CPE301 – SPRING 2019

Design Assignment 4B

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Directory: DA4B

1. COMPONENTS LIST AND CONNECTION BLOCK DIAGRAM w/ PINS

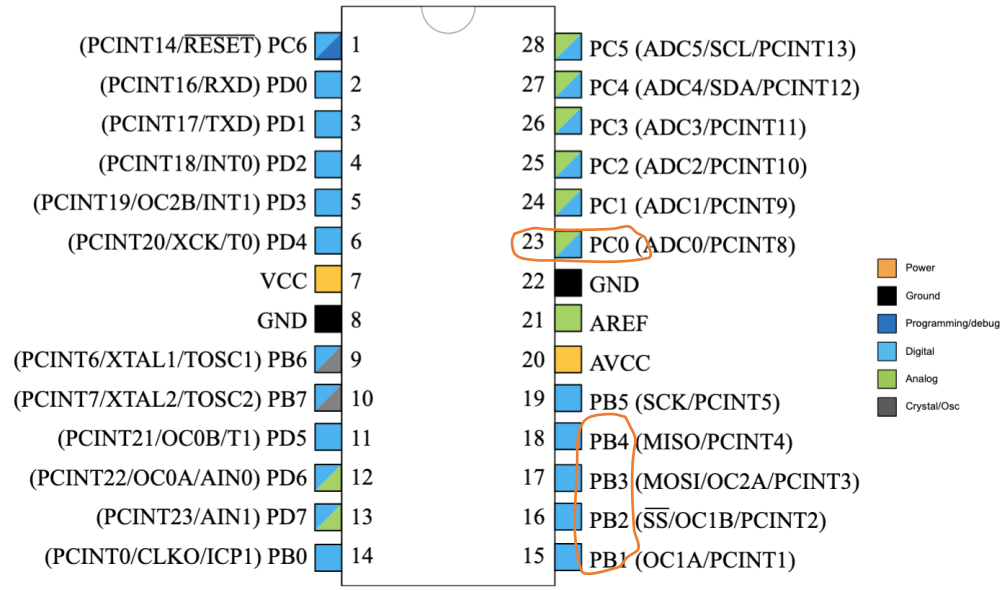
List of Components used

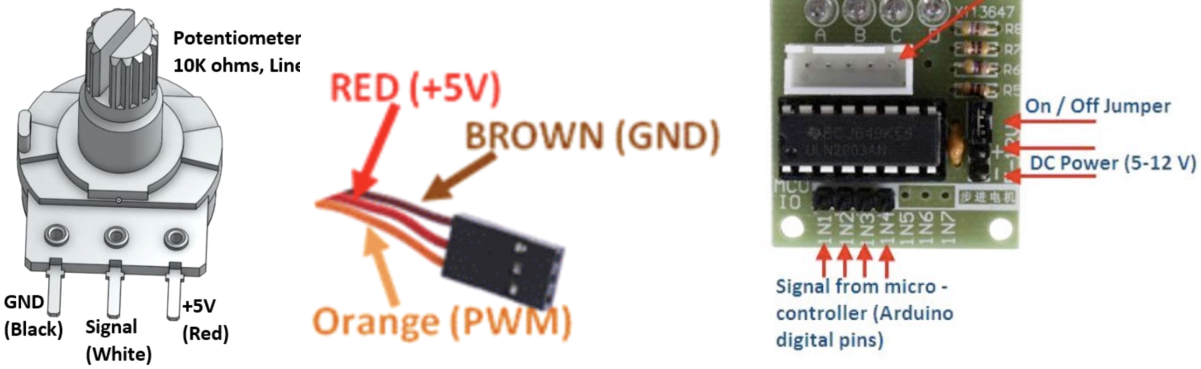
- Xplained mini
- Micro USB
- Male/female wires
- Servo motor
- Stepper motor
- Driver
- Atmega 328P
- Potentiometer
- Power supply

Block diagram with pins used in the Atmega328P

Pin-out

Figure 5-1. 28-pin PDIP





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

Task 1:

```
/*
 * DA4B_T1.c
 *
 * Created: 4/20/2019 8:42:49 PM
 * Author : itzel
 */

#define F_CPU 16000000UL
#include <avr/io.h>
#include <util/delay.h>
#include <avr/interrupt.h>

void adc_int(void); //prototype for adc init function
void timer_init(void); //prototype for timer init function
volatile unsigned int speed; // variable for control delay
volatile int stop = 0; // if 1, the motor is turned off

int main(void)
{
	DDRB = 0x0F;   //Enable as output for portB
	PORTB = 0x00; // initialize to 0v
	adc_int();      // call ADC function
	TCCR1B = 0x1A; // set CTC mode and 1024 prescaler
	ICR1 = 62258; //set value of ICR1

	while(1)
	{
		while((ADCSRA&(1<<ADIF))==0); // wait for conversion
		if (ADC >= 820)
		{
			stop = 1;
		}
		if ((ADC < 820) && (ADC >= 617))
		{
			 stop = 0;
			 speed = 0x1869;
		}
		if ((ADC < 617) && (ADC >= 414))
```

