CPE301 – Fall 2019

Design Assignment 6

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Directory: <https://github.com/reedjacobp/submission_da>

Submit the following for all Labs:

1. In the document, for each task submit the modified or included code (only) with highlights and justifications of the modifications. Also, include the comments.
2. Use the previously create a Github repository with a random name (no CPE/301, Lastname, Firstname). Place all labs under the root folder ESD301/DA, sub-folder named LABXX, with one document and one video link file for each lab, place modified asm/c files named as LabXX-TYY.asm/c.
3. If multiple asm/c files or other libraries are used, create a folder LabXX-TYY and place these files inside the folder.
4. The folder should have a) Word document (see template), b) source code file(s) and other include files, c) text file with youtube video links (see template).

1. **COMPONENTS LIST AND CONNECTION BLOCK DIAGRAM w/ PINS**

ATmega328PB Xplained Mini

MPU6050

1. **DEVELOPED CODE OF TASK 1**

/\*

\* DA6.c

\*

\* Created: 12/5/2019 4:58:33 PM

\* Author : jreed

\*/

#define F\_CPU 16000000UL

#include <avr/io.h>

#include <util/delay.h>

#include <inttypes.h>

#include <stdlib.h>

#include <stdio.h>

#include "MPU6050\_res\_define.h"

#include "I2C\_Master\_H\_file.h"

#include "USART\_RS232\_H\_file.h"

float Acc\_x,Acc\_y,Acc\_z,Temperature,Gyro\_x,Gyro\_y,Gyro\_z;

void MPU6050\_Init()

{

*\_delay\_ms*(150); /\* Power up time >100ms \*/

I2C\_Start\_Wait(0xD0); /\* Start with device write address \*/

I2C\_Write(SMPLRT\_DIV); /\* Write to sample rate register \*/

I2C\_Write(0x07); /\* 1KHz sample rate \*/

I2C\_Stop();

I2C\_Start\_Wait(0xD0);

I2C\_Write(PWR\_MGMT\_1); /\* Write to power management register \*/

I2C\_Write(0x01); /\* X axis gyroscope reference frequency \*/

I2C\_Stop();

I2C\_Start\_Wait(0xD0);

I2C\_Write(CONFIG); /\* Write to Configuration register \*/

I2C\_Write(0x00); /\* Fs = 8KHz \*/

I2C\_Stop();

I2C\_Start\_Wait(0xD0);

I2C\_Write(GYRO\_CONFIG); /\* Write to Gyro configuration register \*/

I2C\_Write(0x18); /\* Full scale range +/- 2000 degree/C \*/

I2C\_Stop();

I2C\_Start\_Wait(0xD0);

I2C\_Write(INT\_ENABLE); /\* Write to interrupt enable register \*/

I2C\_Write(0x01);

I2C\_Stop();

}

void MPU\_Start\_Loc()

{

I2C\_Start\_Wait(0xD0); /\* I2C start with device write address \*/

I2C\_Write(ACCEL\_XOUT\_H); /\* Write start location address from where to read \*/

I2C\_Repeated\_Start(0xD1); /\* I2C start with device read address \*/

}

void Read\_RawValue()

{

MPU\_Start\_Loc(); /\* Read Gyro values \*/

Acc\_x = (((int)I2C\_Read\_Ack()<<8) | (int)I2C\_Read\_Ack());

Acc\_y = (((int)I2C\_Read\_Ack()<<8) | (int)I2C\_Read\_Ack());

Acc\_z = (((int)I2C\_Read\_Ack()<<8) | (int)I2C\_Read\_Ack());

Gyro\_x = (((int)I2C\_Read\_Ack()<<8) | (int)I2C\_Read\_Ack());

Gyro\_y = (((int)I2C\_Read\_Ack()<<8) | (int)I2C\_Read\_Ack());

Gyro\_z = (((int)I2C\_Read\_Ack()<<8) | (int)I2C\_Read\_Nack());

I2C\_Stop();

}

int main()

{

char buffer[20], float\_[10];

float Xa,Ya,Za,t;

float Xg=0,Yg=0,Zg=0;

I2C\_Init();

MPU6050\_Init();

USART\_Init(9600);

while(1)

{

Read\_RawValue();

Xa = Acc\_x/16384.0; /\* Divide raw value by sensitivity scale factor to get real values \*/

Ya = Acc\_y/16384.0;

Za = Acc\_z/16384.0;

