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CPE301 – SPRING 2018

Design Assignment 4

DO NOT REMOVE THIS PAGE DURING SUBMISSION:

The student understands that all required components should be submitted in complete for grading of this assignment.

NO	SUBMISSION ITEM	COMPLETED (Y/N)	MARKS (/MAX)
1	COMPONENTS LIST AND CONNECTION BLOCK DIAGRAM w/ PINS		
2.	INITIAL CODE OF TASK 1/A		
3.	INCREMENTAL / DIFFERENTIAL CODE OF TASK 2/B		
3.	INCREMENTAL / DIFFERENTIAL CODE OF TASK 3/C		
3.	INCREMENTAL / DIFFERENTIAL CODE OF TASK 4/D		
3.	INCREMENTAL / DIFFERENTIAL CODE OF TASK 5/E		
4.	SCHEMATICS		
5.	SCREENSHOTS OF EACH TASK OUTPUT		
5.	SCREENSHOT OF EACH DEMO		
6.	VIDEO LINKS OF EACH DEMO		
7.	GOOGLECODE LINK OF THE DA		

1. COMPONENTS LIST AND CONNECTION BLOCK DIAGRAM w/ PINS

- Atmega328P
- FTDI (only for providing power)
- DC motor, Stepper motor, and servo motor for tasks 1, 2, and 3 respectively
- Potentiometer
- Jumper wires

2. INITIAL/DEVELOPED CODE OF TASK 1/A

```
#define F_CPU 8000000
#include <avr/io.h>
#include <util/delay.h>
#include <avr/interrupt.h>

int val = 0;

void ADC_init() {
    ADMUX = 0;                  // read from port ADC0
    ADMUX |= (1<<REFS0);        // use AVcc for reference
    ADCSRA |= (1<<ADPS2) | (1<<ADPS1); // prescalar of 64
    ADCSRA |= (1<<ADEN);        // enable ADC
    ADCSRB = 0;                 // free running mode
}

unsigned int readADC()
{
    ADMUX &= ~(1<<ADLAR);               // clear the adc value
    ADCSRA |= (1 << ADSC);              // start adc
    while(ADCSRA & (1<<ADSC));          // wait until adc is done


    return ADC;
}

int main(void)
{
    ADC_init();
    DDRB |= (1 << 1) | (1 << 2);   // set pins portb.1 and 2 as output
    PORTB = (1 << 2);              // set B2 as high for clockwise rotation
    DDRD |= (1 << 6);              // set D6 as output to control enable on driver

    OCR0A = 243;

    TCCR0A |= (1 << COM0A1);               // non-inverted mode
    TCCR0A |= (1 << WGM02) | (1 << WGM00); // phase correct PWM
    TCCR0B |= (1 << CS01);                 // prescalar of 8



    while(1)
    {
          val = readADC() / 4.20;  // read ADC and divide by 4.2 to not exceed 243
          OCR0A = val;             // which is 95% of PWM value. then update PWM
compare
    }
}
```

