

ECE 5 Lab 5: Whack - A - Mole
Project Proposal
Fall 2020
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Main Objective:

In Lab 5, we will be creating a whack-a-mole game that ties in your understanding and experiences with both Arduino and the GUI function on MATLAB. Technical skills that will be built upon include reading fritzing and circuit diagrams and building their respective circuits, and coding with MATLAB. Throughout the challenges, we will guide you in the building of your Arduino board and the whack-a-mole game that we will eventually play via the GUI in MATLAB. By the end of the lab, you will be able to play this virtual game by pressing on the pushbuttons on your Arduino board. We hope that you will have fun learning to make and playing with this arcade styled project!

Background: (List any additional theoretical foundation needed, or technical topics worth discussing, or how your team will motivate the project / explain the purpose of the lab)

Some of the technical foundations that will be reviewed in Lab 5 include embedded systems and control, DSP, and programming. Through the use of these topics, you will gain a deeper understanding of the process a signal takes from a push button on a breadboard to registering on the MATLAB GUI. You will also revisit DSP through processing images on the MATLAB GUI and by manipulating them depending on the player's inputs.

- Embedded systems and control
- DSP
- Communications

Materials/Tools: (List the materials, tools, and components that will be used in the lab)

- | | |
|---------------------------|------------------|
| - 1 Arduino Mega (or Uno) | - 5 LEDs |
| - 1 USB Cable A-B | - ? Resistors |
| - 1 Breadboard | - ? Jumper Wires |
| - 4 Pushbutton | - 1 Piezo buzzer |
| - Matlab GUI | |

Challenge #1: In challenge #1, we will set up the buttons and led lights on the arduino for the whack-a-mole game. Every two times you push a button, an extra LED should illuminate. After 10 button presses, all 5 LEDs should light up.

This will test the user's ability to build a circuit based on the provided fritzing and circuit diagrams.

Include fritzing and circuit diagrams.

Challenge #2: In challenge #2, we will build on the circuit built in challenge #1 to incorporate a sound capability when a button is pressed. Each button will have a different sound and when all 5 LEDs are illuminated, there will be a special tune played.

This will test the user's ability to build a circuit based on the provided fritzing and circuit diagrams.

Include fritzing and circuit diagrams. Make a board (PCB) of the project

Use this link to code the different sounds that the buzzer will make.

<https://create.arduino.cc/projecthub/SURYATEJA/use-a-buzzer-module-piezo-speaker-using-arduino-uno-89df45>

Challenge #3: In challenge #3, we will set up the frontend of the game on MATLAB GUI. This will consist of making the layout of the game and setting up graphics on the GUI. There will be a start button, a score counter, and graphics of the moles.

This will build user's skills in matlab specifically GUI which helps the user build their front and back end skills.

Use this link to understand how to set up an app in GUI:

https://www.mathworks.com/help/matlab/creating_guis/about-the-simple-guide-gui-example.html

Challenge #4: In Challenge #4, we will set up the GUI user interface. We will be coding the whack-a-mole game so that it will be playable with a mouse. In this app, the user will play the reactionary game so that each time the user clicks within a reasonable time frame the score will increase by one. The objective is to get to a score of 10.

Challenge #5: Challenge #5 is where everything will be integrated together to create a working whack-a-mole game. You will need to connect the circuit you created in Challenge #1 to your MATLAB GUI created in the previous challenge. We will be using the buttons on the Arduino board to "whack" the moles with each press.

Challenge #6: If you were to play this game at an actual arcade, how would this game look? Using 3D prototyping via OnShape, SolidWorks, etc. create a physical representation of what this game looks like for you.

Provide an example image of the 3D prototype.

Use this link to help guide you through OnShape:

<https://www.youtube.com/watch?v=kGLZcrLkmHM>

Author's Roles:

Henry Liu -

- Proposal

- Brainstorming
- Submission
- Challenge 1
 - Schematic
 - Quality check
 - Submission
- Challenge 2
 - Documentation
 - Code
 - Assembly
 - Schematic
 - Fritzing Diagram
 - PCB Board
- Challenge 3
- Challenge 4
- Challenge 5
- Challenge 6
 - Build 3D prototype on OnShape

Nate Seekins

- Proposal
 - Brainstorming
- Challenge 1
 - Fritzing Diagram
- Challenge 2
 - Fritzing Diagram
- Challenge 3
 - Documentation
- Challenge 4
 - Front end UI
 - Code for game
 - Documentation
- Challenge 5
 - Integrating MatLab game and Arduino hardware
 - Documentation
- Challenge 6
 - Video Demo (Code + Hardware)
 - Laser Cut 3D Onshape model

Alexis Yu

- Proposal
 - Brainstorming
- Challenge 1

- Code and circuit assembly
- Documentation of code and parts
- Challenge 2
 - Documentation
- Challenge 3
 - Layout of GUI (Frontend)
 - Code for GUI(make all the buttons functioning)
- Challenge 4
 - Code GUI
 - Documentation
- Challenge 5
 - Code to connect arduino to GUI
 - Documentation
- Challenge 6
 - Documentation
- Slides

Add References:

[1]Use a Buzzer Module (Piezo Speaker)

<https://create.arduino.cc/projecthub/SURYATEJA/use-a-buzzer-module-piezo-speaker-using-arduino-uno-89df45>

<https://www.programmingelectronics.com/an-easy-way-to-make-noise-with-arduino-using-tone/>

[2] Create a Simple App Using GUI

https://www.mathworks.com/help/matlab/creating_guis/about-the-simple-guide-gui-example.html

[3] Challenge 1 Code Explanation

<https://medium.com/arduino-playground/checking-for-a-button-press-in-arduino-7681cbb7bde7>

[4] OnShape Tutorial

<https://www.youtube.com/watch?v=kGLZcrLkmHM>