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CSC 299

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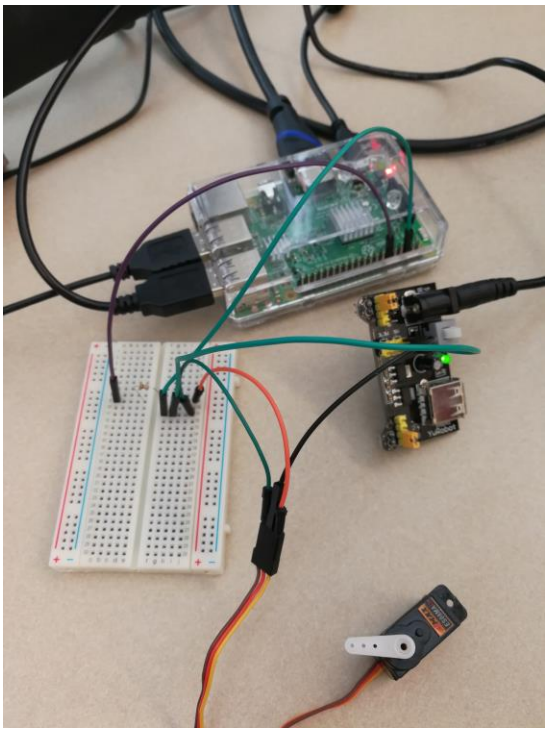
# Lab 6: Motors

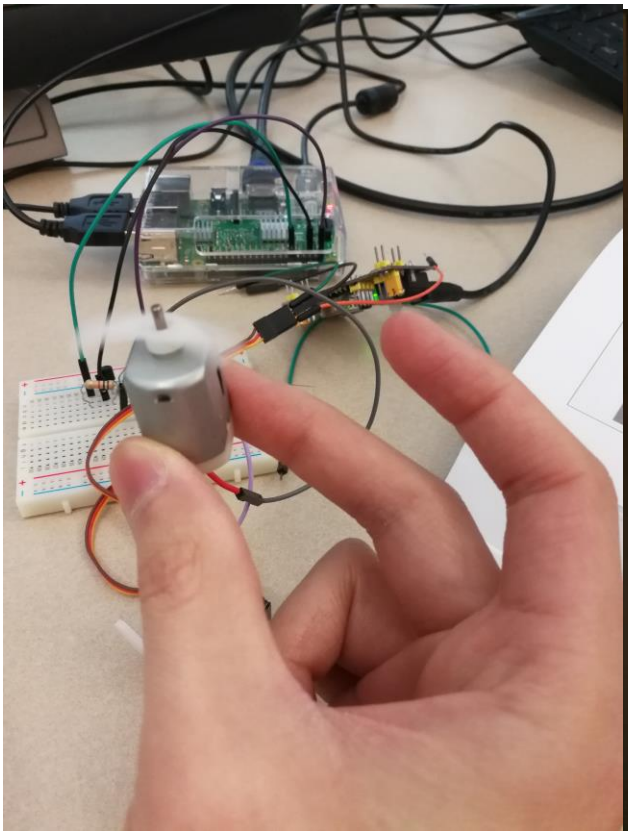
This lab was all about utilizing motors. In the first exercise, we learned how to control servo motors using Pulse Width Modulation to control the position of it (between 0 and 180 degrees), which is determined by the length of the pulse. The second exercise taught us how to control the speed of a DC motor using a GUI slider, a small 2N3904 transistor, and a 1N4001 diode. In the third exercise we learned how to control the direction of a DC motor using an L293D chip H-bridge. By reversing the polarity across the motor, an H-Bridge also reverses the direction the motor turns. The fourth exercise taught us how to drive a five-lead unipolar stepper motor using the Pi and a ULN2803 Darlington driver. Like a regular motor, a stepper motor can rotate continuously, but you can also very accurately position them by moving them a step at a time in either direction. In the final exercise we learned how to build a robot rover using a RaspiRobot board. We programmed it to use the range finder and turn around once it is 1ft away from a wall/object.

