

CNIT 581

Assignment 1

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Code

```
/******  
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  
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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 //DATA X0, store the value of X0  
#define Register_X1 0x33 //DATA X1, store the value of X1  
#define Register_Y0 0x34 //DATA Y0, store the value of Y0  
#define Register_Y1 0x35 //DATA Y1, store the value of Y1  
#define Register_Z0 0x36 //DATA Z0, store the value of Z0  
#define Register_Z1 0x37 //DATA Z1, 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
```

```

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

```
/dev/cu.usbmodem14301 (Arduino/Genuino Uno)

X, Y, Z -- (X-Y, Y-Z, X-Z)

[0.08, 0.04, 0.89] || [4.99, 2.49, 5.58]
[0.07, 0.04, 0.89] || [4.78, 2.51, 5.40]
[0.07, 0.04, 0.89] || [4.49, 2.49, 5.14]
[0.07, 0.04, 0.89] || [4.49, 2.49, 5.14]
[0.07, 0.04, 0.89] || [4.76, 2.75, 5.50]
[0.33, 0.04, 0.85] || [21.38, 2.21, 21.50]
[0.57, 0.05, 0.72] || [38.41, 2.91, 38.57]
[0.70, 0.05, 0.64] || [47.58, 3.06, 47.74]
[0.77, 0.05, 0.56] || [53.59, 3.06, 53.76]
[0.81, 0.05, 0.50] || [58.27, 3.05, 58.45]
[0.89, 0.06, 0.38] || [66.00, 3.45, 67.09]
[0.92, 0.06, 0.33] || [69.88, 3.65, 70.24]
[0.93, 0.05, 0.31] || [71.45, 3.18, 71.74]
[0.93, 0.05, 0.31] || [71.30, 3.21, 71.60]
[0.93, 0.05, 0.30] || [71.66, 3.19, 71.96]
[0.93, 0.06, 0.31] || [71.12, 3.42, 71.46]
[0.95, 0.05, 0.27] || [73.57, 3.18, 73.90]
[0.97, 0.05, 0.21] || [77.64, 2.92, 78.01]
[0.92, 0.14, 0.32] || [69.42, 4.02, 71.10]
[0.95, 0.15, 0.02] || [80.78, 9.12, 88.61]
[0.94, 0.12, 0.00] || [81.50, 7.87, 85.30]
[0.66, 0.05, 0.66] || [45.10, 2.88, 45.25]
[0.03, 0.02, 0.89] || [-1.75, 1.00, 2.02]
[0.64, 0.02, 0.70] || [-42.31, 1.18, 42.34]
[0.04, 0.02, 0.48] || [-60.40, 1.39, 60.44]
[0.09, 0.03, 0.43] || [-64.30, 1.82, 64.37]
[0.00, 0.03, 0.39] || [-66.32, 1.82, 66.00]
[0.62, 0.09, 0.59] || [-46.00, 5.71, 46.56]
[0.06, 0.03, 0.49] || [-60.25, 1.59, 60.30]
[0.73, 0.03, 0.61] || [-49.22, 1.85, 49.28]
[0.57, 0.05, 0.75] || [-37.00, 3.09, 37.17]
[0.72, 0.06, 0.59] || [-50.44, 3.82, 50.70]
[0.79, 0.02, 0.57] || [-54.45, 1.15, 54.47]
[0.76, 0.04, 0.57] || [-53.13, 2.12, 53.21]
[0.74, 0.04, 0.61] || [-50.39, 2.09, 50.47]
[0.75, 0.04, 0.59] || [-51.58, 2.34, 51.67]
[0.70, 0.05, 0.64] || [-47.10, 2.83, 47.24]
[0.42, 0.04, 0.87] || [-25.72, 2.09, 25.81]
[0.04, 0.04, 0.91] || [2.71, 2.47, 3.67]
[0.05, 0.04, 0.90] || [3.48, 2.73, 4.43]
[0.06, 0.04, 0.89] || [3.74, 2.74, 4.64]
[0.06, 0.04, 0.89] || [3.74, 2.74, 4.64]
[0.05, 0.04, 0.90] || [3.48, 2.49, 4.28]
[0.05, 0.05, 0.89] || [3.49, 2.99, 4.60]
[0.05, 0.04, 0.89] || [3.50, 2.50, 4.30]
[0.05, 0.04, 0.89] || [3.25, 2.75, 4.25]
[0.05, 0.04, 0.90] || [3.48, 2.73, 4.43]
[0.05, 0.04, 0.89] || [3.49, 2.75, 4.45]
[0.05, 0.04, 0.90] || [3.48, 2.49, 4.28]
[0.05, 0.04, 0.89] || [3.49, 2.75, 4.45]
[0.05, 0.04, 0.90] || [3.48, 2.73, 4.43]
[0.05, 0.04, 0.89] || [3.25, 2.50, 4.10]
[0.05, 0.05, 0.89] || [3.49, 2.99, 4.60]
[0.05, 0.05, 0.89] || [3.49, 2.99, 4.60]
[0.06, 0.04, 0.90] || [3.73, 2.73, 4.62]
[0.06, 0.04, 0.89] || [3.74, 2.50, 4.50]
[0.06, 0.04, 0.89] || [3.76, 2.51, 4.52]
[0.06, 0.04, 0.90] || [3.73, 2.73, 4.62]
[0.20, 0.04, 0.89] || [-12.89, 2.21, 13.09]
[0.46, 0.03, 0.79] || [-30.40, 1.97, 30.48]
[0.58, 0.04, 0.72] || [-38.63, 2.18, 38.71]
[0.65, 0.04, 0.68] || [-43.62, 2.14, 43.70]
[0.67, 0.04, 0.66] || [-44.30, 2.11, 44.38]
[0.61, 0.02, 0.71] || [-40.75, 0.96, 40.77]
[0.13, -0.03, 0.88] || [8.34, -1.77, 8.50]
[0.51, 0.00, 0.46] || [63.13, 3.51, 63.40]
[0.94, 0.12, 0.27] || [72.78, 7.06, 74.37]
[0.95, 0.11, 0.20] || [76.24, 6.66, 78.01]
[0.69, 0.08, 0.61] || [48.20, 4.83, 48.61]
[0.62, 0.01, 0.70] || [41.61, 0.40, 42.62]
[0.07, -0.23, 0.80] || [-4.52, -14.72, 15.43]
[0.08, -0.52, 0.73] || [5.00, -35.41, 35.87]
[0.07, -0.65, 0.61] || [4.64, -45.51, 45.89]
[0.08, -0.71, 0.56] || [7.80, -62.16, 62.91]

