CNIT 581

Assignment 1

Afkhamiaghda, Mahdi

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Code

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/*****************************************************
  Name: Microprocessor, Sensors and Actuators
  Description: Print X,Y, and Z accelerometer readings and the X-Z, Y-Z, and X-Y angles Serial Monitor
  Email: mafkhami@purdue.edu
  Date: 21/2/2019
  Author: Mahdi Afkhamiaghda
 *****************************************************/

#include <Wire.h>  //Call the I2C library built in Arduino

//Set the address of the register
#define Register_ID 0
#define Register_2D 0x2D  //standby,measurement,sleep,wake_up mode set
#define Register_X0 0x32  //DATAX0, store the value of X0
#define Register_X1 0x33  //DATAX1, store the value of X1
#define Register_Y0 0x34  //DATAY0,  store the value of Y0
#define Register_Y1 0x35  //DATAY1,  store the value of Y1
#define Register_Z0 0x36  //DATAZ0,  store the value of Z0
#define Register_Z1 0x37  //DATAZ1,  store the value of Z1

int ADXAddress = 0x53;  //I2C address
//int reading = 0;
//int val = 0;
int X0, X1, X_out;
int Y0, Y1, Y_out;
int Z1, Z0, Z_out;
double Xg, Yg, Zg;
double XY,YZ, XZ;
const int motorIn1 = 9;  //attach to one of the pin of the motor
const int motorIn2 = 10;  //attach to another pin of the motor
const int redled = 5;  //attach red LED to the arduino
const int greenled = 6;  //attach green LED to the arduino
int pos;              // Mapping  Variable
int pos2;
int pos3;
int pos4;
void setup()
{
  // defining I.O
  analogReference(EXTERNAL);  // Setting AREF to 3.3 V
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 pinMode(motorIn1,OUTPUT);  //initialize the motorIn1 pin as output
 pinMode(motorIn2,OUTPUT);  //initialize the motorIn2 pin as output
 pinMode(redled, OUTPUT);  // Setting the red LED as output
 pinMode(greenled, OUTPUT);  // Setting the green LED as output

 Serial.begin(9600);//Set the baud rate of serial monitor as 9600bps
 delay(100);
 Wire.begin();  //Initialize I2C
 delay(100);
 Wire.beginTransmission(ADXAddress); //transmit to device ADXAddress 0x53
 Wire.write(Register_2D); //
 Wire.write(8);  //measuring enable
 Wire.endTransmission(); //end transmitting
 Serial.println("(X, Y, Z) -- [X-Y, Y-Z, X-Z]");
 Serial.println("============================");

}
void clockwise(int speed){         //Defining the rotaion of DC Motor
 analogWrite(motorIn1, speed);
 analogWrite(motorIn2, 0);
}
void counterclockwise(int speed){   //Defining the rotaion of DC Motor
 analogWrite(motorIn1, 0);
 analogWrite(motorIn2, speed);
}
void loop()
{
 Wire.beginTransmission(ADXAddress);  //transmit to device ADXAddress 0x53
 Wire.write(Register_X0);  //request the X0 value
 Wire.write(Register_X1);  //request the X1 value
 Wire.endTransmission();  //stop transmitting
 Wire.requestFrom(ADXAddress, 2); //request 2 bytes from device 0x53
 if (Wire.available() <= 2);  //if the received value is less than 2 bytes,then
 {
   X0 = Wire.read();  //receive X0 value
   X1 = Wire.read();  // receive X1 value
   X1 = X1 << 8;   //X1 left shift 8 bits
   X_out = X0 + X1;  //the X_out is 0xX1X0
 }

 Wire.beginTransmission(ADXAddress);  //request 2 bytes from device 0x53
 Wire.write(Register_Y0);
 Wire.write(Register_Y1);
 Wire.endTransmission();
```

```
  Wire.requestFrom(ADXAddress, 2);
  if (Wire.available() <= 2);
  {
    Y0 = Wire.read();
    Y1 = Wire.read();
    Y1 = Y1 << 8;
    Y_out = Y0 + Y1;
  }

  Wire.beginTransmission(ADXAddress);  //request 2 bytes from device 0x53
  Wire.write(Register_Z0);
  Wire.write(Register_Z1);
  Wire.endTransmission();
  Wire.requestFrom(ADXAddress, 2);
  if (Wire.available() <= 2);
  {
    Z0 = Wire.read();
    Z1 = Wire.read();
    Z1 = Z1 << 8;
    Z_out = Z0 + Z1;
  }
  Xg = X_out / 256.00; //Convert the output result into the acceleration g, accurate to 2 decimal
points.
  Yg = Y_out / 256.00;
  Zg = Z_out / 256.00;
  XY = atan2(Xg, sqrt(Yg*Yg + Zg*Zg)) * 57.3;  // roll for x - radian to degree by dividing 180 by PI
  YZ = atan2(Yg, sqrt(Xg*Xg + Zg*Zg)) * 57.3;  // pitch for y - radian to degree by dividing 180 by
PI
  XZ = atan2(sqrt(Xg*Xg + Yg*Yg),Zg) * 57.3;
  Serial.println("");
  Serial.print("(");
  Serial.print(Xg);  //print the value of Xg
  Serial.print(", ");
  Serial.print(Yg);  //print the value of Yg
  Serial.print(", ");
  Serial.print(Zg);  //print the value of Zg
  Serial.print(")");
  Serial.print("\t");
  Serial.print("||");
  Serial.print("\t");
  Serial.print("[");
  Serial.print(XY);  //print the value of X_Y angle
  Serial.print(", ");
  Serial.print(YZ);  //print the value of Y_Z angle
```

```
 Serial.print(", ");
 Serial.print(XZ);  //print the value of X_Z angle
 Serial.print("]");

 //Setting the motor speed on X-Y plane
 if (XY > 10 & XY < 90){               // 10 instead of 0 to counteract the noise and error effect
      pos = map (XY, 0, 90, 0, 255);
      clockwise (pos);
 }else if (XY< 0 & XY > - 90){
       pos2 = map (XY, 0, -90, 0, 255);
       counterclockwise(pos2);
 }
 //Setting the motor speed on Y-Z plane
 if (YZ > 10 & YZ < 90){               // 10 instead of 0 to counteract the noise and error effect
       pos = map (YZ, 0, 90, 0, 255);
       clockwise(pos);
 }else if(YZ < 0 & YZ > - 90){
      pos = map (YZ, -90, 0, 0, 255);
      counterclockwise(pos);
 }
 //Setting the LED status on X-Y plane
 if (abs(XY) >10){                    // 10 instead of 0 to counteract the noise and error effect
   pos3 = map (XY, 0, 90, 0, 255);
   analogWrite(redled, pos3);
 }
 //Setting the LED status on Y-Z plane
 if (abs(YZ) >10){                    // 10 instead of 0 to counteract the noise and error effect
   pos4 = map (YZ, 0, 90, 0, 255);
   analogWrite(greenled, pos4);
 }

 delay(1000);  //Delay 1s
}
```

Console Output