COMP140 Report

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April 2020

1 Project Proposal Introduction

The controller I have created for this assignment has been designed to work alongside a game which I built in unity called 'Cut the Wire'. In the game the player will take on the role of a bomb disposal technician whose task is to clear out a field of as many bombs as possible. The player will be using my controller as their bomb defusing tool. The controller will inform the player how they will be able to defuse the bomb by identifying the wires needed to be cut before it will no longer detonate. I researched several other games which had similar goals such as Keep Talking and Nobody Explodes. Although the game has similar goals, there is no physical controller for the game.

In my original proposal, the player would have used a trackball to navigate their way around each level. The player would have been able to explore an area ridden with bombs needing to be disposed. The closer to a bomb the player finds them-self, the more LEDs on the LED ring would light up. However, this idea had to be changed due to delivery complications bought about by the COVID-19 outbreak. To overcome this challenge I updated my plan for my controller to work around the missing components.

2 Components

My controller is made up of three main components: the Arduino uno, a RFID-RC522 and a twenty-four LED Adafruit neopixel ring. Both the RFID reader and the LED ring will be directly connected to the Arduino uno without the use of a breadboard.

There are four RFID cards, each card is colour coded one of four colours: red, blue, yellow and green. The cards will signify which colour wire the player has decided to cut.The RFID reader will be used to read the tag of each card which the Arduino will convert to a string before sending the data to be compared in the unity project ColourCheck script.

The LED ring will be used in two ways throughout the game. During the main menu the LED ring will have a rainbow effect, cycling through colours. During game-play the ring will light up a random colour, representing which

colour coded card the player needs to use to defuse the bomb. The light will begin to flash when the user have five seconds left to make a decision.

I had originally intended to use a trackball as one of the components for my controller. The trackball would have been used to allow the user to travel across a level depending on the direction it was being moved.

Figure 1: The four colour-coded cards being used with my controller.

3 Controller Design

The controller is contained in a cardboard box. The LED ring can be seen at the top of the box with the the RFID reader popping out of the bottom. I had originally covered the RFID reader however this caused issues reader the tags of the cards. There is also a pocket on the side of the box so that the cards can be kept in one place. I intend to increase the number of pockets for the container so that each card has it's own space.

Both the LED ring and the RFID reader will be directly connected to the Arduino rather than being connected to a breadboard. The LED ring is connected to the 5v port. The RFID reader is connected to the 3.5v port.

4 Game Experience

The player will have a set amount of time to try and defuse as many bombs as possible using the colour coded cards. Each round will last two minutes. At the beginning of the game the player will have twenty seconds to attempt to pick the right coloured card and tap it against the reader. As the player's score increases, the amount of time they have will decrease. Due to the fidgety nature of the game it can be quite stressful on the player to swap cards as the time to make a decision decreases, leading to the player becoming frustrated and making mistakes. As a way of making the game easier on the player, if

Figure 2: The physical design of my controller.

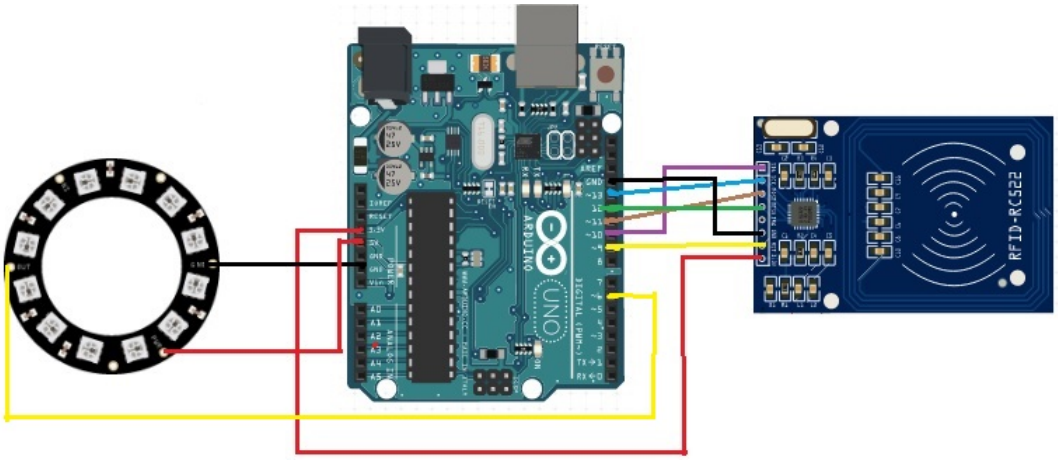

Figure 3: The hardware design of my controller.

they constantly miss a wire or choose the wrong card their score will decrease and the time that they have will increase. The timer will never be higher than twenty seconds or lower than three seconds.