Xg = Gyro\_x/16.4;

Yg = Gyro\_y/16.4;

Zg = Gyro\_z/16.4;

*dtostrf*( Xa, 3, 2, float\_ ); /\* Takes the first parameter and formats it to be 3 characters, 2 decimal points of precision and puts it in float\_ \*/

*sprintf*(buffer," Ax = %s g\t",float\_); /\* This is where the value is being put as a string onto the buffer variable \*/

USART\_SendString(buffer); /\* This is where it is being displayed on the serial terminal \*/

*dtostrf*( Ya, 3, 2, float\_ );

*sprintf*(buffer," Ay = %s g\t",float\_);

USART\_SendString(buffer);

*dtostrf*( Za, 3, 2, float\_ );

*sprintf*(buffer," Az = %s g\t",float\_);

USART\_SendString(buffer);

*dtostrf*( Xg, 3, 2, float\_ );

*sprintf*(buffer," Gx = %s%c/s\t",float\_,0xF8);

USART\_SendString(buffer);

*dtostrf*( Yg, 3, 2, float\_ );

*sprintf*(buffer," Gy = %s%c/s\t",float\_,0xF8);

USART\_SendString(buffer);

*dtostrf*( Zg, 3, 2, float\_ );

*sprintf*(buffer," Gz = %s%c/s\r\n",float\_,0xF8);

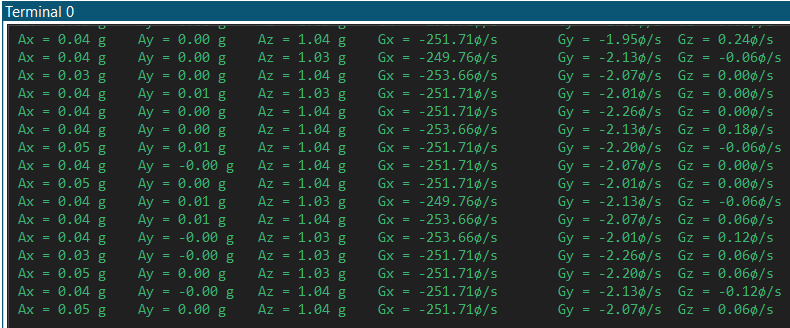
USART\_SendString(buffer);

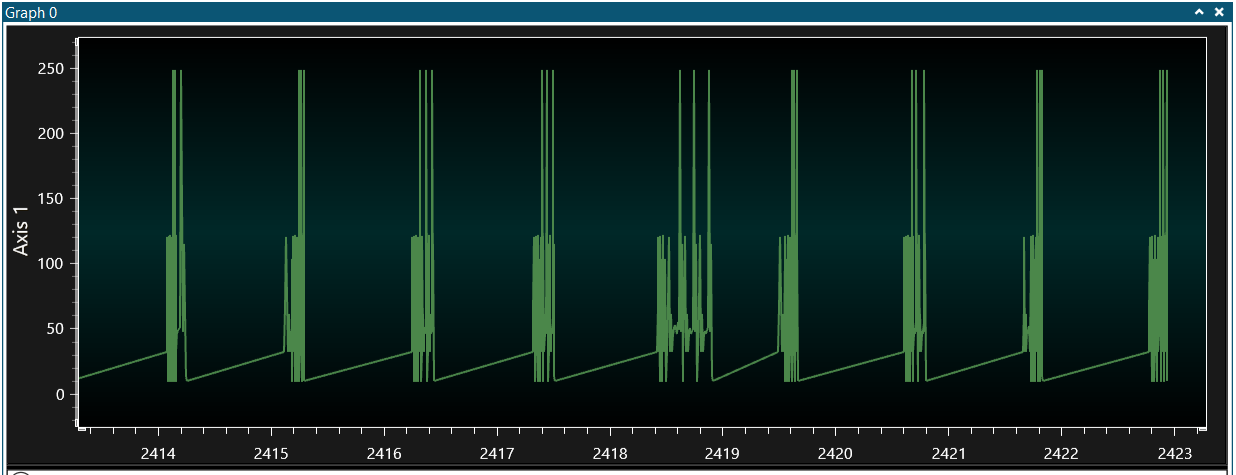
*\_delay\_ms*(1000);

