Milestone 3 – Report

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1. Overview

Context/Game story

Everyone knows the famous game of pong. However, this one is limited to a computer game. With the new possibilities offered by the Cellulos, we decided to revisit this game by offering the possibility to the players to not only play on the computer but also in the real world! The game we created is a remake of the original game with quite some twists 😜! You are now able to enlarge or shrink the zone the Cellulo Paddles lie in, make the Cellulo Ball go crazy, freeze your opponents, and more. In this report, we will go through these features and highlight the problems we encountered with their implementation.

Application

The main goal of the Cellulo Pong Game is to address the learned theory topics in a practical way. By using the Cellulos robots and Unity. The game will mainly have a playful role. It is meant to be played by anyone without any limitations. We could also think that the game aims to promote human / cellulo interaction in order to show what are the possibilities offered by these robots. We tried to use their capabilities as much as possible in order to present all the possibilities they offer.

(haptic feedback, sound, lights, movement, LED buttons)

2. Game Mechanics and Powers:

Game Goal

In this game, the main purpose is to finish with the highest score possible. To do so, players must score a goal, with the Cellulo Ball in order to collect points.

The player wins a point if the Cellulo Ball collisions the opponent's back wall, that is, without him having managed to send the ball back.

There is no time limit in the game, however there is a score limit, set to 3 to make the game quick and fun. You also have the possibility to change the Cellulos' color and choose 3 powers out of 5 that you would like to have. These powers that you'll have access to can be used to weaken or deceive the opponent. Here's the complete list of powers with their descriptions:

Powers:

- **Crazy Ball :** reverses the Cellulo Ball's direction with a random angle deviation.
- **Zone Enlarger :** Enlarges the zone. There are three zones in total. If the zone is largest, this power does not do anything.
- **Zone Shrinker :** Shrinks the zone. If the zone is smallest, this power does not do anything.
- **Slime Opponent :** Changes the opponent's haptic feedback to "*move on mud"* for ten seconds
- **Freeze Opponent:** Freezes the opponent. He will not be able to move for five seconds.

To activate a power in the virtual game you just have to click on the corresponding button. They are all labelled. In the real world, you'll have to do a long press on the led with the same color as the power you'd like to use.

Menu and User Interface

The organization is very simple. There is the main menu, it's where you are starting. Then from here you can either change the general settings of the game, read the instructions or play the game. If you choose to play the game you will have a menu with multiple options you can change for your game such as the cellulo LED colors, powers, etc. After that, the game starts. Finally, the end game scene will display the final score and the winner

If you choose to modify the main settings you will be able to change the volume of the gam. Otherwise if you decide to begin a new game, a game setting menu will appear and you'll be able to start over a game. During the game you will have a 2D view of the scene. The score appears in a HUD.

Players and Map

Our game can be played 1 on 1 and there will be a cellulo ball in the middle. Each player controls their own Cellulo. The Cellulo ball is computer controlled and reproduces the behavior of a ball bumping against objects and bouncing endlessly. Knowing that cellulos do not have an infinite capacity of acceleration, the difficulty of the game comes from the fact that the map on which we play is large and that the zones can be enlarged, shrunk. The Map consists of three zones through which the Cellulo Ball can go through but not the players : the first one which is a straight line that is further back, the second one which is also a straight line but closer to the center, and the third one which is to semi-circles. As said before each player has also access to 3 powers that he chose. So in the end it's also about skill and how you master the game!

Agents

Two of the three Cellulo agents in our game will behave as paddles do in the classic version of the pong game. The third will be the ball and will move back and forth from one side of the map to the other if the players manage to collide with it.

Phases evolution

There are several added difficulties, that are the use of powers described above.

Player view

In order to have an overall view, the camera is placed in such a way that you can see the whole set just like in the original pong game.

Scoring mechanism

The scoring mechanism is pretty straight forward :

If the Cellulo Ball fully enters the opponent's rectangle area, the player wins a point (+1)

Usability

The controlled robots of this game (paddle robots) can be moved with the keyboard (AWSD for a player and ARROWS for the other). Depending on the size of the rectangle area where the paddles lie, players will sometimes mainly be able to move the paddles with SW and ARROW_UP/ARROW_DOWN and if the area gets bigger, they would play with the full range.

Players will use their hands and fingers in the real-world environment to operate with the robots.

Real Robots interaction

In our version of the game, the real robots are manipulated by the players and interact between themselves thanks to the game mechanism that we designed and created in the virtual world.

The haptic feedback is a key feature as it sometimes constrains the player in his movements and incapacitates him to do things for a few seconds.

3. How to address the theory

In our new game we used everything that we have learned in the CS-213 course:

- With the start menu, we got familiar with the creation of a neat and attractive UI.
- With the game engine, we learned how to use lighting for our scene, worked with an environment, textures and most importantly physics engine. Because this game has the particularity to be played both virtually and physically, the virtual version must have some kind of relation with the real-world physics.
- We also practiced creating and publishing an executable build.

4. Design/Implementations challenges

The most challenging parts of our implementation was:

- Creating the different powers.
- Implementing smooth rebounds against walls and paddles
- Working with haptic feedback to constrain the player's real-world interaction (not being able to move past a certain line)
- Creating a well done UI that's nice to look at.

Music:

Two original soundtracks Loïc created will be played throughout the whole game to be fully entertained and completely immersed in our game.

Final Comment:

We implemented everything that we put in our Milestone 2, except for the gems as we thought that the powers where already largely sufficient to play an interesting game.