5 Software Design

The RFID reader will be connected to the Arduino which will submit data recieved by RFID reader to the unity project. When the player taps one of the four colour coded RFID cards, the reader will read the card's tag. The tag will be converted to a string. The string will then be compared to a variable stored within the ColourTag script in the unity project. The unity project will then check if the card which the user tapped was the correct card. If the player taps

the correct card then the player's score will increase by five points. There is

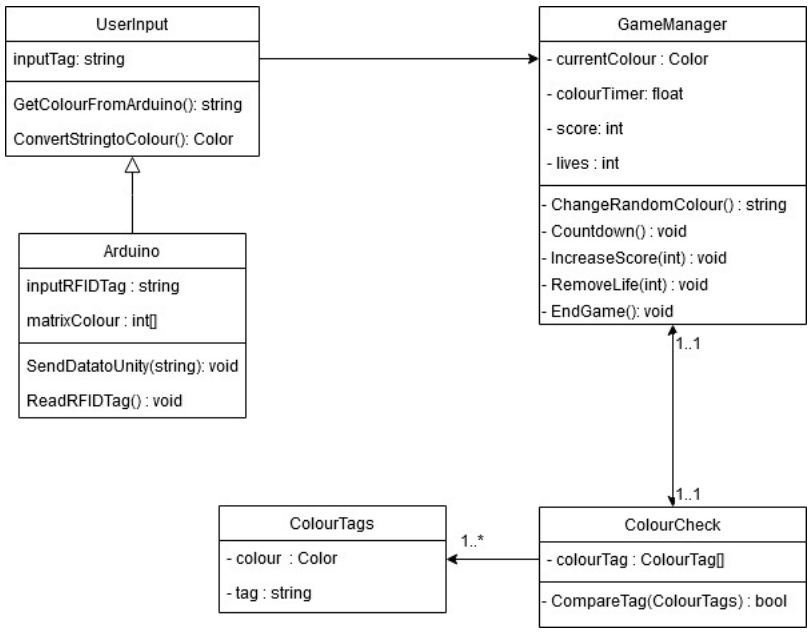

Figure 4: Class Diagram

a script in the unity project which randomly chooses a colour from an array. There are four choices in the array: blue, red, green and yellow. Depending on which colour out of the array has been chosen, the relevant sprite will become active and be displayed at the bottom of the screen. I used the light sprites as a way to check whether the LED ring matched the colour which was chosen from the array.

6 Reflection

In reflection I would have liked to explore other option which would have enabled the player to move around the level. I feel as though the removal of this element simplified my controller greatly. I would have also liked to explore a range of ways for the player to use the controller. I did consider the LED ring to display a sequence of colours which the player would then have to follow when tapping the colour coded cards. However due to time constraints and adjusting to a new method of working at home I had difficulties completing this task.

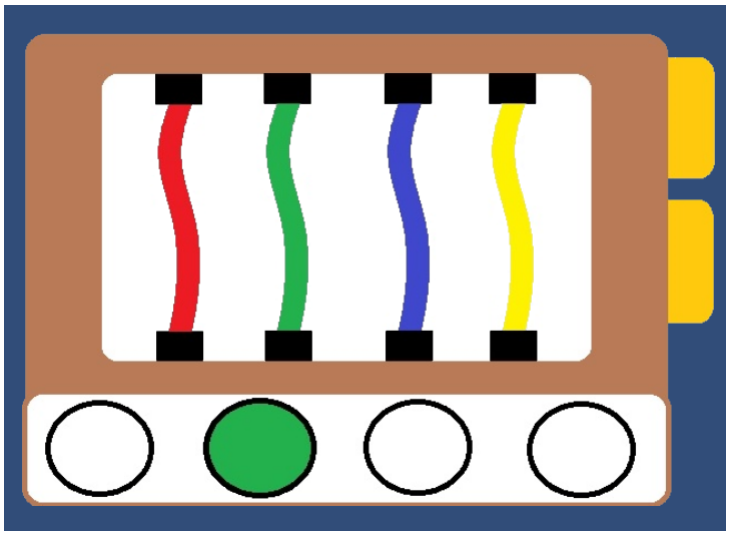

Figure 5: The user interface the player will see during game-play.

