CPE301 – SPRING 2019

MIDTERM 1

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Directory: Repository_301

1. COMPONENTS LIST AND CONNECTION BLOCK DIAGRAM w/ PINS

List of Components used
Atmega328P, ESP2866, USB serial, and LM35

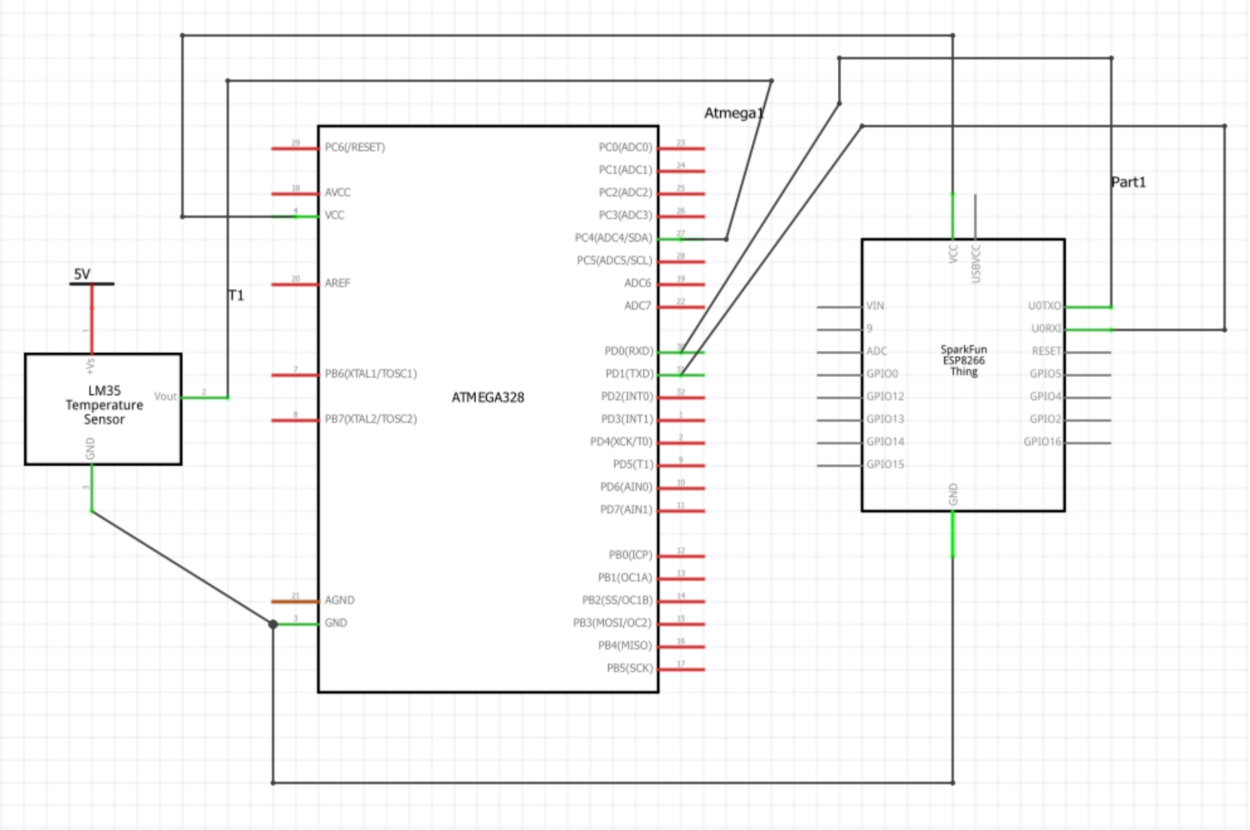
2. INITIAL/MODIFIED/DEVELOPED CODE OF TASK 1/A

```
#define F_CPU 16000000UL
#define BAUD 9600 // BAUD rate
#define BAUD_PRESCALLER F_CPU/16/BAUD-1 // Prescaler

#include <avr/io.h>
#include <util/delay.h>
#include <stdio.h>
#include <avr/interrupt.h>
#include <stdlib.h>

void read_adc(void);  //Read Temp using ADC
void adc_init(void);  // Start ADC
void USART_init( unsigned int ubrr ); // Start USART communication
void USART_tx_string(char *data); //Print String USART
volatile unsigned int adc_temp; // Volatile temp variable
volatile unsigned int tempF; // Volatile Fahrenheit
volatile unsigned int tempC; // Volatile Celsius
char outs[256]; // String array used for sending USART commands
volatile char received_data; // String array used for receiving USART communication

int main(void) {

	adc_init(); // Start A2D Converter on PC4
	USART_init(BAUD_PRESCALLER); // Start the USART (RS232 interface)
	_delay_ms(500); // Delay for hardware start up
	while(1)
	{
		// Constantly read the temp from ADC and send to thingspeak

		/* Start AT commands */
		//AT connect check
		unsigned char AT[] = "AT\r\n";
		//Set device mode, 1 = Station mode
```

```
              unsigned char AT_CWMODE[] = "AT+CWMODE=1\r\n";
              //Perform Wifi connection, provide SSID and Password
              unsigned char AT_CWJAP[] = "AT+CWJAP=\"Michael iPhone\",\"hello dad\"\r\n";
              //Set device for single IP Address Mode
              unsigned char AT_CIPMUX[] = "AT+CIPMUX=0\r\n";
