

# Design Assignment 6

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Primary Github address: <https://github.com/WorkuT1226/CPE301.git>

Directory:

Submit the following for all Labs:

- In the document, for each task submit the modified or included code (only) with highlights and justifications of the modifications. Also, include the comments.
  - 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.
  - If multiple asm/c files or other libraries are used, create a folder LabXX-TYY and place these files inside the folder.
  - 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).
- 
- **COMPONENTS LIST AND CONNECTION BLOCK DIAGRAM w/ PINS**

Atmega328p

MPU6050

- **INITIAL/MODIFIED/DEVELOPED CODE OF TASK 1/A**

```
#define F_CPU 16000000UL
#include <stdlib.h>
#include <stdio.h>
#include <avr/io.h>
#include <util/delay.h>
#include <math.h>
#define MPU6050_WRITE 0xD0
#define MPU6050_READ 0xD1
float ax, ay, az, gx, gy, gz;
void init_uart(uint16_t baudrate){
    uint16_t UBRR_val = (F_CPU/16)/(baudrate-1);
    UBRR0H = UBRR_val >> 16;
    UBRR0L = UBRR_val;
    UCSRB |= (1<<TXEN0) | (1<<RXEN0) | (1<<RXCIF0);
    UCSRC |= (1<<USBS0) | (3<<UCSZ00);
}
void uart_putx(unsigned char x){
    while(!(UCSR0A & (1<<UDRE0)));
    UDR0 = x;
```

```

}
void uart_puty(char *y){
    while(*y){
        uart_puty(*y);
        y++;
    }
}

void init_MPU6050(void){
    _delay_ms(250);
    i2c_start("MPU6050_WRITE,0x07");
    i2c_stop();
    _delay_ms(250);
    i2c_start("MPU6050_WRITE");
    i2c_write("PWR_MGMT_1, 0x01");
    i2c_stop();
    _delay_ms(250);
    i2c_start("MPU6050_WRITE");
    i2c_write("CONFIG, 0x01");
    i2c_stop();
    _delay_ms(250);
    i2c_start("MPU6050_WRITE");
    i2c_write("GYRO_CONFIG, 0x01");
    i2c_stop();
    _delay_ms(250);
    i2c_start("MPU6050_WRITE");
    i2c_write("INT_ENABLE, 0x01");
    i2c_stop();
}

void read(void){
    i2c_start("MPU6050_WRITE");
    i2c_write("ACC");
    i2c_stop();
    i2c_start(MPU6050_READ);
    ax = (((int)i2c_read_ack()<<16) | (int)i2c_read_ack());
    ay = (((int)i2c_read_ack()<<16) | (int)i2c_read_ack());
    az = (((int)i2c_read_ack()<<16) | (int)i2c_read_ack());
    gx = (((int)i2c_read_ack()<<16) | (int)i2c_read_ack());
    gy = (((int)i2c_read_ack()<<16) | (int)i2c_read_ack());
    gz = (((int)i2c_read_ack()<<16) | (int)i2c_read_ack());
    stop();
}

int main(void){
    char array1[20];
    char f[10];
    float ax,ay,az,gx,gy,gz;
    i2c_init();
    init_MPU6050();
    while(1){
        read();
        ax = ax/16384.000;
        ay = ay/16384.000;
        az = az/16384.000;
        gx = gx/16.400;
        gy = gy/16.400;
        gz = gz/16.400;
        dtostrf( ax, 3, 2, f);
        sprintf(array1,"%s, ",f);
        USART_send(array1);
        _delay_ms(1500);
        dtostrf( ay, 3, 2, f);
        sprintf(array1,"%s, ",f);
        USART_send(array1);
        _delay_ms(1500);
    }
}

