CAB202 ASSESSMENT

MICROCONTROLLLER ASSINGMENT

# 

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# INTRODUCTION

This report is a documentation for the designated task given in CAB202. The task includes the invention, design, implementation and demonstration of a working prototype of a microcontroller-based product.

The invention that has been explored is a game called “Whack-The-Box” which is a spin-off of the classic arcade game, Whack-A-Mole. The audience of this game would be people who have played the exam in the past and are interested in a bit of nostalgia or for anyone interested in a having the experience of a classical game.

# GAME DESIGN AND FUNCTION

The game starts with an introduction to the game and asks the user to adjust the level of difficulty which is controlled by an analog input. After which the level of difficulty is displayed, and the LCD screen proceeds to the contents of the game. The screen has four boxes and each box is labelled with a character next to it. The buttons are arranged in the same order as the boxes shown in the screen. An arrow randomly pops up next to a box and the LED corresponding to it lights up and the player can press the button to score. The game has a counter called whack score and has a limit of ten correct whacks. The reaction time for each whack is counted. If the players misses a whack it will be displayed on the screen. Once the player has completed the objective of the game, which is to press the button as fast as they can. The reaction time will be displayed on the serial monitor.

# SCHEMATIC DIAGRAM

The schematic diagram displaying the circuit used has been displayed below.

A close up of a map

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## WIRING FOR THE ARDUINO

The wires have been color coded as shown in the above diagram for its specific function.

1. Red wires are connected to the power supply from the Arduino and carries 5V. This is connected to the positive terminal of the breadboard powering up the ‘+’ lines.
2. Black wires connect the components to the ground (GND terminal). This is connected to the negative terminal of the breadboard grounding the ‘-’ lines.
3. The grey wires connect the anode of the LEDs to the pins in the Arduino board. (PB2, PB3, PB4 and PB5).
4. The green wire connects the data input pins in the Arduino to the LCD screen (DB4, DB5, DB6 and DB7 to PD4, PD5, PD6 and PD7 respectively).
5. The yellow wires connect the 2a terminal of the switches to the switch pins (PC2, PC3, PC4, PC5)
6. The purple is a standalone connection that connects the wiper of the potentiometer to PC0
7. The pink is also a standalone wire that connects “LED” pin (left) on the LCD screen to a resistor and then to power.
8. The blue wire connects the RS (register select pin) to PB1 in the Arduino board
9. The orange wire connects the enable pin of the LCD screen to the PB0 pin.
10. Potentiometer
11. LED’s
12. Switches
13. Arduino Board

# DEMONSTRATED LEARNING OUTCOMES AND SPECIFICATIONS

For this task certain specifications and learning outcomes that were expected. They are as follows,

1. Digital I/O – switch

This outcome was achieved as four switches were used which acted as the “whack” when the button was pressed.

1. Digital I/O – interrupt-based debouncing

The button “A” which is connected to PC2 in the Arduino has been debounced. Debouncing has been done such that each button press is measured as only one button press and makes the circuit more efficient.

1. Digital I/O – LED

Four LEDs have been used which were connected to the PORTB and to the ground terminal.

1. Analog Input

A potentiometer has been used for the analog input which is connected to the + terminal , the wiper to the PC0 pin and to the ground terminal.

1. Analog Output (PWM) – hardware-based; OR software-based “bit-banging”

LED 4 which is connected to PC5 has been used for the PWM which regulates the brightness from low to high throughout the game.

1. Serial I/O – hardware based; polling OR interrupt mediated

After the player has completed the game a message is printed out in the serial monitor with the player’s reaction during his gameplay.

1. LCD – simple text display; OR: bit-mapped graphics, including sprites, line or pixel art
2. Timers – other than debouncing or PWM

The “timer2” was used to calculate the reaction time which is the time elapsed from the led being lit up and the time the player presses the button.

# FUTURE RECOMMANDATIONS, CRITICAL EVALUATION AND CONCLUSION

The theoretical design satisfies all criteria. When practically simulated on tinker cad however the serial I/O does not work as intended as there was a error in the implementation of timer2 to calculate the reaction time.

The second error in this design is the LED 4 which has the PWM criteria keeps regulating the brightness throughout the game. (While it satisfies the criteria, it decreases game performance) This can be fixed by either using a separate LED or stopping the PWM after the initial displaying of the game

Another recommendation is for the game to be set such that for every button press it will to follow a pattern/rhythm where it would play out the modern hip hop song “The Box” by Roddy Rich and the player would play whack a box according to that.

# Tinker CAD link

https://www.tinkercad.com/things/1kWXIYu6cZN-copy-of-copy-of-t11-lcd-hero-adventure-student-copy/editel?tenant=circuits?sharecode=IVhZyboeVCafO4691gJFHPl6n7Vd8i0gYholKw\_pb6o

# Video presentation on YouTube link

https://youtu.be/N2IW1mgnzbg

# APPENDIX – Extension Letters and medical

A screenshot of a cell phone

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