              // Start TCP connection to Thingspeak.com at port 80
              unsigned char AT_CIPSTART[] =
"AT+CIPSTART=\"TCP\",\"api.thingspeak.com\",80\r\n";
              // Give upcoming string length
              unsigned char AT_CIPSEND[] = "AT+CIPSEND=100\r\n";

              // Send commands listed from above
              _delay_ms(200);
              USART_tx_string(AT);
              _delay_ms(5000);
              USART_tx_string(AT_CWMODE);
              _delay_ms(5000);
              USART_tx_string(AT_CWJAP);
              _delay_ms(15000);
              USART_tx_string(AT_CIPMUX);
              _delay_ms(10000);
              USART_tx_string(AT_CIPSTART);
              _delay_ms(10000);
              USART_tx_string(AT_CIPSEND);
              _delay_ms(5000);

              PORTC^=(1<<5);
              // Read next ADC value from LM35
              read_adc();
              // Convert temp into Celsius and Fahrenheit
              adc_temp = (adc_temp*500)/1023;
              tempC = adc_temp;
              tempF = (tempC*1.8)+32;
              // Send to thingspeak using provided link, website channel key, and field
location
              snprintf(outs,sizeof(outs),"GET
https://api.thingspeak.com/update?api_key=G7MZKO6271CLAB83&field1=%3d\r\n", tempF);
              USART_tx_string(outs);//send data
              _delay_ms(10000);
       }
}

/* ADC Start */
void adc_init(void) // Start ADC
{

       ADMUX = (0<<REFS1)| // Reference Selection Bits

       (1<<REFS0)| // AVcc - external cap at AREF
       (0<<ADLAR)| // ADC Left Adjust Result
       (1<<MUX2)| // Analog Channel Selection Bits
       (0<<MUX1)| // ADC2 (PC2 PIN25)
       (0<<MUX0); // 010

       ADCSRA = (1<<ADEN)| // ADC Enable

       (0<<ADSC)| // ADC Start Conversion
       (0<<ADATE)| // ADC Auto Trigger Enable
```