```

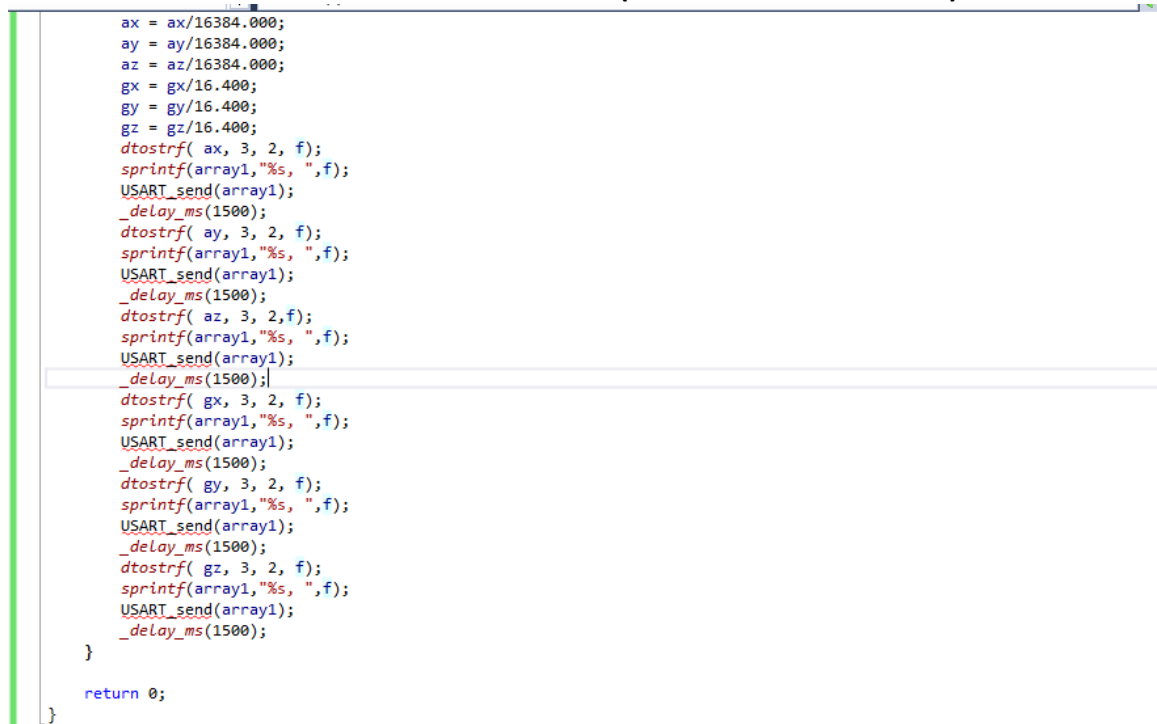
```

        dtostrf( az, 3, 2,f);
        sprintf(array1,"%s, ",f);
        USART_send(array1);
        _delay_ms(1500);
        dtostrf( gx, 3, 2, f);
        sprintf(array1,"%s, ",f);
        USART_send(array1);
        _delay_ms(1500);
        dtostrf( gy, 3, 2, f);
        sprintf(array1,"%s, ",f);
        USART_send(array1);
        _delay_ms(1500);
        dtostrf( gz, 3, 2, f);
        sprintf(array1,"%s, ",f);
        USART_send(array1);
        _delay_ms(1500);
    }

    return 0;
}

```

- **SCREENSHOTS OF EACH TASK OUTPUT (ATMEL STUDIO OUTPUT)**



```

ax = ax/16384.000;
ay = ay/16384.000;
az = az/16384.000;
gx = gx/16.400;
gy = gy/16.400;
gz = gz/16.400;
dtostrf( ax, 3, 2, f);
sprintf(array1,"%s, ",f);
USART_send(array1);
_delay_ms(1500);
dtostrf( ay, 3, 2, f);
sprintf(array1,"%s, ",f);
USART_send(array1);
_delay_ms(1500);
dtostrf( az, 3, 2,f);
sprintf(array1,"%s, ",f);
USART_send(array1);
_delay_ms(1500);|
dtostrf( gx, 3, 2, f);
sprintf(array1,"%s, ",f);
USART_send(array1);
_delay_ms(1500);
dtostrf( gy, 3, 2, f);
sprintf(array1,"%s, ",f);
USART_send(array1);
_delay_ms(1500);
dtostrf( gz, 3, 2, f);
sprintf(array1,"%s, ",f);
USART_send(array1);
_delay_ms(1500);
}

return 0;
}