Autoscroll Show timestamp No line ending 9600 baud Clear output
```

```
/dev/cu.usbmodem14301 (Arduino/Genuino Uno)

[-0.90, 0.03, 0.39] || [-66.32, 1.82, 66.48]
[-0.62, 0.09, 0.59] || [-46.00, 5.71, 46.56]
[-0.86, 0.03, 0.49] || [-60.25, 1.59, 60.30]
[-0.73, 0.03, 0.61] || [-49.22, 1.85, 49.28]
[-0.57, 0.05, 0.75] || [-37.00, 3.09, 37.17]
[-0.72, 0.06, 0.59] || [-50.44, 3.82, 50.70]
[-0.79, 0.02, 0.57] || [-54.45, 1.15, 54.47]
[-0.76, 0.04, 0.57] || [-53.13, 2.12, 53.21]
[-0.74, 0.04, 0.61] || [-50.39, 2.09, 50.47]
[-0.75, 0.04, 0.59] || [-51.58, 2.34, 51.67]
[-0.70, 0.05, 0.64] || [-47.10, 2.83, 47.24]
[-0.42, 0.04, 0.87] || [-25.72, 2.09, 25.81]
[0.04, 0.04, 0.91] || [2.71, 2.47, 3.67]
[0.05, 0.04, 0.90] || [3.48, 2.73, 4.43]
[0.06, 0.04, 0.89] || [3.74, 2.74, 4.64]
[0.06, 0.04, 0.89] || [3.74, 2.74, 4.64]
[0.05, 0.04, 0.90] || [3.48, 2.49, 4.28]
[0.05, 0.05, 0.89] || [3.49, 2.99, 4.60]
[0.05, 0.04, 0.89] || [3.50, 2.50, 4.30]
[0.05, 0.04, 0.89] || [3.25, 2.75, 4.25]
[0.05, 0.04, 0.90] || [3.48, 2.73, 4.43]
[0.05, 0.04, 0.89] || [3.49, 2.75, 4.45]
[0.05, 0.04, 0.90] || [3.48, 2.49, 4.28]
[0.05, 0.04, 0.89] || [3.49, 2.75, 4.45]
[0.05, 0.04, 0.90] || [3.48, 2.73, 4.43]
[0.05, 0.04, 0.89] || [3.25, 2.50, 4.10]
[0.05, 0.05, 0.89] || [3.49, 2.99, 4.60]
[0.05, 0.05, 0.89] || [3.49, 2.99, 4.60]
[0.06, 0.04, 0.90] || [3.73, 2.73, 4.62]
[0.06, 0.04, 0.89] || [3.74, 2.50, 4.50]
[0.06, 0.04, 0.89] || [3.76, 2.51, 4.52]
[0.06, 0.04, 0.90] || [3.73, 2.73, 4.62]
[0.20, 0.04, 0.89] || [-12.89, 2.21, 13.09]
[0.46, 0.03, 0.79] || [-30.40, 1.97, 30.48]
[0.58, 0.04, 0.72] || [-38.63, 2.18, 38.71]
[0.65, 0.04, 0.68] || [-43.62, 2.14, 43.70]
[0.67, 0.04, 0.66] || [-44.30, 2.11, 44.38]
[0.61, 0.02, 0.71] || [-40.75, 0.96, 40.77]
[0.13, -0.03, 0.88] || [8.34, -1.77, 8.50]
[0.51, 0.00, 0.46] || [63.13, 3.51, 63.40]
[0.94, 0.12, 0.27] || [72.78, 7.06, 74.37]
[0.95, 0.11, 0.20] || [76.24, 6.66, 78.01]
[0.69, 0.08, 0.61] || [48.20, 4.83, 48.61]
[0.62, 0.01, 0.70] || [41.61, 0.40, 42.62]
[0.07, -0.23, 0.80] || [-4.52, -14.72, 15.43]
[0.08, -0.52, 0.73] || [5.00, -35.41, 35.87]
[0.07, -0.65, 0.61] || [4.64, -45.51, 45.89]
[0.08, -0.71, 0.56] || [7.80, -62.16, 62.91]