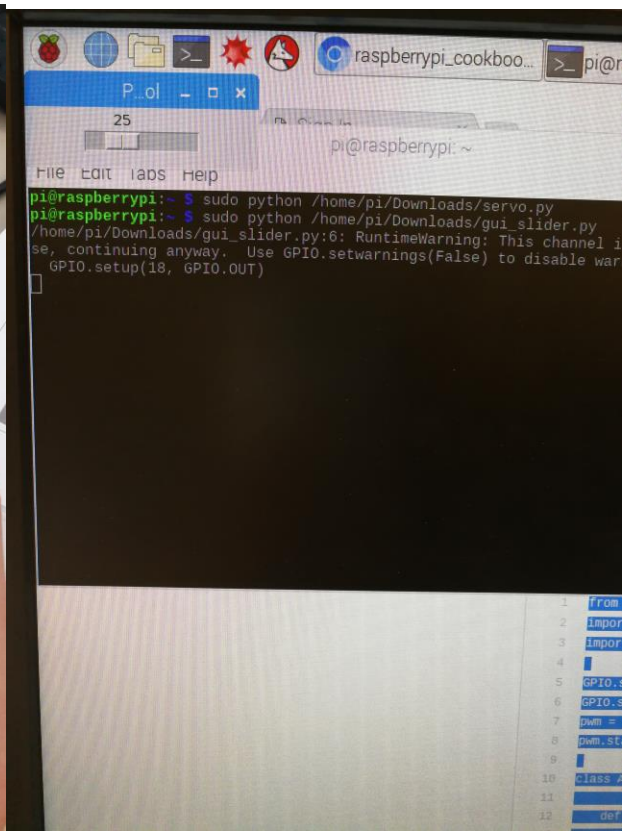
Our only challenge we had in this lab was figuring out how to correctly connect and wire up the different parts of the robot rover. It took us a little while, but once we asked for tips from our classmates in the lab, we were able to get rolling.

1.

