MECH 452 - Mechatronics Engineering
Department of Mechanical and Materials Engineering
Faculty of Engineering and Applied Science, Queen's University, Kingston

Group #08
Laboratory #42 - Introduction to the Universe and Everything

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Summary:

A prewired USB-Boarduino with a potentiometer and servo motor were used to demonstrate a system that takes an analog input (potentiometer), and outputs to a digital device (servo motor). The servo motor was first calibrated to turn from 0 to 180 degrees. Then Arduino code was written to have the analog potentiometer write a position for the servomotor to turn to.

Program:

A listing of the program Group8Lab1ServoMoter used in the lab is given in **Appendix A**. A flowchart explaining the code is seen in Figure 1

Results*:*

The answers to the questions from the lab are as follows:

a) They do not need to be integers since they are multiplied into a function that determines the pulse width in milliseconds which does not require an integer input.

b) The delays are between the calculation of the pulse width and uploading the new position to the servo. The delays were shortened in the initial and return motions to allow the servo to travel more quickly to its new position

c) The potentiometer rotates more than 180 degrees so the values relayed to the servo needed to be tuned to allow them to line up.

d) The potentiometer would be mirrored, 180 on the potentiometer would be 0 on the servo and vice versa

Appendix A - Program Listing*:*

```
// Pin Assignments
   int RED = 4;          //red LED Pin                    // Set-up Routine
   int GRN = 5;          //yellow LED Pin                 void setup() {
   int YLW = 6;          //green LED Pin
   int BUTTON = 8;       //pushbutton                       pinMode(servoPin, OUTPUT);  //sets servoPin
                                                          output
   int servoPin = 12;    //servo connected to              Serial.begin(9600);
   digital pin 12
   int myAngle;          //angle of the servo            // initialize led pins as outputs.
   roughly 0-180                                           pinMode(GRN, OUTPUT);
   int pulseWidth;       //servoPulse function             pinMode(YLW, OUTPUT);
   variable                                                pinMode(RED, OUTPUT);
   #include <Servo.h> //servo library call
   Servo myservo; // create myservo object for          //initialize button pin as input
   library Servo                                           pinMode(BUTTON, INPUT);
   int potPin = 3;                                       //initialize servo and define pin
                                                         myservo.attach(servoPin);
```

```
}

// Main Routine
void loop(){

// Wait for button press (and flash green
while waiting)
  Serial.println("Press button to start.");
  do{
      digitalWrite(GRN, HIGH);
      delay(125);
      digitalWrite(GRN, LOW);
      delay(125);
    }while(digitalRead(BUTTON) == LOW);

  Serial.println("Servo sweeping.");
  turnOnLED(YLW);      // yellow indicates
running

    while(true){
    int potVal = analogRead(potPin); //
analog range assumes 5 v = 1023
    //myAngle = map(potVal,125,800,180,0);
    myAngle = map (potVal,0,1023,0,180);
    myservo.write(myAngle);
    delay(15);

}
```

```
}

//**************** FUNCTIONS (subroutines)
*************

void servoPulse(int servoPin, int myAngle)
{
  pulseWidth = (myAngle * 5) + 1000;
//nominal is 5 and 1000
  digitalWrite(servoPin, HIGH);  //set servo
high
  delayMicroseconds(pulseWidth);
//microsecond pause
  digitalWrite(servoPin, LOW);  //set servo
low
}

void turnOnLED(int COLOUR)
{
  digitalWrite(GRN, LOW);
  digitalWrite(YLW, LOW);
  digitalWrite(RED, LOW);
  digitalWrite(COLOUR, HIGH);
}
}
```
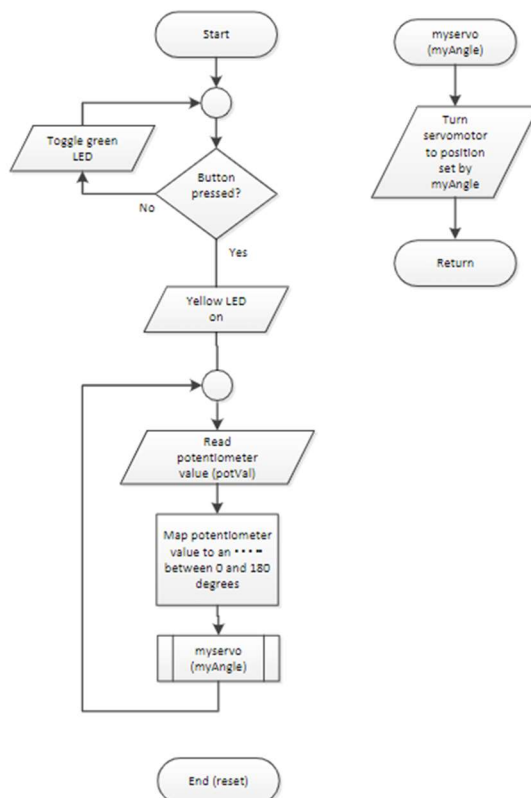

Figure 1: Flowchart of code