CPE301 – SPRING 2019

Design Assignment 6

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Primary Github address: https://github.com/RickyPerez79/submission_da
Directory: DA6

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

- MPU6050
- Atmega328p

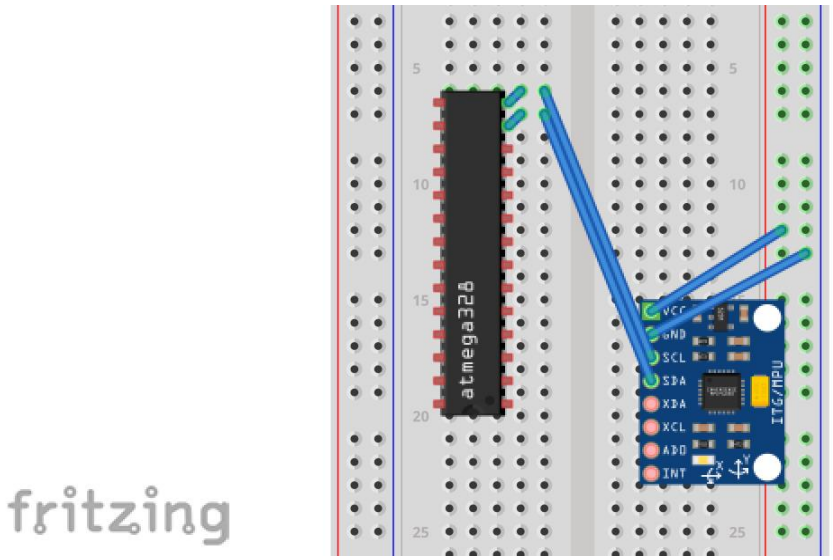
2. INITIAL/MODIFIED/DEVELOPED CODE OF TASK 1/A

```
 /*
 * DA6.c
 * Created 4/30/19
 * Author : perezr1
 */

/****************** Libraries/Definitions ***********************************/
#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"
/****************************************************************************/
/******************** Variables for acceleration and gyro ***************************/
float Acc_x,Acc_y,Acc_z,Gyro_x,Gyro_y,Gyro_z;
/****************************************************************************/
/***************************Initialize MPU6050*****************************************/

void MPU6050_Init()                                                    //
Gyro initialization function
{
       _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();
```

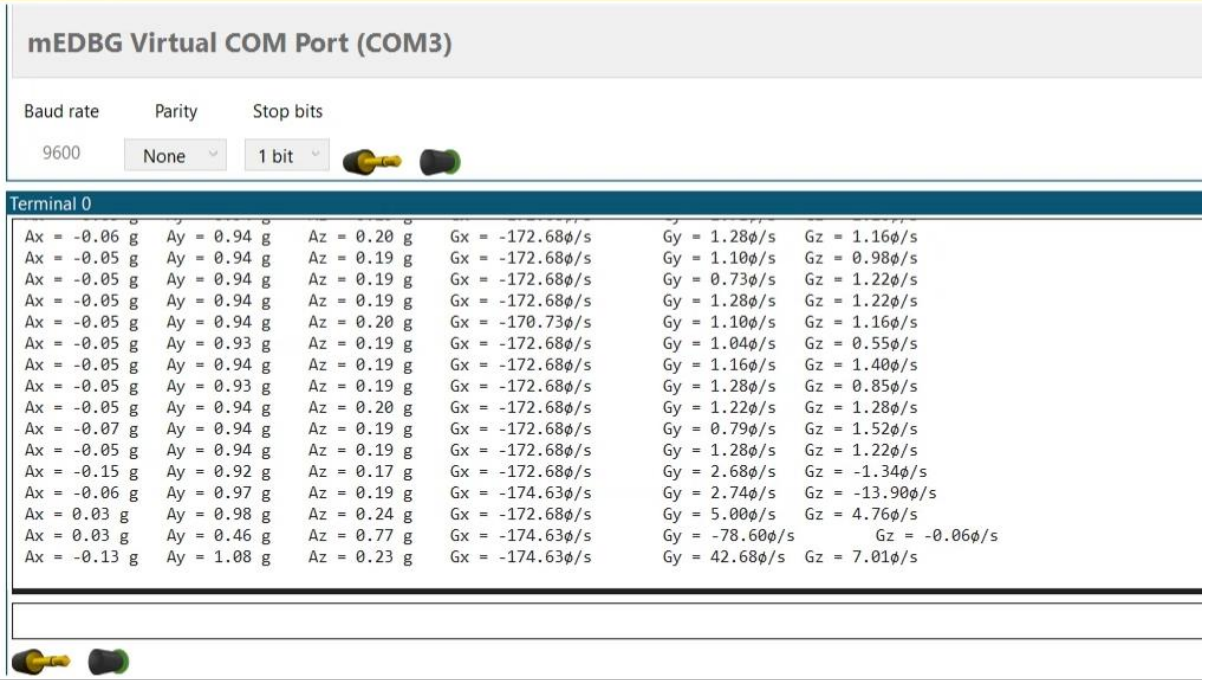
```
	I2C_Start_Wait(0xD0);
	I2C_Write(GYRO_CONFIG);                                                    //
Write to Gyro configuration register
	I2C_Write(0x18);                                                           //
Full scale range +/- 2000 degree/C
	I2C_Stop();

	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 X_a,Y_a,Z_a;
	float X_g=0,Y_g=0,Z_g=0;
	I2C_Init();
	// Initialize I2C
	MPU6050_Init();
	// Initialize MPU6050
	USART_Init(9600);          // Initialize USART with 9600 baud rate

	while(1)
	{
		Read_RawValue();
		// Acceleration
		X_a = Acc_x/16384.0;       // Divide raw value by sensitivity scale factor
to get real values
		Y_a = Acc_y/16384.0;
```

```
                Z_a = Acc_z/16384.0;

                // Gyro
                X_g = Gyro_x/16.4;
                Y_g = Gyro_y/16.4;
                Z_g = Gyro_z/16.4;

                dtostrf( X_a, 3, 2, float_ );         // Take values in buffer to send all
parameters over USART
                sprintf(buffer," Ax = %s g\t",float_);
                USART_SendString(buffer);

                dtostrf( Y_a, 3, 2, float_ );
                sprintf(buffer," Ay = %s g\t",float_);
                USART_SendString(buffer);

                dtostrf( Z_a, 3, 2, float_ );
                sprintf(buffer," Az = %s g\t",float_);
                USART_SendString(buffer);

                dtostrf( X_g, 3, 2, float_ );
                sprintf(buffer," Gx = %s%c/s\t",float_,0xF8);
                USART_SendString(buffer);

                dtostrf( Y_g, 3, 2, float_ );
                sprintf(buffer," Gy = %s%c/s\t",float_,0xF8);
                USART_SendString(buffer);

                dtostrf( Z_g, 3, 2, float_ );
                sprintf(buffer," Gz = %s%c/s\r\n",float_,0xF8);
                USART_SendString(buffer);
                _delay_ms(1000);
        }
}
```