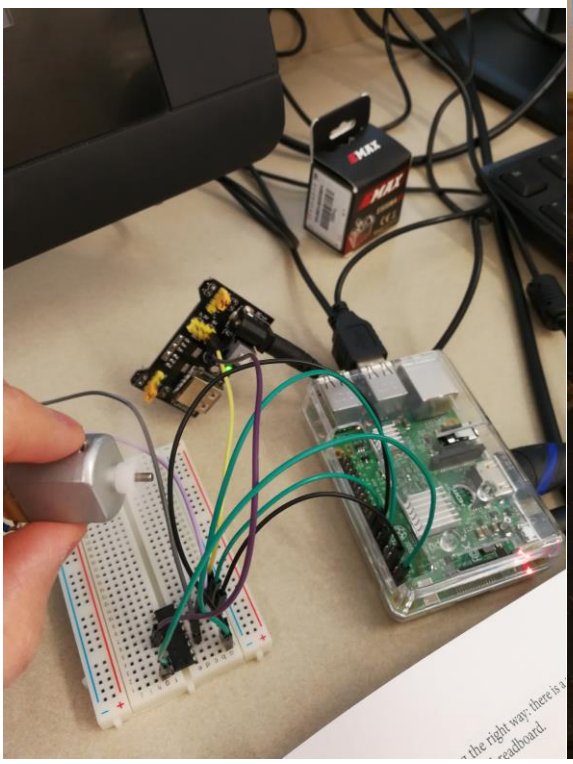


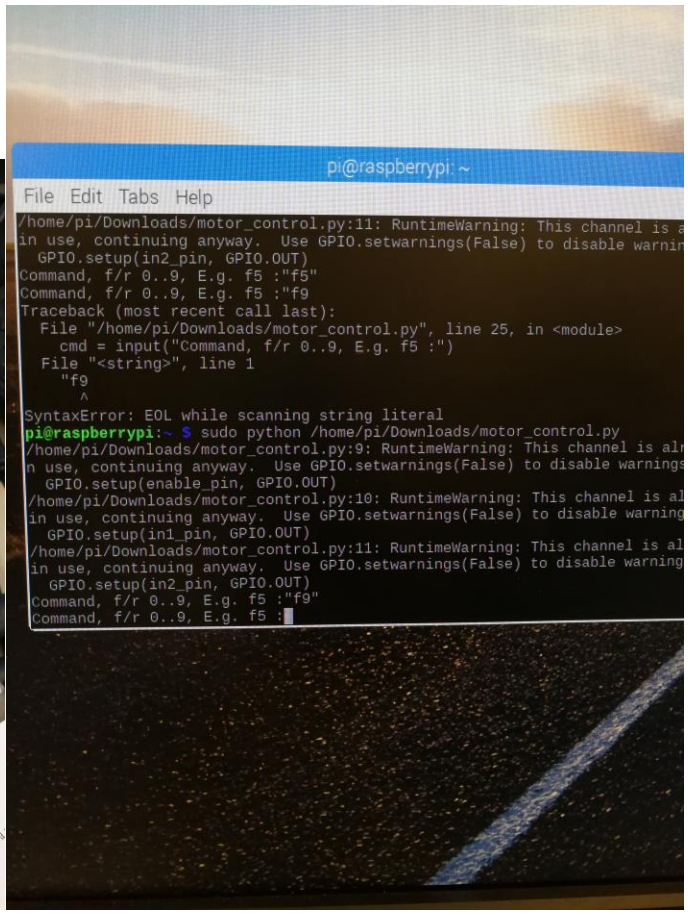
2.



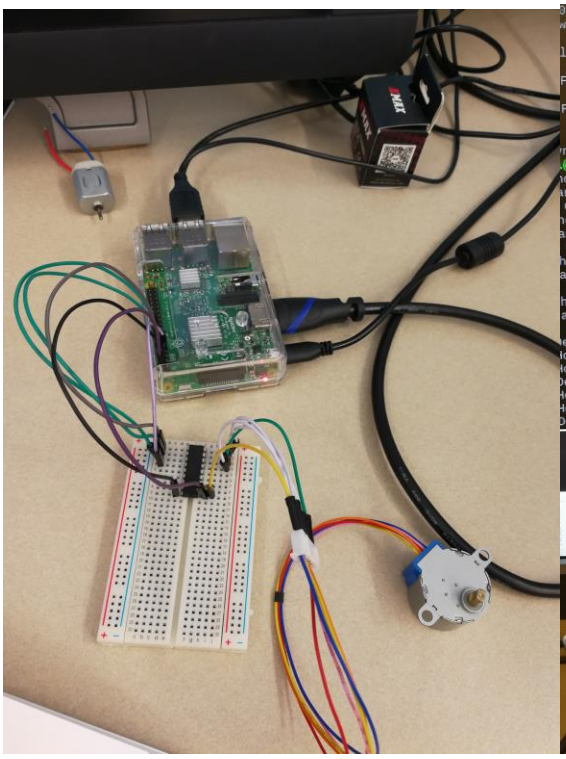

raspberrypi_cookboo...
pi@r
P...ol
25
pi@raspberrypi: ~
File Edit Tabs Help
pi@raspberrypi:~ $ sudo python /home/pi/Downloads/servo.py
pi@raspberrypi:~ $ sudo python /home/pi/Downloads/gui_slider.py
/home/pi/Downloads/gui_slider.py:6: RuntimeWarning: This channel i
se, continuing anyway. Use GPIO.setwarnings(False) to disable war
GPIO.setup(18, GPIO.OUT)

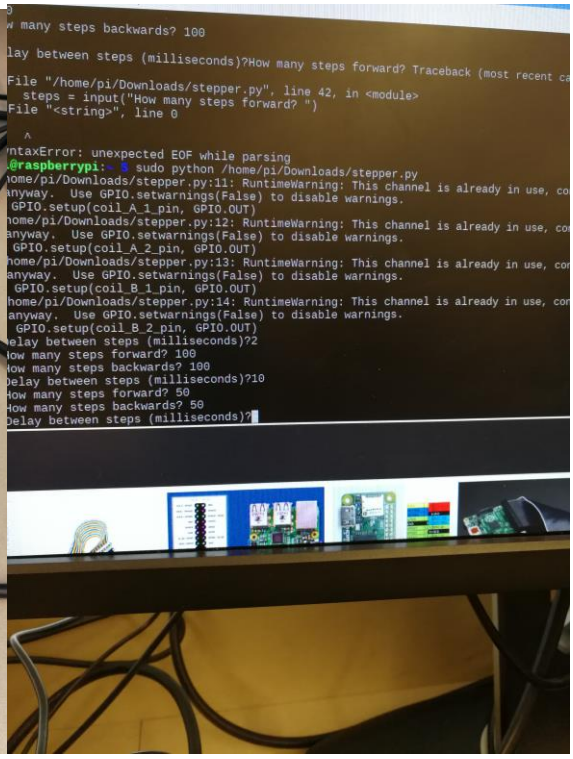
3.




