**EYE TRACKER TESTING ROBOT**

SOFTWARE INSTRUCTION MANUAL

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**Pull GitHub files –**

1. Open github.com/jpswensen/EyeTrackingTestRig \*replace with MSResearch Github link\* and clone the repository onto your local machine.
2. This repository contains the API, Arduino Code and the CAD files associated with the robot.

**Flashing the EEPROM –**

The Arduino code upon boot-up expects certain variables to be present in the EEPROM, in certain pre-defined addresses. The robot will not function as expected if these variables are not present or the wrong values for these variables are loaded. So, if this the first time that you will be flashing the Arduino, it is necessary to flash the EEPROM before. Below are the steps to follow to flash the EEPROM.

1. Navigate to Arduino CODE -> EyeTrackerRevamped -> EEPROMFlasher
2. Open EEPROMFlasher.ino. Select the COM port associated with the robot’s Arduino Mega.
3. Upload the code.

Now the required variables should be loaded onto the EEPROM.

**Flashing the Arduino Code –**

1. Navigate to Arduino CODE -> EyeTrackerRevamped.
2. Open EyeTrackerRevamped.ino and upload this file onto the Arduino Mega.
3. Once the file is done uploading, you should hear the relay in the electrical box make a clicking sound and the eye servos should rotate to their “home” position.

Once the Arduino has been flashed, you should be set to start controlling the robot.

**Windows API –**

In order for the API to work with the Arduino, you will need a USB to TTL Serial cable like the one in the link here: [954 Adafruit Industries LLC | Cable Assemblies | DigiKey](https://www.digikey.com/en/products/detail/adafruit-industries-llc/954/7064488?utm_adgroup=Smart%20Cables&utm_source=google&utm_medium=cpc&utm_campaign=Shopping_Product_Cable%20Assemblies&utm_term=&utm_content=Smart%20Cables&gclid=CjwKCAjwsNiIBhBdEiwAJK4khlGjRPFNOOKKscV4dIo9O3pYCLK6Yia9psCAwBHcUHW0kDFpBTdkuxoC1D0QAvD_BwE)

The pin out for this cable should be as follows:

Red -> 5V on the Arduino; Black -> GND on the Arduino; White (RX) -> TX on the Arduino; Green (TX) -> TX on the Arduino.

Once the USB to TTL Serial Cable has been connected to the Arduino, connect it to the PC you are using for controlling the robot.

1. Navigate to EyeRobotControlApp -> EyeRobotControlApp -> bin -> Debug.
2. Open EyeRobotControlApp.exe.
3. Enter the COM port associated with the USB to Serial Cable in the window that pops up.

Graphical user interface, application

Description automatically generated

Figure 1 COM Port Window

1. If the COM port entered was right, you should see the screen given below.Graphical user interface, application

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Figure 2 Robot Control Application Main Window

The Windows API has three tabs or pages: Eye Control, Neck Control and Shoulder Control. These three pages provide all the functionalities of the robot. Each page also has a corresponding calibration window that allows one to calibrate the associated subsystem.

Eye Control Page –

Graphical user interface, website

Description automatically generated

Figure 3 Eye Control Page

1. To point the eyes at a desired position on the screen, type out the coordinates in the text boxes under Gaze and click on the Gaze button to make the eyes point at that position. Note: the coordinates are in meters, so X and Y values greater than 0.1 will make the eyes point outside the screen.
2. Clicking on the center button will send the eyes to the center position on the screen.
3. To calibrate the eyes, click on the Eye Servo Calibration button and a window as given below should pop up.

Chart, treemap chart

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Figure 4 Eye Calibration Window

1. In this window, you can select which eye servo you wish to control and move that servo Up-Down or Left-Right.
2. Once you have managed to get both eyes to point at a single point at the center of the screen, you can exit the calibration process by pressing the CANCEL button.

Neck Control Page –

1. The neck control page allows the user to manually control the neck of the robot and direct it toward the desired angle. All angles are accepted in radians.
2. PhiR indicates the amplitude of the twist and PhiS indicates the direction of the twist (0⁰ is straight forward; 90⁰ is to the right; 180⁰ is to the left). PhiD indicates the angle of yaw of the neck.
3. To move the neck input the desired coordinates in their respective positions and press set.
4. To calibrate the neck, press the calibrate button and the calibration window as shown in figure 6 should pop up.

Graphical user interface

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Figure Neck Control Page

Table

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Figure Neck Calibration Page

1. Select the desired motor to calibrate in the calibration page and up/down to loosen or tighten the respective neck stepper. **Once finished calibrating, press the Done button to exit the window and save the set calibration variables to the PROM.**

Shoulder Control Page –

Graphical user interface, website

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Figure Shoulder Control Page

1. The shoulder control page allows for manual control of the shoulder of the robot.
2. **Upon first-time bootup, always calibrate the shoulder by pressing the home steppers button.** Doing so will move the shoulders to their zero or home position.
3. To move the shoulder to the desired coordinates, input the X,Y,Z coordinates in their respective text boxes and press move shoulders button.