IM3080 Design and Innovation Project (AY2022/23 Semester 1)
Individual Report

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Group No: _4_____

Project Title: _Interactive - Tetris_____

Contributions to the Project (1 page)

1. Design the set of rules of the game.

2. Software: develop the algorithm of Tetris functions including:

- Shapes generation: shape O, shape L, shape Z, shape T, shape I and respective colors of each shape.

- Shape's movement: automatic fall down, move left and right using buttons.

- Stop and stack function: shapes stop at the bottom and stack over other shapes.

- Rotate function: shapes can rotate using button.

- Collision detection: decide whether the shape is allowed to move left and right by detecting the edge pixels of shape, and whether can rotate by detecting the surrounding pixels.

- Line clear function: clear the lines need to be cleared, from 1 line to 4 lines.

- Fast falling function: shapes will fall faster if the button is pressed.

- Instant drop function: shapes will drop to the bottom instantly if the button is pressed.

- Game over and restart function: the game stops if the player loses and can be restarted if the button is pressed.

- Score system: record the current score and the highest score.

- Preview of next tile function: the next tile can be shown.

- Difficulty level feature: the game will become more difficult (the shapes will fall faster) as the score increases.

3. Test codes with both Tinkercad and real hardware, find bugs and solve bugs.

4. Hardware: Test wires using Arduino.

Reflection on Learning Outcome Attainment

Point 1: _Engineering knowledge_

Before starting this project, I have never experienced designing a project involving hardware. I didn't know what to do in the first week as I have no knowledge in combining software with hardware and I have no idea what Arduino is and how to utilize it. Then I began to learn Arduino, at the same time, I searched online how others designed their Tetris and I got a rough idea of what I should do. I learned the basic knowledge of Arduino and I tried hardware with breadboard, including LED blinking and Buzzer controlling. However, during the code developing stage, it is troublesome to test code with breadboard and wires. Therefore, we utilized Tinkercad, an online platform for circuit design and coding. It is much more efficient for us to test code and debug. Besides, I also experienced soldering wires. For the software part, I learned the basic procedure of developing a project. Firstly, we need to settle down the basic features of our Tetris and also need to rank the priority of different parts. In case that we cannot finish all the features in time, the most important part should be developed first. For example, the most basic function of Tetris, moving down, left and right should be developed first. Then, different features can be developed respectively. We found that it was important to test our codes regularly, otherwise, it will be difficult to find the bug as we cannot find which part was in error.

Point 2: _Individual and team work_

Our team divided the whole team into hardware, software and design group. This project involves both hardware design and software development. As a result, all groups must communicate timely and coordinate well. For example, software team must discuss with hardware team which pin on Arduino can be used to connect to the LED stripes and buttons as audio device can only be connected to several specific pins, buttons and LED stripes cannot occupy these pins. One thing happened due to the delayed communication between software team and design team. We first set the pixels number as 40, however, after measuring the game board and LED stripes, there can be at most 38 pixels, so we must change our codes. Among our software team, we found that it was quite difficult and boring to come up with the algorithm alone. What's more, every part of functions is connected to each other. For example, our whole algorithm is based on the basic array called lightArray. Therefore, we discussed the main algorithm together, after that, we assigned different parts for everyone. When there was a bug occurred, usually it was quite hard for the person who wrote the code to find the logic error, so we will discuss together to find the error. If one person made an error, others can stop him timely, which saved a lot of time.