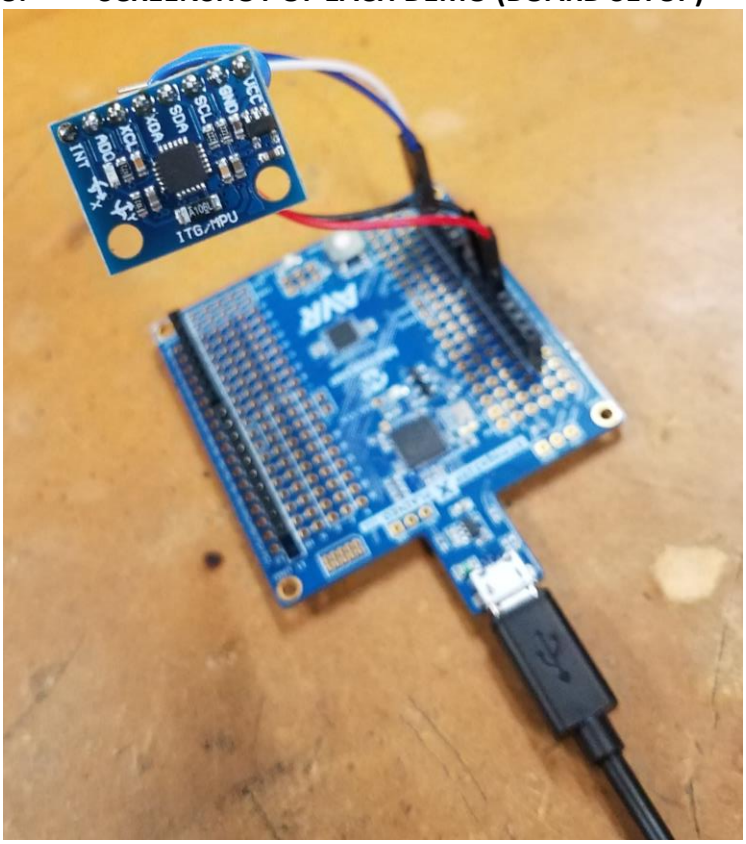
3. SCHEMATICS



4. SCREENSHOTS OF EACH TASK OUTPUT (ATMEL STUDIO OUTPUT)



5. SCREENSHOT OF EACH DEMO (BOARD SETUP)



6. VIDEO LINKS OF EACH DEMO

https://youtu.be/DppTeAGKsx0

7. GITHUB LINK OF THIS DA

https://github.com/RickyPerez79/submission_da

Student Academic Misconduct Policy

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

"*This assignment submission is my own, original work*".

RICKY PEREZ