Lab 1: Introduction to Raspberry Pi, Basic I/O and ADC

Mark Hazen & Jimmy Nguyen

1 Exercise 1

In this exercise we set up the Eduroam Wi-Fi connection and the remote connection by following the supplemental documents. We then demonstrated our results to the lab instructors.

```
182  cd home
183  ls
184  pwd
185  nano wpa_supplicant.conf
186  sudo chmod +x setup_wifi.sh
187  ifconfig
188  sudo service ssh start
189  ifconfig
190  sudo service ssh start
```

2 Exercise 2

In this exercise we used a series of Linux commands to finish provided operations. The commands we used included: pwd, ls, nano, mkdir, cp, mv, rm -r, history. We demonstrated our operations to the lab instructors.

```
193  pwd
194  ls
195  nano exe1.txt
196  mkdir ECEN4213Lab1
197  cp exe1.txt ECEN4213Lab1/exe1.txt
198  ls
199  cd ECEN4213Lab1/
200  ls
201  mv exe1.txt exe_1.txt
202  ls
203  cd ../
204  rmdir ECEN4213Lab1/
205  rm -r ECEN4213Lab1/
206  ls
207  mkdir group_09
208  cd group_09/
209  history
```

3 Exercise 3

In this exercise we programmed a stepper motor to move in the forward direction at a specified speed. After showing our lab instructor the wiring, we completed the provided code and then demonstrated the result to the TA.

3.1 Circuit

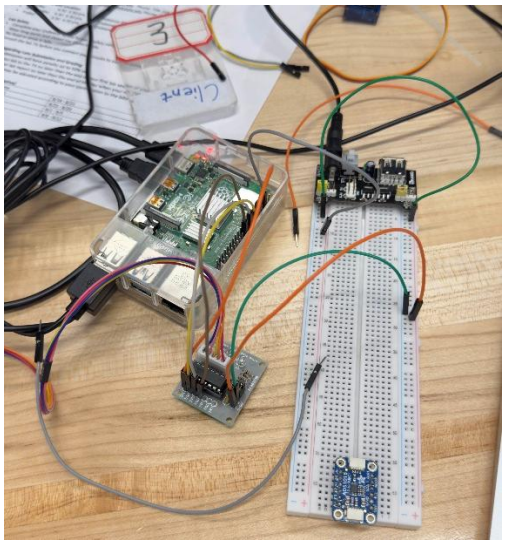

Figure 5: circuit for exercise

4 Exercise 4

In this exercise we programmed a servo to rotate from the minimum angle to the maximum angle and from the maximum angle to the minimum angle. Once we wired up our circuit and confirmed with the TA we completed the provided code and demonstrated the results to the TA

4.1 Circuit

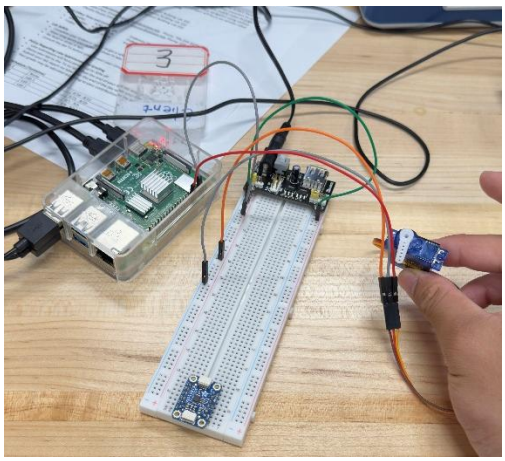

Figure 5: circuit for exercise

5 Exercise 5

In this exercise we used a potentiometer to control the rotation of a servo to be between 0 and 180 degrees. We used the ADS1015 chip to convert analog signals to digital signals and a button to control the rotation mode using interrupts. The rotation mode covers both clockwise and counter-clockwise. Once we built our circuit and had it checked by our lab instructors we completed the provided code and demonstrated our results to the lab instructor.

5.1 Circuit

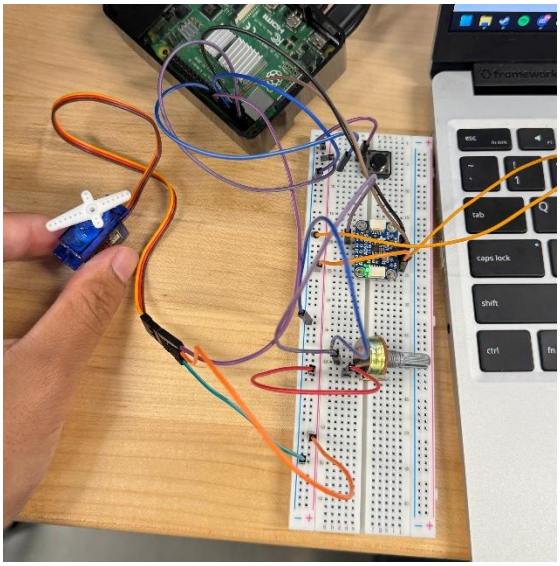

Figure 5: circuit for exercise

6 Supplemental Questions

6.1 Briefly summarize what you learned from this lab.

In this lab we learned to set up the Raspberry Pi for remote access over Wi-Fi and how to use basic Linux commands. We also built and programmed circuits to control motors and interfaced with analog components using an ADC and a potentiometer. We also used interrupts to incorporate button presses into our code.

6.2 What is the advantage of using interrupts?

Using interrupts is efficient. As opposed to using polling which constantly checks for changes in inputs, the processor can focus on other tasks and only respond when an interrupt occurs. This allows for faster response times and reduces the amount of resources needed to detect inputs.

6.3 Explain the differences between stepper motors and servo motors and DC motors.

Stepper motors have discrete rotation states that they can fall into due to the magnet layout. This allows them to be very good at moving precise distances and maintaining them. DC motors are good for power and speed applications that don't require as much precision. Servos have potentiometers in them and usually have a limited range. These are good for quick movements that are also precise and are usually used for repetitive movements.

ACKNOWLEDGMENTS

I certify that this report is my/our own work, based on my/our personal study and/or research and that I/we have acknowledged all material and sources used in its preparation, whether they be books, articles, reports, lecture notes, and any other kind of document, electronic or personal communication. I/We also certify that this assignment/report has not previously been submitted for assessment anywhere, except where specific permission has been granted from the coordinators involved.

Author-1 Signature **Jimmy Nguyen**
Author-2 Signature **Mark Hazen**