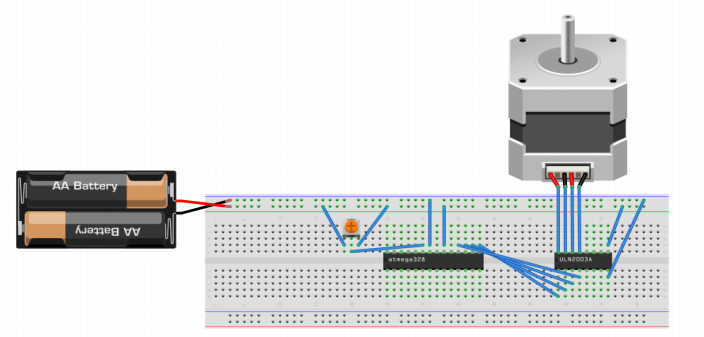
```
		{
			stop = 0;
			speed = 0x124F;
		}
		if ((ADC < 414) && (ADC >= 211))
		{
			stop = 0;
			speed = 0x0C34;
		}
		if ((ADC < 211) && (ADC >= 000))
		{
			stop = 0;
			speed = 0x061A;
		}

		OCR1A = speed;// set OCR1A to the determined speed
		TCNT1 = 0x00; // reset the clock
		if(stop == 0)
		{
		// if the motor is not stopped, run a step with the assigned length delay
			while((TIFR1 & 0x2) != 0x2);
			PORTB = 0x09;
			TIFR1 |= (1<<OCF1A);
			while((TIFR1 & 0x2) != 0x2);
			PORTB = 0x03;
			TIFR1 |= (1<<OCF1A);
			while((TIFR1 & 0x2) != 0x2);
			PORTB = 0X06;
			TIFR1 |= (1<<OCF1A);
			while((TIFR1 & 0x2) != 0x2);
			PORTB = 0X0C;
			TIFR1 |= (1<<OCF1A);
		}
	}
}

void adc_int(void){
	ADMUX = (0<<REFS1)|//Reference selection bits
	(1<<REFS0)|//AVcc-external cap at AREF
	(0<<ADLAR)|//ADC Left Adjust Result
	(0<<MUX3)|
	(0<<MUX2)|//ANalogChannel Selection      Bits
	(0<<MUX1)|//ADC0 (PC0)
	(0<<MUX0);

	ADCSRA = (1<<ADEN)|//ADC ENable
	(1<<ADSC)|//ADC      Start Conversion
	(1<<ADATE)|//ADC Auto Trigger Enable
	(0<<ADIF)|//ADC      Interrupt Flag
	(1<<ADIE)|//ADC      Interrupt Enable
	(1<<ADPS2)|//ADC PrescalerSelect Bits
	(1<<ADPS1)|
	(1<<ADPS0);
}
```

Task 2:

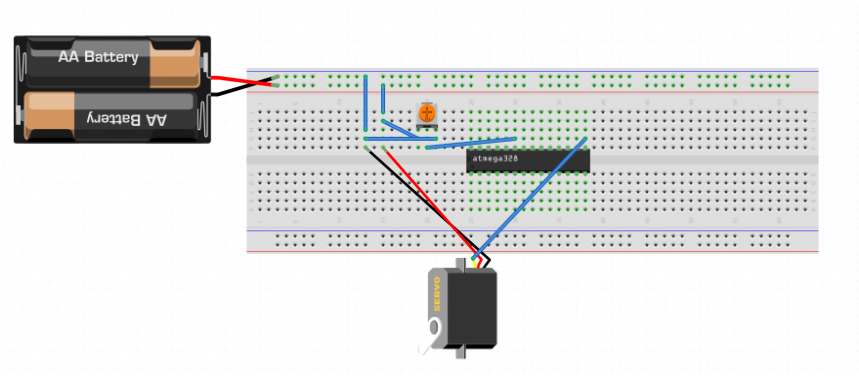
```
/*
 * DA4B_T2.c
 *
 * Created: 4/20/2019 9:00:35 PM
 * Author : itzel
 */

#define F_CPU 16000000UL
#include <avr/io.h>
#include <util/delay.h>
#include <avr/interrupt.h>
int check = 0;//set variable to 0

int main(void)

{
	DDRB = 0xFF; //set DDRB as an output
	DDRD = 0xFF; //set DDRD as an output
	TCCR1B|=(1<<WGM13)|(1<<WGM12)|(1<<CS11)|(1<<CS10); //prescaler 64 & mode
	TCCR1A|=(1<<COM1A1)|(1<<COM1B1)|(1<<WGM11); //set TCCR1A register
	ICR1 = 4999;
	ADMUX = 0x60; //use PC0 as ADC pin
	ADCSRA = 0xA6;//set ADEN, ADSC, ADPS1, ASPS2

	while (1)
	{
		ADCSRA |= ( 1 << ADSC); //start conversion
		while((ADCSRA & (1 << ADIF))== 0);
		check = ADCH; //check value

		if(check == 0) //if zero
		{
			OCR1A = 0; //turn 0 degrees
			_delay_ms(1000); //delay
		}
		if(check == 255) //Max pot value
		{
			OCR1A = 535;  //turn 180 degrees
			_delay_ms(1000); //delay
		}
	}
}
```