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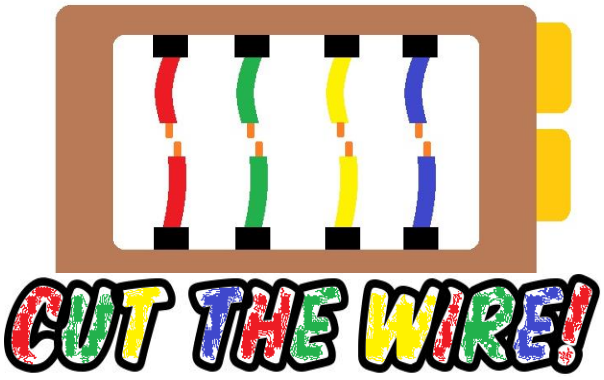
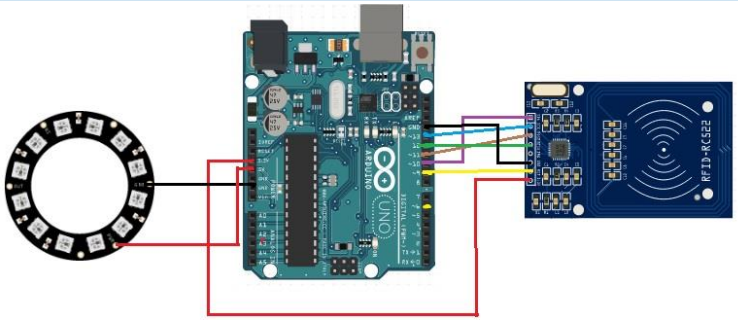
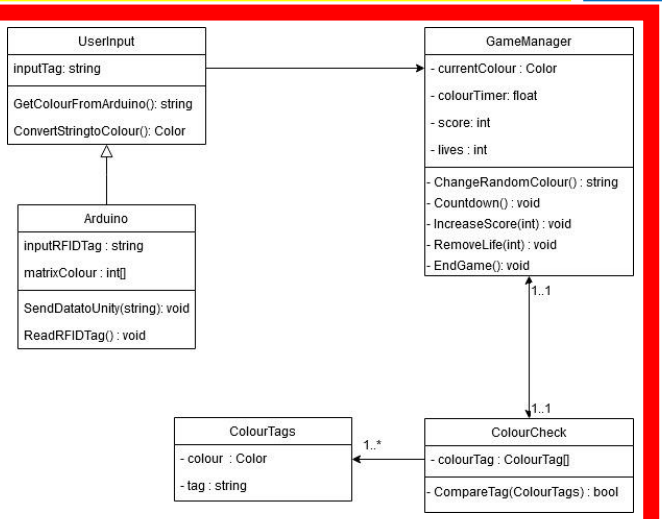


My controller has been designed to work alongside a unity project. The controller will be used in a fast pace game where the user acts as a bomb diffuser who will have to pick the right wire, by pick the corresponding RDFID card to the colour shown on the ring, to defuse the bomb. As the player progresses throughout the game the speed at which the light changes will increase. If the player taps the wrong card too many times or misses too many lights then game over.

My controller will have an Adafruit NeoPixel 24 LED ring. The ring will randomly change colour after a specific time interval, or when the player has tapped one of the given RFID cards against the card reader.

The controller will also have an RFID-RC522 which the user will use to tap the relevant colour coded RFID card according to the colour being flashed by the NeoPixel ring.





There are two main components of the game. The flashing ring and the RFID cards. The Arduino will read the tag of the RFID card tapped against the reader. The tag of the card will be returned as a string. The string will then be compared to variables stored in a script in the unity project which will determine whether the player choose the right card. The colour that the lights will flash will be stored in an RGB format and stored in an array. There will be a function that will randomly choose which colour out of the array the ring will light up next. There will also be a function that will change the length of time a certain colour will display based on the players score.

The game will run as one infinite level, speeding up as the player increases their score. Every correctly chosen card will result in the player receiving 5 points. The number of points that the player has received over the game will increase the speed at which the lights will be displayed. For every 25 points the player receives, the time will decrease by 5 seconds. If the player taps the wrong card then they will lose a life, starting with three at the beginning of the game. After the player loses three lives then the game will end. A problem that I have found with this method however is that it can end the game too quickly which may lead to frustration for the player. I may instead change the gameplay so that if the player taps the wrong card or misses a light then the time will increase again. If I were to do this, I would change the score system to giving the player a set time to defuse as many bombs as they can.