURE 4: Ferrofluid Game Level

The second level is about hydrophobia. Hydrophobicity is the physical property of a molecule that is seemingly repelled from a mass of water. There is no repulsive force; it is an absence of attraction [7]. This level is vertical. Sprites were converted into animations to simulate a waterfall. Nanito jumps along rock slabs while the camera speeds up exponentially as the level progresses.

The information about the level’s concept is going to be delivered through pop-up windows, whenever the character collects an atom. At the end of each level, an enemy will ask the player questions about the information given and the player must answer them correctly in order to advance to the next level.

6. Results

Survey participants: 66
- 88% Enjoy of playing videogames
- 61% Prefer video games in Spanish
- 80% Enjoy of educational video games
- 53% Learn with video games
- Preferred devices: computers and phone

7. Future Work

- Design Solar Energy level
- Design Food Preservation level
- Visit schools for game evaluation: interest in STEM and knowledge in Nanotechnology

8. References


9. Acknowledgement

This material is based upon work supported by the National Science Foundation under Grant CNS-1042341.