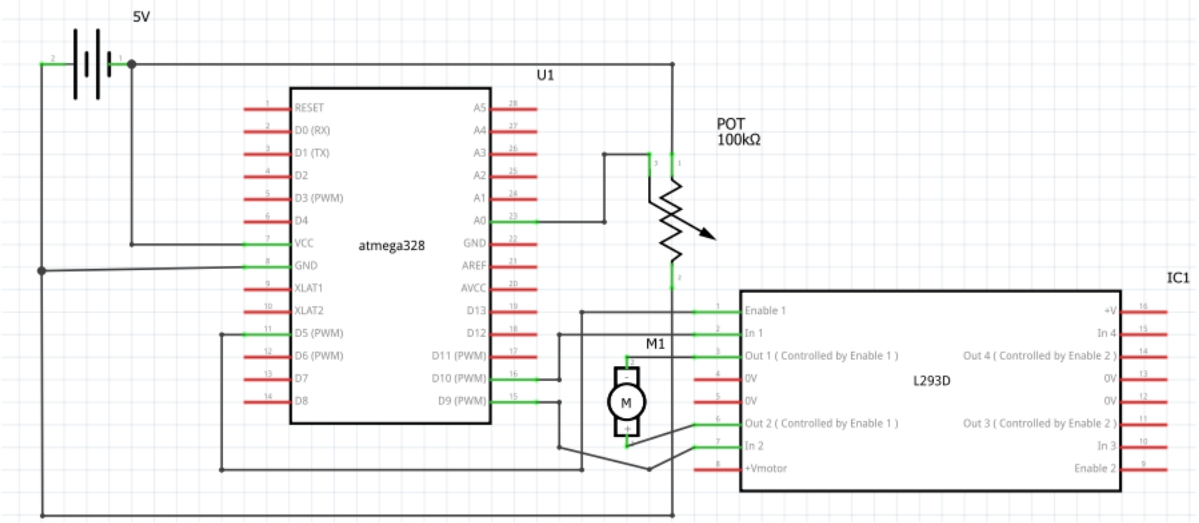
3. TASK 2 CODE

```
#define F_CPU 8000000
#include <avr/io.h>
#include <util/delay.h>
#include <avr/interrupt.h>

volatile int step;

void ADC_init() {
    ADMUX = 0;                  // read from port ADC0
    ADMUX |= (1<<REFS0);        // use AVcc for reference
    ADCSRA |= (1<<ADPS2) | (1<<ADPS1); // prescalar of 64
    ADCSRA |= (1<<ADEN);        // enable ADC
    ADCSRB = 0;                 // free running mode
}

unsigned int readADC()
{
    ADMUX &= ~(1<<ADLAR);               // clear the adc value
    ADCSRA |= (1 << ADSC);              // start adc
    while(ADCSRA & (1<<ADSC));          // wait until adc is done

    return ADC;
}

ISR(TIMER0_COMPA_vect)
{
    if (step == 0)            // change position of motor depending
           PORTB = (1 << 1);    // on which step it is currently at
    else if (step == 1)
           PORTB = (1 << 2);
    else if (step == 2)
           PORTB = (1 << 3);
    else if (step == 3)
           PORTB = (1 << 4);


    step++;
    if (step == 4)         // increment and reset step if necessary
           step = 0;

    _delay_us(500);            // small delay to let motor move
    OCR0A = 255  - readADC() / 4.02;      // change Compare value to ADC value
                                  // divide 4.02 so that max value is 254.
    TIFR0 |= (1 << OCF0A);        // reset interrupt flag

}

int main(void)
{
    ADC_init();          // initialize ADC
    DDRB  = 0xFF;        // set all port b ports as output
    //int val = 0;
    step = 0;
    TCCR0A |= (1 << WGM01);            // CTC mode
    TCCR0B |= (1 << CS01) | (1 << CS00);   // Prescalar of 64
    TIMSK0 |= (1 << OCIE0A);               // turn on overflow interrupt
```

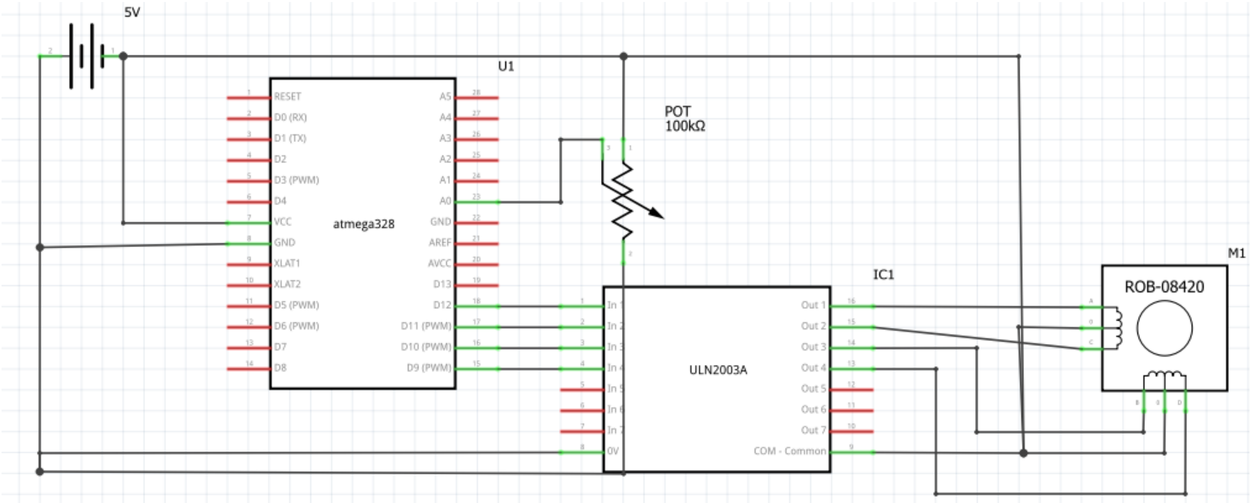
```
        OCR0A = 200;                            // set initial match value
        sei();                          // turn on interrupt

         while (1)
         {
         }
    }
```

