CPE301 – SPRING 2020

Design Assignment 3A

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Primary Github address: <https://github.com/jasonvillanuevagit/submission_designAssignments->

Directory: <https://github.com/jasonvillanuevagit/submission_designAssignments-/tree/master/DesignAssignment3A>

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

Atmel Studio 7.0 Atmega328PB-Xmini PC

- Assembler

- Simulator

- Debugger

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

DA\_3A T1 (C)

#define BAUD 9600

#define F\_CPU 16000000UL

#include <avr/io.h>

#include <util/delay.h>

#include <util/setbaud.h>

#include <avr/interrupt.h>

#include <stdlib.h>

#include <stdio.h>

//FUNCTION TO INITIALIZE USART

void USART\_init(void){

UBRR0H = UBRRH\_VALUE;

UBRR0L = UBRRL\_VALUE;

UCSR0C = \_BV(UCSZ01) | \_BV(UCSZ00); //8-BIT DATA

UCSR0B = \_BV(RXEN0) | \_BV(TXEN0); //ENABLE RX AND TX

}

//FUNCTION THAT READS IN 1 CHAR AT A TIME

void USART\_tx\_string(char\*data){

//CONTROL ENTERS WHILE DATA REG NOT EMPTY

while((\*data!='\0')){

//WAIT FOR BUFFER REGISTER TO CLEAR

while(!(UCSR0A & (1 << UDRE0)));

UDR0 = \*data;//REGESTER EQUALS DATA

data++;//DATA MOVES POSITION

}

}

int main(void){

USART\_init();//Initialize USART

int num = 2303;//Initialize integer value

char char\_array [16];//Character array of 16 for integer

char char\_array2[16];//Character array of 16 for float

while (1){

//Initialization of float value

volatile float float\_value = num \* 3.2;

//To generate random number

num = (((num \* 3) % 100) + 2);

itoa (num, char\_array, 10);

snprintf(char\_array2,sizeof(char\_array2), "%f\r\n", float\_value);

//Prints string Jason Villanueva

USART\_tx\_string("Jason Villanueva");

USART\_tx\_string(" ");

//Prints integer value

USART\_tx\_string(char\_array);

USART\_tx\_string(" ");

//Prints floating value

USART\_tx\_string(char\_array2);

USART\_tx\_string("\n");

USART\_tx\_string("\n");

\_delay\_ms(1000);

}

}

1. **DEVELOPED MODIFIED CODE OF TASK 2/A from TASK 1/A**

DA\_3A T2 (C)

#define BAUD 9600

#define F\_CPU 16000000UL

#include <avr/io.h>

#include <util/delay.h>

#include <util/setbaud.h>

#include <avr/interrupt.h>

#include <stdlib.h>

#include <stdio.h>

//"Global variable"

volatile uint8\_t Overflow;

//FUNCTION TO INITIALIZE USART

void USART\_init(void){

UBRR0H = UBRRH\_VALUE;

UBRR0L = UBRRL\_VALUE;

UCSR0C = \_BV(UCSZ01) | \_BV(UCSZ00); //8-BIT DATA

UCSR0B = \_BV(RXEN0) | \_BV(TXEN0); //ENABLE RX AND TX

}

//FUNCTION THAT SETS TIMER/INTERRUPT REGISTERS

void set(){

TCCR0A = 0;//NORMAL MODE OPERATION

TCCR0B = 0X05;//THE PRESCALER SET TO 1024

TCNT0 = 0X00;//COUNTER VALUE = 0

TIMSK0 = (1<<TOIE0);//ENABLE INTERRUPT

sei();//ENABLE GLOBAL INTERRUPT

}

//INTERUPT SUBROUTINE FOR TIMER 0

ISR(TIMER0\_OVF\_vect){

Overflow++;//INCREMENT OVERFLOW

}

//FUNCTION THAT READS IN 1 CHAR AT A TIME

void USART\_tx\_string(char\*data){

//CONTROL ENTERS WHILE DATA REG NOT EMPTY

while((\*data!='\0')){

//WAIT FOR BUFFER REGISTER TO CLEAR

while(!(UCSR0A & (1 << UDRE0)));

UDR0 = \*data;//REGESTER EQUALS DATA

data++;//DATA MOVES POSITION

}

}

int main(void){

USART\_init();//Initialize USART

set();//CALL SET FUNCTION

int num = 2303;//Initialize integer value

char char\_array [16];//Character array of 16 for integer

char char\_array2[16];//Character array of 16 for float

while (1){

//Initialization of float value

volatile float float\_value = num \* 3.2;

//CONTROL WILL ENTER IF OVERFLOW >= 61 CYCLES ~1sec

if (Overflow >= 61){

//To generate random number

num = (((num \* 3) % 100) + 2);

itoa (num, char\_array, 10);

snprintf(char\_array2,sizeof(char\_array2), "%f\r\n", float\_value);

//Prints string Jason Villanueva

USART\_tx\_string("Jason Villanueva");

USART\_tx\_string(" ");

//Prints integer value

USART\_tx\_string(char\_array);

USART\_tx\_string(" ");

//Prints floating value

USART\_tx\_string(char\_array2);

USART\_tx\_string("\n");

USART\_tx\_string("\n");

//Overflow reset to 0

Overflow = 0;

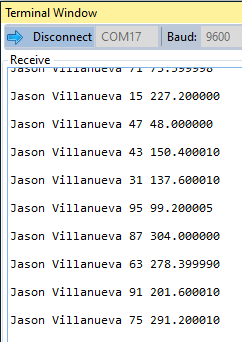
}

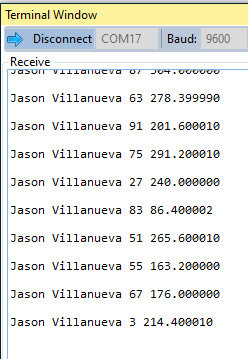
}

}

1. **SCHEMATICS**

N/A

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



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

A circuit board

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1. **VIDEO LINKS OF EACH DEMO**

Task 1 - <https://youtu.be/PNXIC-XKTB8>

Task 2 - <https://youtu.be/WqPRB4P66MI>

1. **GITHUB LINK OF THIS DA**

<https://github.com/jasonvillanuevagit/submission_designAssignments-/tree/master/DesignAssignment3A>

**Student Academic Misconduct Policy**

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

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

Jason Villanueva