CPE301 – SPRING 2019

Design Assignment 6

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Primary Github address: https://github.com/yeeun219/submission_da.git
Directory: cpe301\DesignAssignments\DA6

1. COMPONENTS LIST AND CONNECTION BLOCK DIAGRAM w/ PINS

```
void Gyro_Init()           /* Gyro initialization function */
void MPU_Start_Loc()
void Read_RawValue()
void USART_tx_string( char *data ) /* SEND A STRING TO THE RS-232 */
void USART_init( unsigned int ubrr ) /* INIT USART (RS-232)  */
while(1) read accelerometer and gyro value, then display on uart repeatly.
```

2. DEVELOPED CODE OF

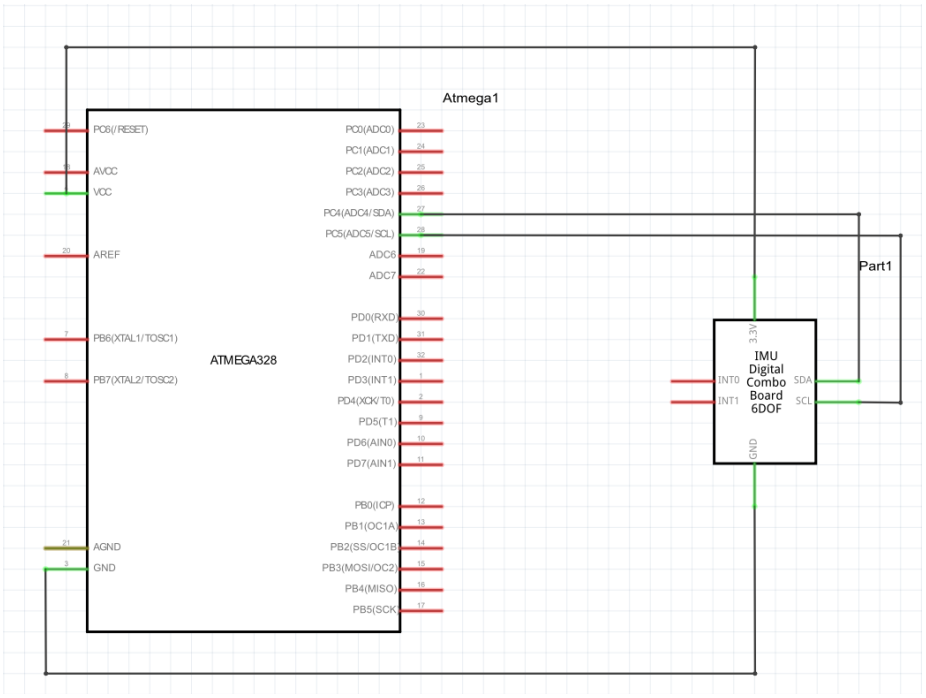
```
 /*
 * DA6.c
 *
 * Created: 5/10/2019 11:15:17 AM
 * Author : llje2
 */

/*
 * ATmega16 Interface with MPU6050
 * http://www.electronicwings.com
 *
 */

#define F_CPU 16000000UL
#include <avr/io.h>         /* Include AVR std. library file */
#include <util/delay.h>            /* Include delay header file */
#include <inttypes.h>              /* Include integer type header file */
#include <stdlib.h>         /* Include standard library file */
#include <stdio.h>          /* Include standard I/O library file */
#include "MPU6050_res_define.h"    /* Include MPU6050 register define file */
#include "I2C_Master_H_file.h"     /* Include I2C Master header file */
#include "uart.h"    /* Include USART header file */
#define BAUDRATE 9600
#define BAUD_PRESCALLER (((F_CPU / (BAUDRATE * 16UL))) - 1)


float Acc_x,Acc_y,Acc_z,Temperature,Gyro_x,Gyro_y,Gyro_z;

void Gyro_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());
	Temperature = (((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();
}

/* SEND A STRING TO THE RS-232 */
void USART_tx_string( char *data )
{
	while ((*data != '\0'))
	{
		while (!(UCSR0A & (1 <<UDRE0)));
		UDR0 = *data;
		data++;
	}
}

/* INIT USART (RS-232)  */
```