3. SCHEMATICS

Task 1:



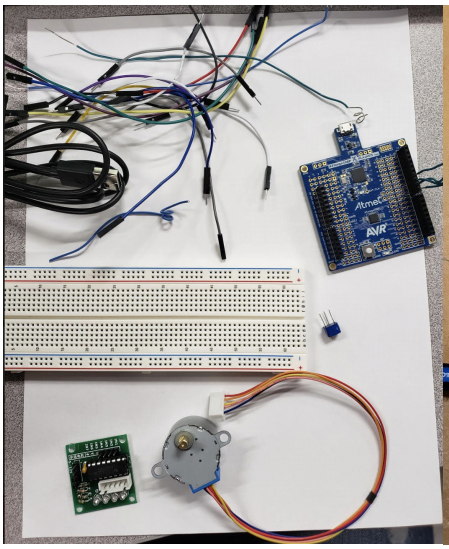
Task 2:

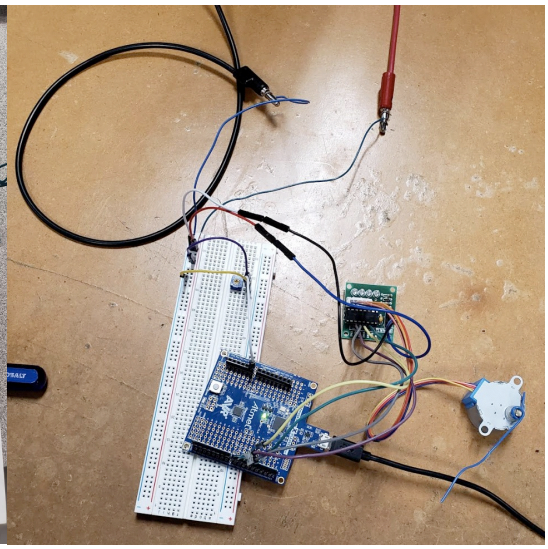


4. SCREENSHOT OF EACH DEMO (BOARD SETUP)

Task 1

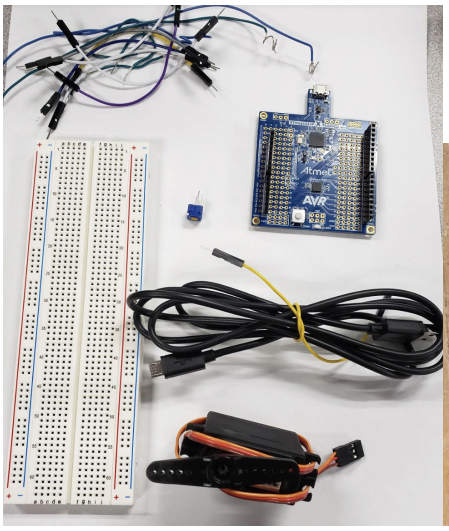
Before: After:

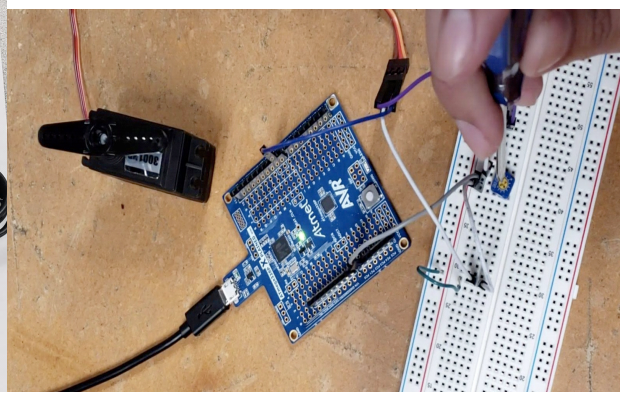




Task 2

Before: After:





5. **VIDEO LINKS OF EACH DEMO**

   Task1:
   https://www.youtube.com/watch?v=FcdadZtnS4Y

   Task2:
   https://www.youtube.com/watch?v=Cjil_zFF3Ug

6. **GITHUB LINK OF THIS DA**

https://github.com/HadidBuilds/hw_sub_da1

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