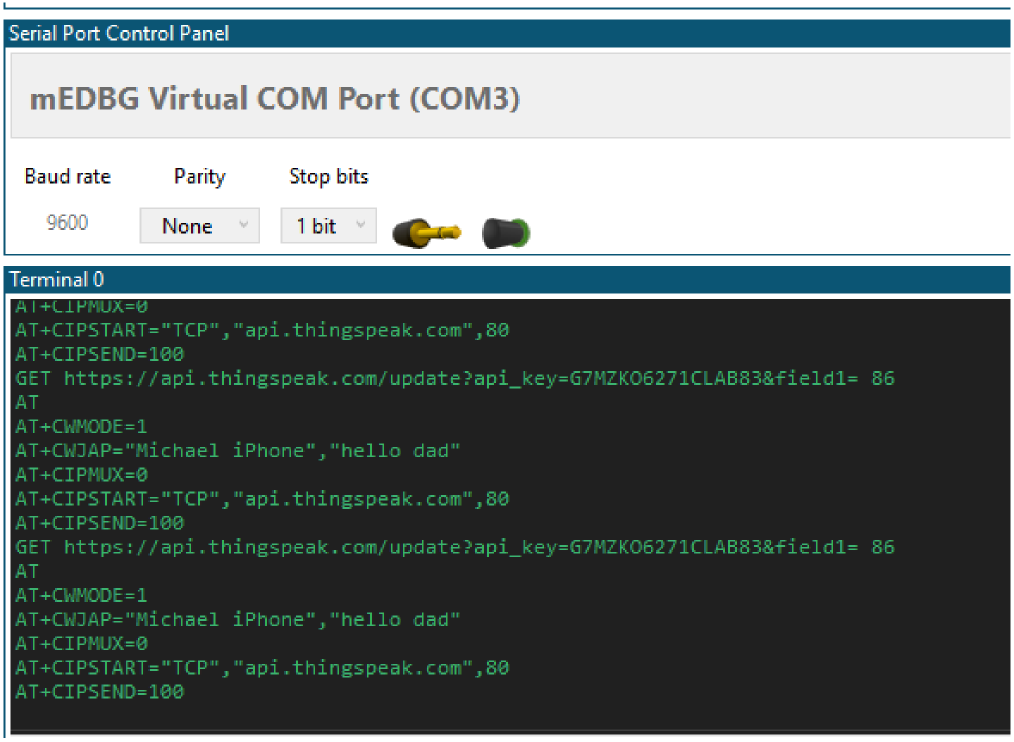
```
        (0<<ADIF)| // ADC Interrupt Flag
        (0<<ADIE)| // ADC Interrupt Enable
        (1<<ADPS2)| // ADC Prescaler Select Bits
        (0<<ADPS1)|
        (1<<ADPS0);

}

/* Read value from ADC */
void read_adc(void) {
        unsigned char i =4;
        adc_temp = 0; // Start adc_temp variable
        while (i--) {
                ADCSRA |= (1<<ADSC);
                while(ADCSRA & (1<<ADSC));
                adc_temp+= ADC;
                _delay_ms(50);
        }
        adc_temp = adc_temp / 4; // Average a few samples

}

/* Start USART communication (RS-232) */
void USART_init( unsigned int ubrr ) {
        UBRR0H = (unsigned char)(ubrr>>8);
        UBRR0L = (unsigned char)ubrr;
        UCSR0B |= (1 << TXEN0) | (1 << RXEN0)| ( 1 << RXCIE0); // Enable receiver,
transmitter & RX interrupt
        UCSR0C |= (1<<UCSZ01) | (1 << UCSZ00);
}

/* USART string sender (RS-232) */
void USART_tx_string( char *data ) {
        while ((*data != '\0')) {
                while (!(UCSR0A & (1 <<UDRE0)));
                UDR0 = *data;
                data++;
        }
}
```