```

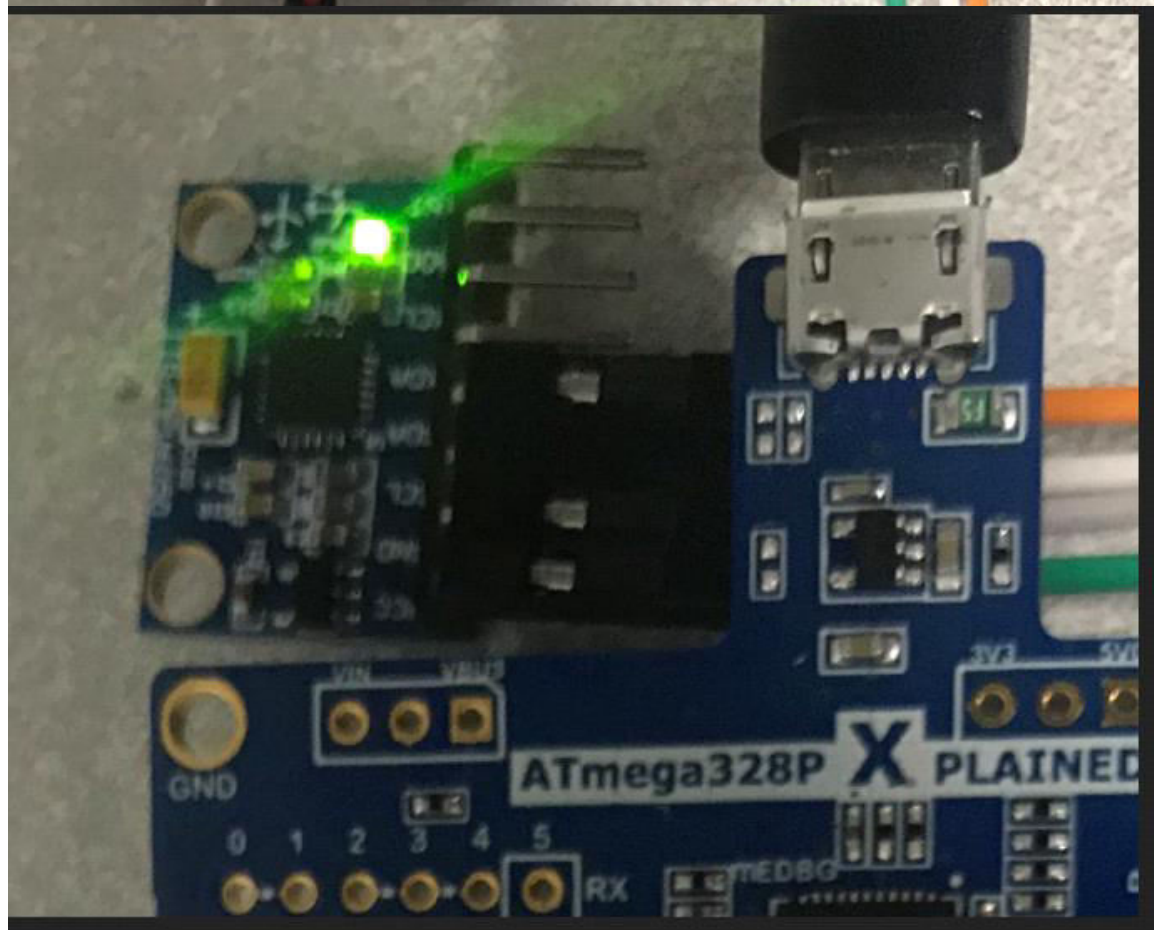
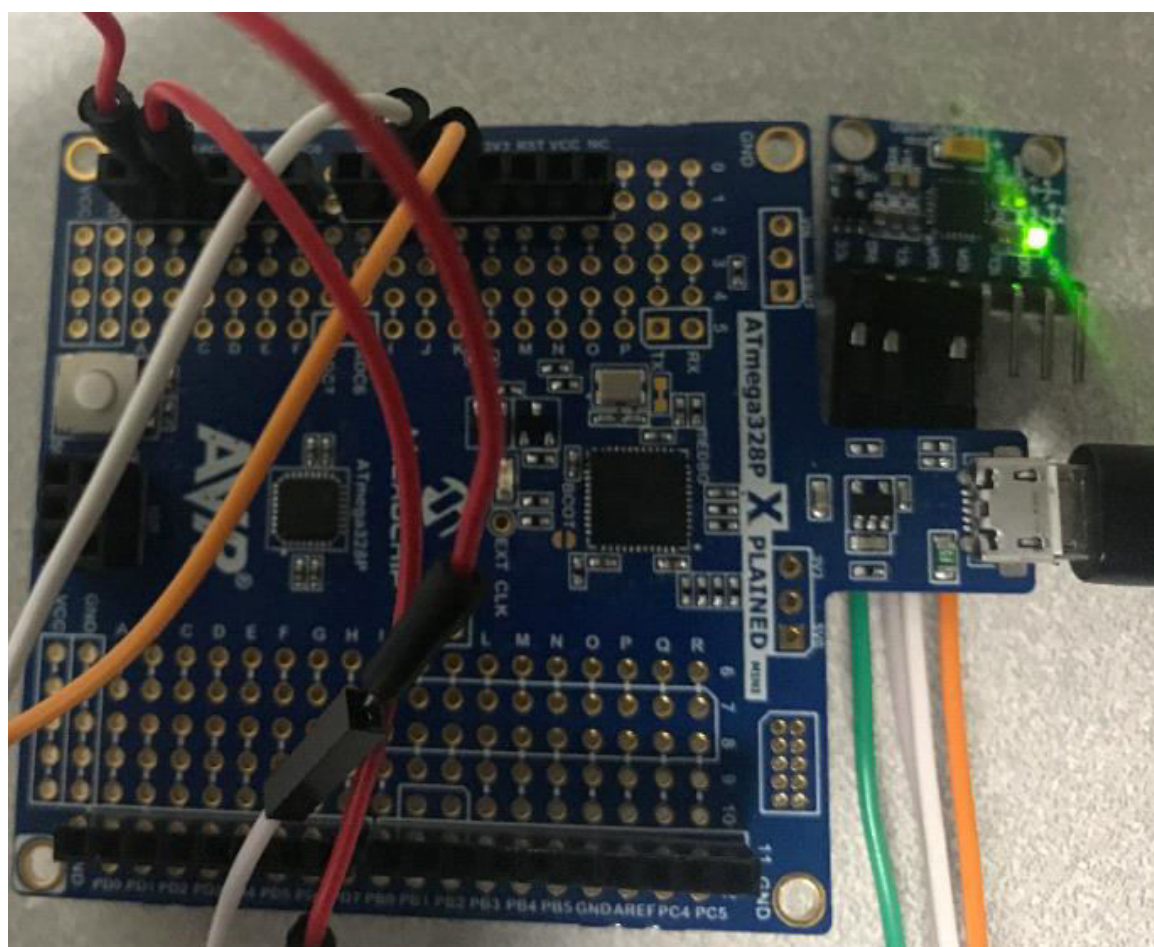
```

        i2c_start("MPU6050_WRITE");
        i2c_write("CONFIG, 0x01");
        i2c_stop();
        _delay_ms(250);
        i2c_start("MPU6050_WRITE");
        i2c_write("GYRO_CONFIG, 0x01");
        i2c_stop();
        _delay_ms(250);
        i2c_start("MPU6050_WRITE");
        i2c_write("INT_ENABLE, 0x01");
        i2c_stop();
    }
    void read(void){
        i2c_start("MPU6050_WRITE");
        i2c_write("ACC");
        i2c_stop();
        i2c_start(MPU6050_READ);
        ax = (((int)i2c_read_ack()<<16) | (int)i2c_read_ack());
        ay = (((int)i2c_read_ack()<<16) | (int)i2c_read_ack());
        az = (((int)i2c_read_ack()<<16) | (int)i2c_read_ack());
        gx = (((int)i2c_read_ack()<<16) | (int)i2c_read_ack());
        gy = (((int)i2c_read_ack()<<16) | (int)i2c_read_ack());
        gz = (((int)i2c_read_ack()<<16) | (int)i2c_read_ack());
        stop();
    }
    int main(void){
        char array1[20];
        char f[10];
        float ax,ay,az,gx,gy,gz;
        i2c_init();
        init_MPU6050();
        while(1){
            read();
            ax = ax/16384.000;
            ay = ay/16384.000;