}

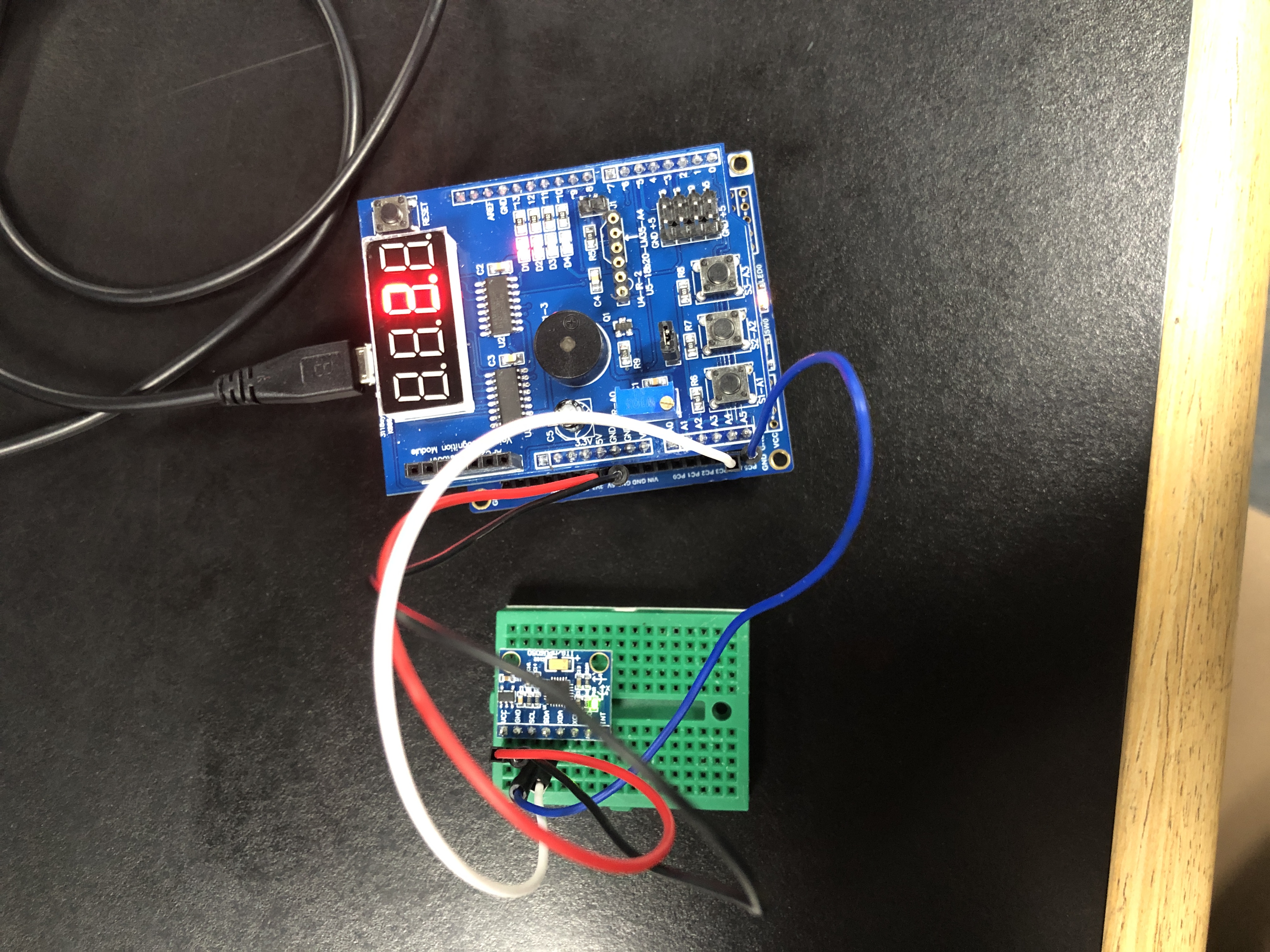
}

1. **SCREENSHOTS OF EACH TASK OUTPUT (ATMEL STUDIO OUTPUT)**





1. **SCREENSHOT OF EACH DEMO (BOARD SETUP)**



1. **VIDEO LINKS OF EACH DEMO**

https://youtu.be/eIUL17CZyB4

1. **GITHUB LINK OF THIS DA**

<https://github.com/reedjacobp/submission_da/tree/master/DesignAssignments/DA6>

**Student Academic Misconduct Policy**

<http://studentconduct.unlv.edu/misconduct/policy.html>

“This assignment submission is my own, original work”.

Jacob Reed