4. SCHEMATICS

Task1:



Task2:

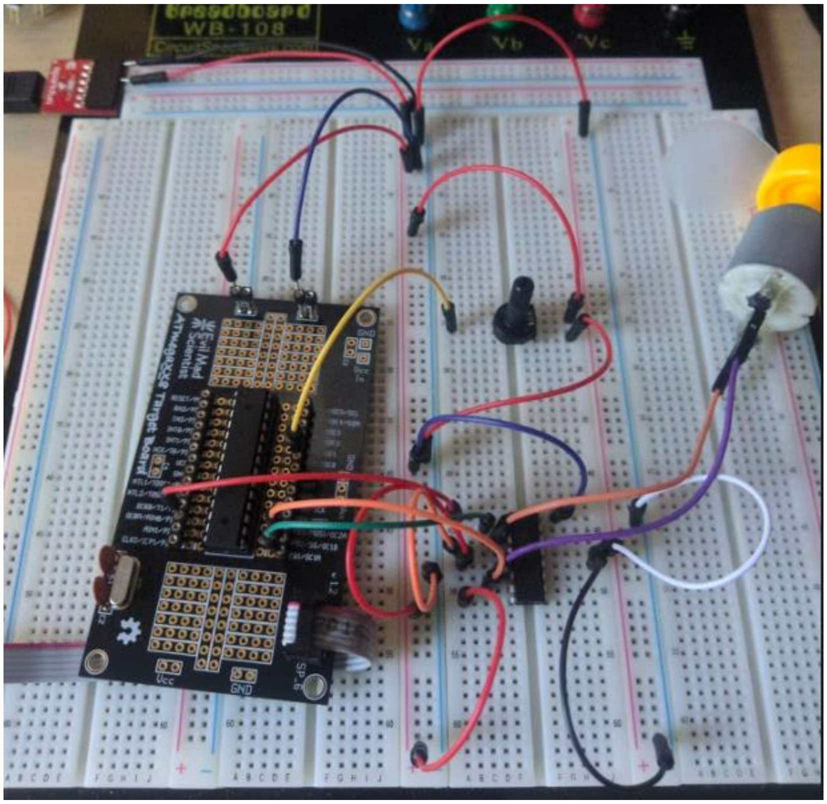


5. SCREENSHOTS OF EACH TASK OUTPUT (ATMEL STUDIO OUTPUT)

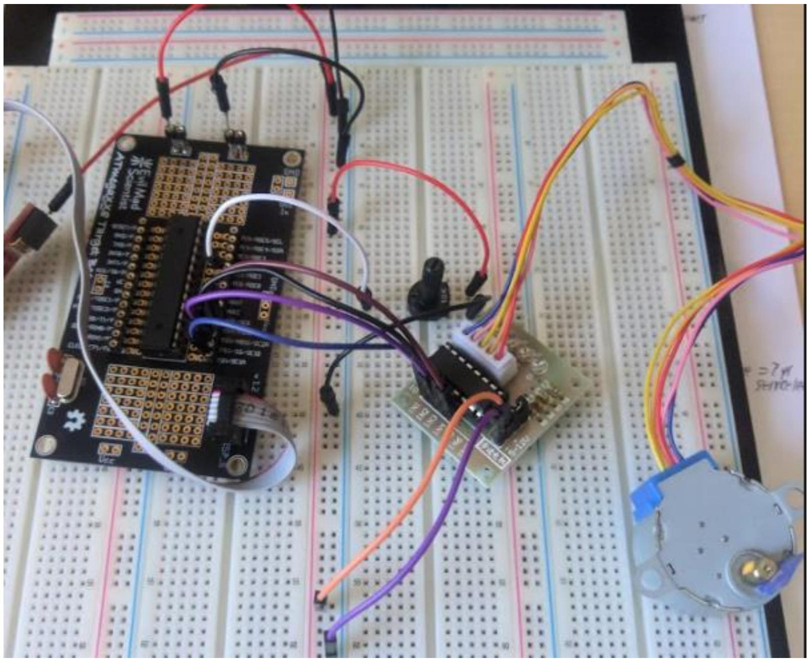
N/A

6. SCREENSHOT OF EACH DEMO (BOARD SETUP)

Task1:



Task2:



7. VIDEO LINKS OF EACH DEMO

Task 1: https://www.youtube.com/watch?v=_ncwYZNwnsk

Task 2: https://www.youtube.com/watch?v=FJHlcehPWT0

8. GITHUB LINK OF THIS DA

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

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