pi@raspberrypi: ~
File Edit Tabs Help
/home/pi/Downloads/motor_control.py:11: RuntimeWarning: This channel is a
in use, continuing anyway. Use GPIO.setwarnings(False) to disable warnin
GPIO.setup(in2_pin, GPIO.OUT)
Command, f/r 0..9, E.g. f5 :"f5"
Command, f/r 0..9, E.g. f5 :"f9
Traceback (most recent call last):
File "/home/pi/Downloads/motor_control.py", line 25, in <module>
cmd = input("Command, f/r 0..9, E.g. f5 :")
File "<string>", line 1
"f9
^
SyntaxError: EOL while scanning string literal
pi@raspberrypi:~ $ sudo python /home/pi/Downloads/motor_control.py
/home/pi/Downloads/motor_control.py:9: RuntimeWarning: This channel is alr
n use, continuing anyway. Use GPIO.setwarnings(False) to disable warnings
GPIO.setup(enable_pin, GPIO.OUT)
/home/pi/Downloads/motor_control.py:10: RuntimeWarning: This channel is al
in use, continuing anyway. Use GPIO.setwarnings(False) to disable warning
GPIO.setup(in1_pin, GPIO.OUT)
/home/pi/Downloads/motor_control.py:11: RuntimeWarning: This channel is al
in use, continuing anyway. Use GPIO.setwarnings(False) to disable warning
GPIO.setup(in2_pin, GPIO.OUT)
Command, f/r 0..9, E.g. f5 :"f9"
Command, f/r 0..9, E.g. f5 :

4.




w many steps backwards? 100
lay between steps (milliseconds)?How many steps forward? Traceback (most recent ca
File "/home/pi/Downloads/stepper.py", line 42, in <module>
steps = input("How many steps forward? ")
File "<string>", line 0
^
ntaxError: unexpected EOF while parsing
@raspberrypi:~ $ sudo python /home/pi/Downloads/stepper.py
ome/pi/Downloads/stepper.py:11: RuntimeWarning: This channel is already in use, co
nyway. Use GPIO.setwarnings(False) to disable warnings.
GPIO.setup(coil_A_1_pin, GPIO.OUT)
ome/pi/Downloads/stepper.py:12: RuntimeWarning: This channel is already in use, co
nyway. Use GPIO.setwarnings(False) to disable warnings.
GPIO.setup(coil_A_2_pin, GPIO.OUT)
ome/pi/Downloads/stepper.py:13: RuntimeWarning: This channel is already in use, co
nyway. Use GPIO.setwarnings(False) to disable warnings.
GPIO.setup(coil_B_1_pin, GPIO.OUT)
ome/pi/Downloads/stepper.py:14: RuntimeWarning: This channel is already in use, co
nyway. Use GPIO.setwarnings(False) to disable warnings.
GPIO.setup(coil_B_2_pin, GPIO.OUT)
elay between steps (milliseconds)?2
ow many steps forward? 100
ow many steps backwards? 100
elay between steps (milliseconds)?10
ow many steps forward? 50
ow many steps backwards? 50
elay between steps (milliseconds)?

5.

File Edit Format Run Options Window Help

```
# Attach: SR-04 Range finder, switch on SW1, and of course motors.

# The switch stops and starts the robot

from rrb2 import *
import time, random

rr = RRB2()

motor_speed = 0.6

# if you dont have a switch, change the value below to True
running = True

def turn_randomly():
    turn_time = random.randint(1, 3)
    if random.randint(1, 2) == 1:
        rr.left(turn_time, motor_speed)
    else:
        rr.right(turn_time, motor_speed)
    rr.stop()

while True:
    distance = rr.get_distance()
    if distance < 30.48 and running:
        rr.left(2, .5)
    if running:
        rr.forward(0, motor_speed)
    if rr.sw2_closed():
        running = not running
    if not running:
        rr.stop()
    time.sleep(0.2)
```