3. SCHEMATICS



Use fritzing.org

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



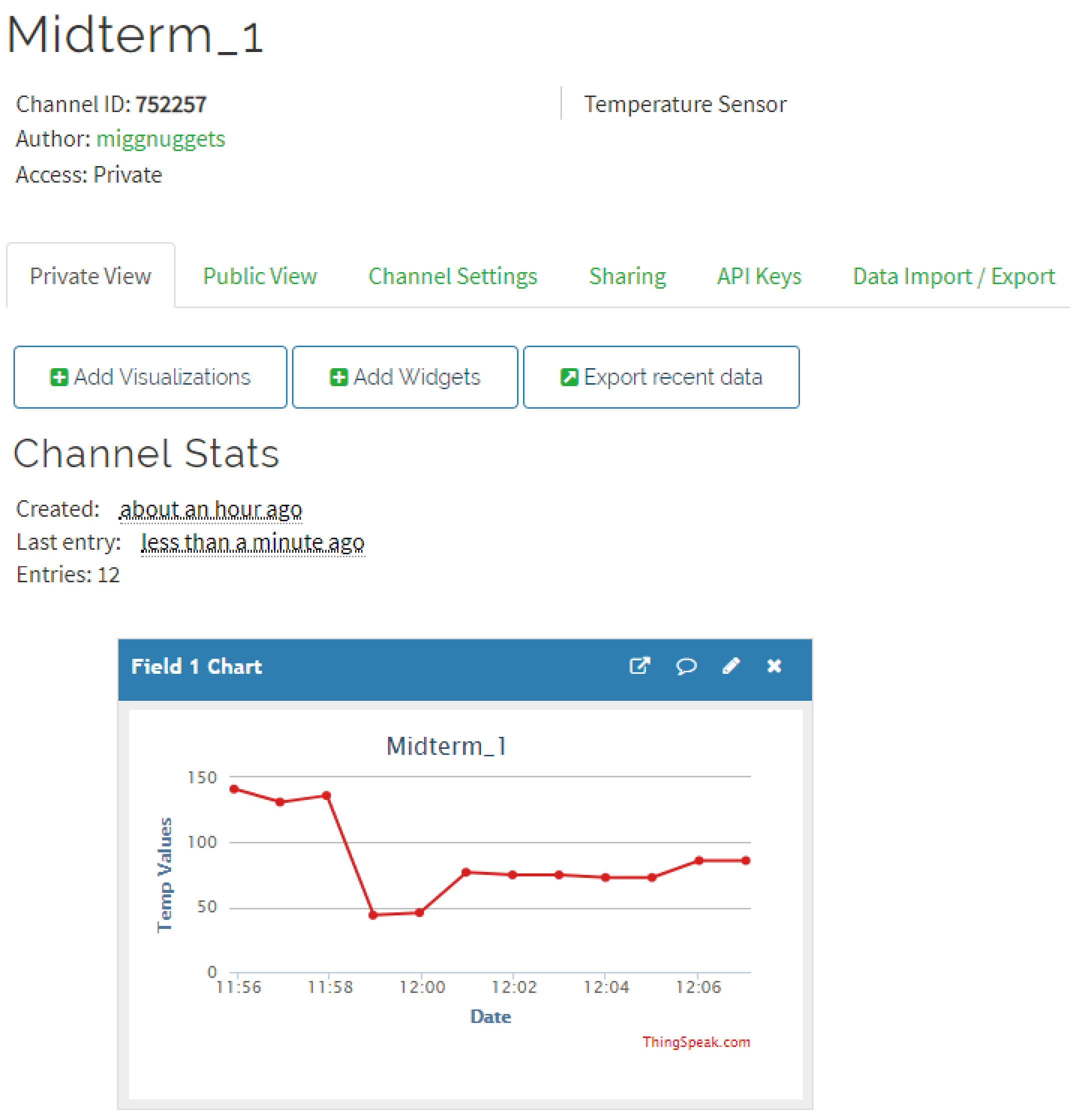
Serial Port Control Panel

mEDBG Virtual COM Port (COM3)

Baud rate: 9600
Parity: None
Stop bits: 1 bit

Terminal 0

```
AT+CIPMUX=0
AT+CIPSTART="TCP","api.thingspeak.com",80
AT+CIPSEND=100
GET https://api.thingspeak.com/update?api_key=G7MZKO6271CLAB83&field1= 86
AT
AT+CWMODE=1
AT+CWJAP="Michael iPhone","hello dad"
AT+CIPMUX=0
AT+CIPSTART="TCP","api.thingspeak.com",80
AT+CIPSEND=100
GET https://api.thingspeak.com/update?api_key=G7MZKO6271CLAB83&field1= 86
AT
AT+CWMODE=1
AT+CWJAP="Michael iPhone","hello dad"
AT+CIPMUX=0
AT+CIPSTART="TCP","api.thingspeak.com",80
AT+CIPSEND=100
```



Midterm_1

Channel ID: **752257**
Author: miggnuggets
Access: Private

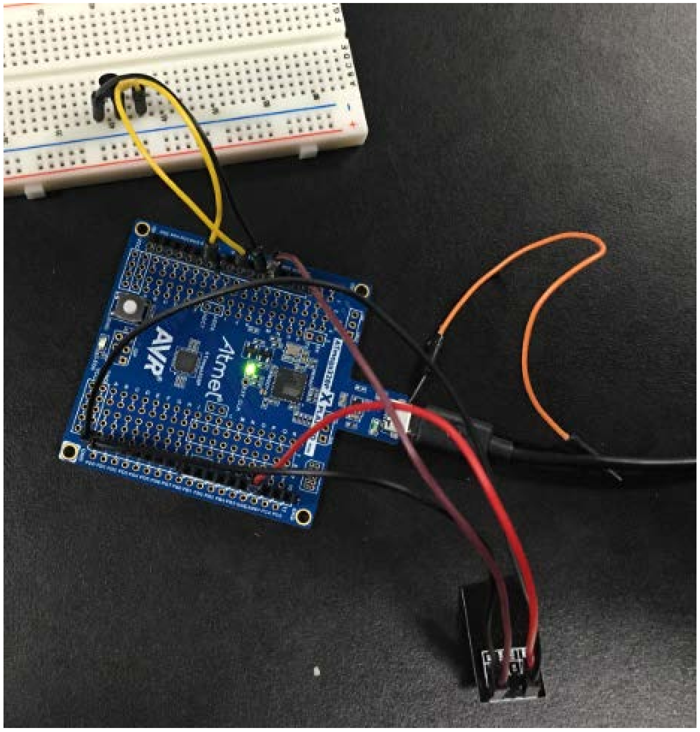
Temperature Sensor

Channel Stats

Created: about an hour ago
Last entry: less than a minute ago
Entries: 12

Field 1 Chart

5. SCREENSHOT OF EACH DEMO (BOARD SETUP)



6. VIDEO LINKS OF EACH DEMO

https://youtu.be/OlwerILGVhs

7. GITHUB LINK OF THIS DA

https://github.com/miggnuggets/submissions.git

Student Academic Misconduct Policy
http://studentconduct.unlv.edu/misconduct/policy.html

"This assignment submission is my own, original work".
Michael Johnson