Lewin Kelley
Professor Striegel
CSE 34468
17 June 2024

Homework 3

1. For the respective key parameters of the device and the A/D, identify the following properties:

The digital value will be able to go from 0 to 2^8-1. The minimum will be 0, the maximum will be 255. The range of values is 0-255 with a step size of 1.

For the resistance strip measurement, the minimum is 10 kilo-ohms with a max of 100 kilo-ohms. This gives a range of 90 kilo-ohms. The step size will be 90/(256) or 0.351 kilo-ohms, 351 ohms.

For the distance measurement, the minimum is 0 cm with a max of 2 cm. This gives a range of 2 cm. The step size will be 2/256 cm or 0.0078125 cm.

2. Write a function named getDistance that gets the digital A/D value via function named readADC1. Return the distance in centimeters that is registered by the pressure strip using what you derived in Question 1.

```
def getDistance():
    value = readADC1()
    distance = value*0.0078125
    return distance
```

3.

```
# External module imports
import RPi.GPIO as GPIO
import time

# Pin Definitons:
pwmPin = 18 # Broadcom pin 18 (P1 pin 12)
RedLedPin = 23 # Broadcom pin 23 (P1 pin 16)
GreenLedPin = 21 # Broadcom pin 21
butPin = 17 # Broadcom pin 17 (P1 pin 11)

dc = 95 # duty cycle (0-100) for PWM pin

# Pin Setup:
```

```
GPIO.setmode(GPIO.BCM) # Broadcom pin-numbering scheme
GPIO.setup(ledPin, GPIO.OUT) # LED pin set as output
GPIO.setup(pwmPin, GPIO.OUT) # PWM pin set as output
pwm = GPIO.PWM(pwmPin, 50)  # Initialize PWM on pwmPin 100Hz frequency
GPIO.setup(butPin, GPIO.IN, pull_up_down=GPIO.PUD_UP) # Button pin set as input w/ pull-up

# Initial state for LEDs:
GPIO.output(ledPin, GPIO.LOW)
pwm.start(dc)

print("Here we go! Press CTRL+C to exit")
try:
    while 1:
        if getDistance()<0.5: # Red turn on
            GPIO.output(RedLedPin, GPIO.HIGH)
            GPIO.output(GreenLedPin, GPIO.LOW)
        elif getDistance()>1.5: # Green LED turns on:
            GPIO.output(RedLedPin, GPIO.LOW)
            GPIO.output(GreenLedPin, GPIO.HIGH)
        else: # Off when not in range
            GPIO.output(RedLedPin, GPIO.LOW)
            GPIO.output(GreenLedPin, GPIO.LOW)
        time.sleep(0.075)
except KeyboardInterrupt: # If CTRL+C is pressed, exit cleanly:
    pwm.stop() # stop PWM
    GPIO.cleanup() # cleanup all GPIO

```

4. Why would a motor need to use a digital encoder instead of a potentiometer to verify position of the motor?

A potentiometer uses the change in resistance in order to measure how far a dial has been turned. A digital encoder on the other hand has absolute step sizes and can therefore be used in situations where accuracy and preciseness are more important. Encoders may also be used in harsher environments as potentiometers break down more quickly due to them requiring a physical contact.

5. Using the web, identify and explain one case of using a Reed switch to detect liquid flow. Compare and contrast that to one example of using a hall sensor.

Reed switches can be used to detect flow rate in tankless water heaters. A permanent magnet opens and closes a switch, by comparing this rate with the size of the pipe the flow rate for the water can be found.
A Hall sensor is used when a permanent connection is not available for example to detect the speed of a tire. As the tire spins around a detector on the car uses magnets that generate a charge to create a digital signal. This signal is then converted to be used for many different things like the speedometer and ABS in a car.

6. Identify two "smart" devices or technologies under the umbrella of the Internet of Things (or Industrial Internet of Things) related to your final project interest. These should not be the same as the links identified by any of your other potential group members.

https://www.lg.com/us/lg-thinq#laundry
This is LG's smart washer and dryer app. This app allows the user to connect their smart dryers and washers to their internet and phone to monitor their laundry and even in some cases start a load from their phones.

https://www.amazon.com/Aqara-Keyless-Bluetooth-Deadbolt-Supports/dp/B0CZNZGGS7?ref_=ast_sto_dp

This smart lock allows the user to control their lock from anywhere by using their cell phone. This product also allows for temporary passwords so if someone is housesitting you can allow them access to your home without giving them your actual key.