Autoscroll Show timestamp No line ending 9600 baud Clear output
```

```
/dev/cu.usbmodem14301 (Arduino/Genuino Uno)

[0.75, 0.05, 0.57] || [52.60, 3.07, 52.77]
[0.76, 0.05, 0.56] || [53.62, 3.11, 53.82]
[0.77, 0.05, 0.54] || [54.82, 3.08, 54.99]
[0.00, 0.04, 0.90] || [37.86, 2.59, 37.99]
[0.81, 0.05, 0.50] || [58.05, 3.27, 58.26]
[0.83, 0.05, 0.49] || [59.32, 3.26, 59.53]
[0.83, 0.05, 0.47] || [60.24, 3.27, 60.46]
[0.00, 0.05, 0.52] || [57.08, 3.29, 57.29]
[0.73, 0.05, 0.61] || [50.10, 3.07, 50.27]
[0.67, 0.05, 0.67] || [44.77, 2.83, 44.91]
[0.64, 0.05, 0.68] || [43.57, 3.11, 43.74]
[0.66, 0.05, 0.66] || [44.92, 3.10, 45.00]
[0.67, 0.05, 0.66] || [45.42, 3.10, 45.59]
[0.68, 0.05, 0.65] || [45.94, 2.86, 46.08]
[0.67, 0.05, 0.66] || [45.27, 2.86, 45.41]
[0.67, 0.05, 0.66] || [45.26, 3.10, 45.42]
[0.68, 0.05, 0.65] || [46.10, 3.10, 46.27]
[0.68, 0.05, 0.66] || [45.76, 3.09, 45.92]
[0.68, 0.05, 0.65] || [45.35, 3.09, 46.09]
[0.65, 0.05, 0.67] || [44.24, 3.11, 44.41]
[0.62, 0.05, 0.68] || [42.18, 3.15, 42.36]
[0.59, 0.05, 0.72] || [39.12, 3.13, 39.30]
[0.55, 0.05, 0.74] || [36.72, 2.90, 36.87]
[0.50, 0.05, 0.76] || [33.23, 3.19, 33.42]
[0.36, 0.05, 0.84] || [23.14, 2.94, 23.34]
[0.12, 0.04, 0.90] || [7.91, 2.71, 8.37]
[0.11, 0.05, 0.85] || [20.21, 2.97, 20.45]
[0.32, 0.05, 0.85] || [20.44, 3.21, 20.71]
[0.03, 0.05, 0.91] || [1.97, 3.45, 3.98]
[-0.22, 0.04, 0.87] || [-14.39, 2.25, 14.57]
[-0.23, 0.03, 0.88] || [-14.75, 1.98, 14.89]
[-0.26, 0.04, 0.86] || [-16.09, 2.24, 16.85]
[-0.33, 0.03, 0.84] || [-21.56, 1.98, 21.66]
[-0.40, 0.03, 0.82] || [-25.79, 1.96, 25.87]
[-0.43, 0.03, 0.83] || [-28.07, 1.94, 28.15]
[-0.49, 0.03, 0.79] || [-32.00, 1.93, 32.14]
[-0.44, 0.02, 0.80] || [-28.52, 1.47, 28.57]
[-0.05, 0.04, 0.90] || [-2.72, 2.04, 3.41]
[0.04, 0.05, 0.89] || [2.50, 3.00, 3.90]
[0.05, 0.04, 0.90] || [2.98, 2.73, 4.05]
[0.05, 0.04, 0.89] || [3.25, 2.98, 4.10]
[0.05, 0.04, 0.89] || [3.31, 2.51, 4.32]
[0.06, 0.04, 0.89] || [3.74, 2.50, 4.50]
[0.06, 0.04, 0.89] || [3.74, 2.50, 4.50]
[0.03, 0.05, 0.90] || [1.99, 2.99, 3.59]
[-0.00, 0.04, 0.91] || [-0.25, 2.22, 2.24]
[0.00, 0.04, 0.90] || [0.25, 2.73, 2.74]
[-0.15, 0.04, 0.89] || [-9.70, 2.48, 10.82]

Autoscroll Show timestamp No line ending 9600 baud Clear output
```