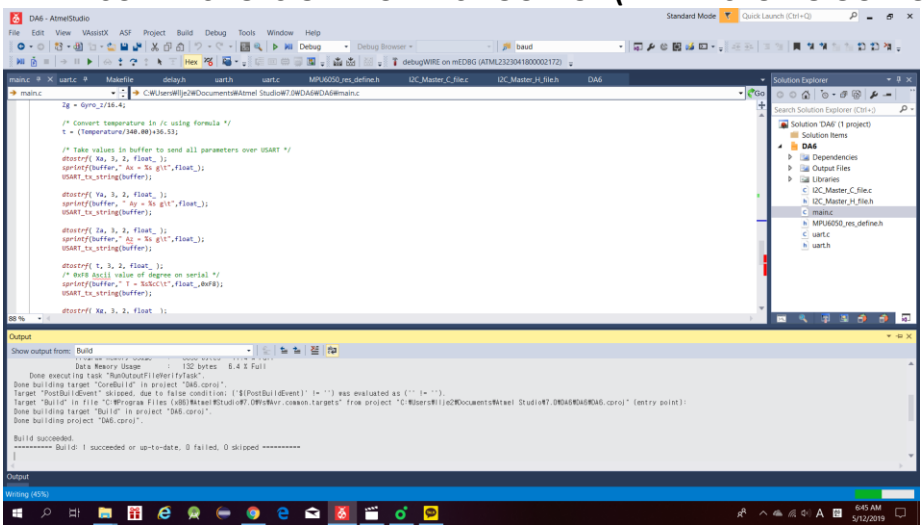
```
void USART_init( unsigned int ubrr )
{
	UBRR0H = (unsigned char)(ubrr>>8);
	UBRR0L = (unsigned char)ubrr;
	UCSR0B = (1 << TXEN0);     // Enable RX, TX & RX interrupt
	UCSR0C = (3 << UCSZ00);    //asynchronous 8 N 1
}
int main()
{
	char buffer[20], float_[10];
	float Xa,Ya,Za,t;
	float Xg=0,Yg=0,Zg=0;
	I2C_Init();          /* Initialize I2C */
	Gyro_Init();         /* Initialize Gyro */
	USART_init(BAUD_PRESCALLER);  // Initialize the USART
	USART_tx_string("Connected!\r\n");    // we're alive!

	while(1)
	{
		Read_RawValue();

		/* Divide raw value by sensitivity scale factor */
		Xa = Acc_x/16384.0;
		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;

		/* Convert temperature in /c using formula */
		t = (Temperature/340.00)+36.53;

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

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

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

		dtostrf( t, 3, 2, float_ );
		/* 0xF8 Ascii value of degree on serial */
		sprintf(buffer," T = %s%cC\t",float_,0xF8);
		USART_tx_string(buffer);

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

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

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

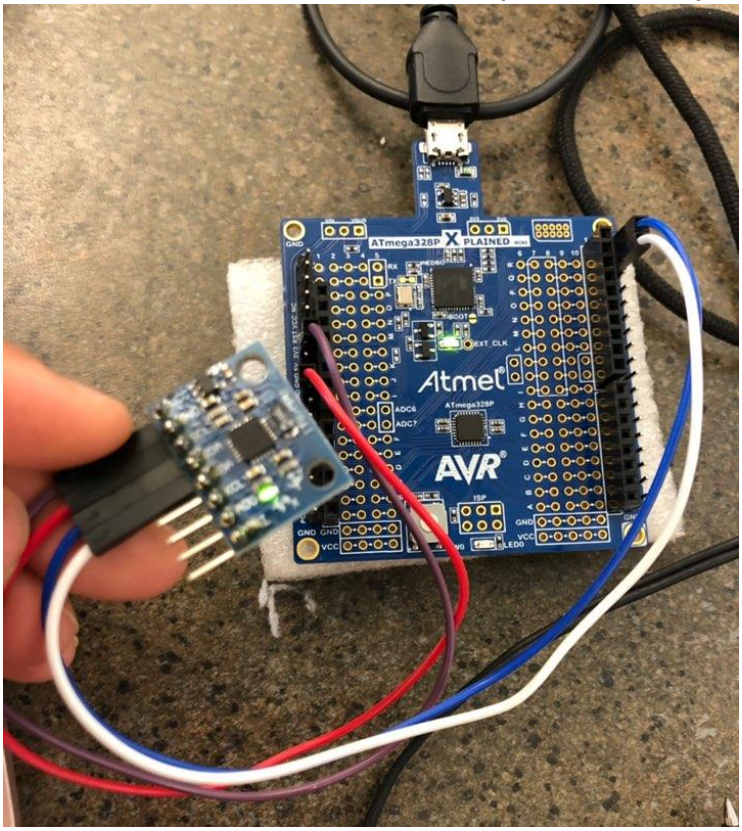
3. SCHEMATICS



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/Puc4eGRTJQI

7. GITHUB LINK OF THIS DA

Primary Github address: https://github.com/yeeun219/submission_da.git
Directory: cpe301\DesignAssignments\ DA6

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

YEEUNLEE