            az = az/16384.000;
        }
    }

#define F_CPU 16000000UL
#include <stdlib.h>
#include <stdio.h>
#include <avr/io.h>
#include <util/delay.h>
#include <math.h>
#define MPU6050_WRITE 0xD0
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float ax, ay, az, gx, gy, gz;
void init_uart(uint16_t baudrate){
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    UBRR0H = UBRR_val >> 16;
    UBRR0L = UBRR_val;
    UCSR0B |= (1<<TXEN0) | (1<<RXEN0) | (1<<RXCIE0);
    UCSR0C |= (1<<USBS0) | (3<<UCSZ00);
}
void uart_putx(unsigned char x){
    while(!(UCSR0A & (1<<UDRE0)));
    UDR0 = x;
}
void uart_puty(char *y){
    while(*y){
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        y++;
    }
}
void init_MPU6050(void){
    _delay_ms(250);
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    i2c_stop();
    _delay_ms(250);
    i2c_start("MPU6050_WRITE");
    i2c_write("PWR_MGMT_1, 0x01");
    i2c_stop();
    _delay_ms(250);
}

```

- **SCREENSHOT OF EACH DEMO (BOARD SETUP)**



- VIDEO LINKS OF EACH DEMO
- GITHUB LINK OF THIS DA

**Student Academic Misconduct Policy**

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

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

Worku Tafara