Drexel University

To: Dr. Christopher Peters

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Re: Pulse Width Modulation

Purpose

The purpose of this lab was to add the functionality to set the ICR manually and then use analogRead and analogWrite.

Discussion

The additional functions needed were set_ICR and set_duty_cycle which were relatively simple to create. Then we had to take readings of the LED using a photocell as we increment the duty cycle. This involved charts that compared the duty cycle with the resistance and the voltage of the LED and the photocell.
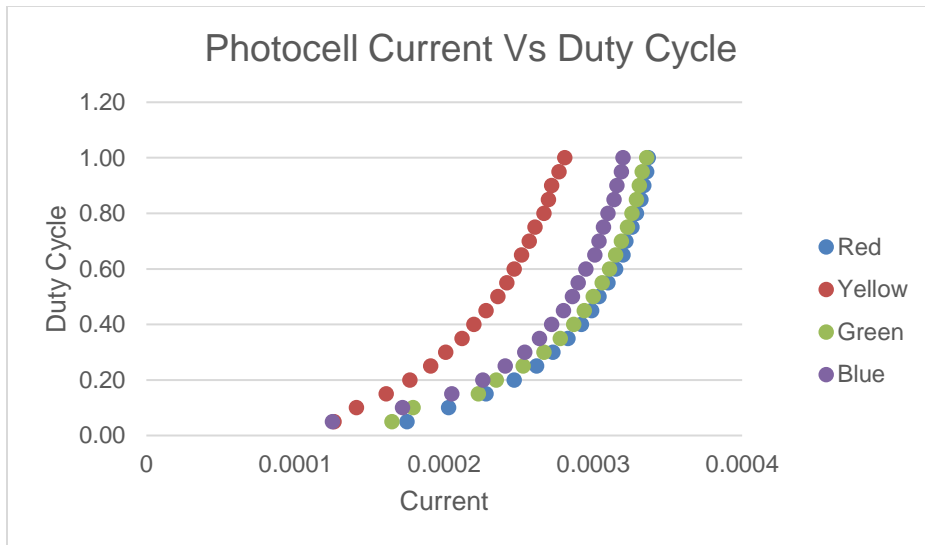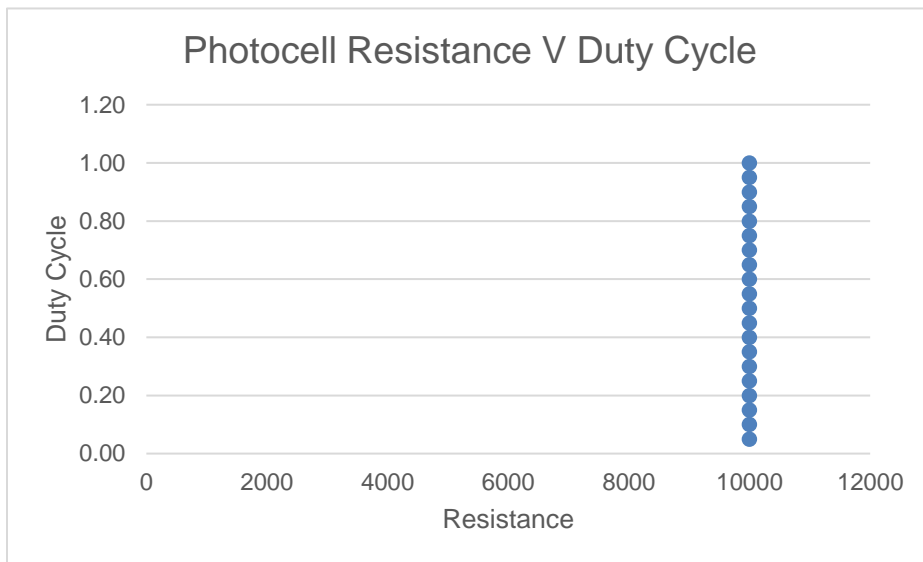
1.LED Current V Duty Cycle

LED Current V Duty Cycle

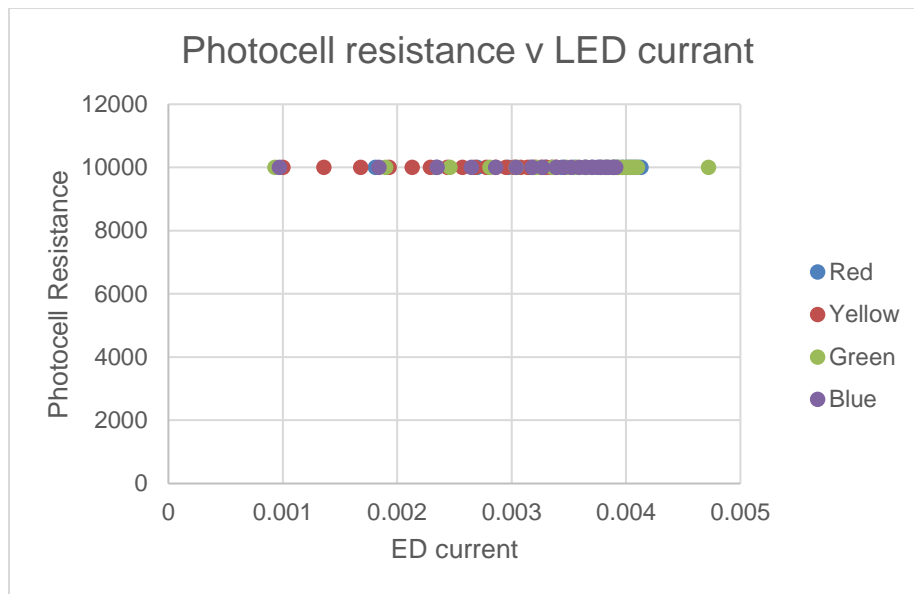## 2. LED resistance v Duty cycle
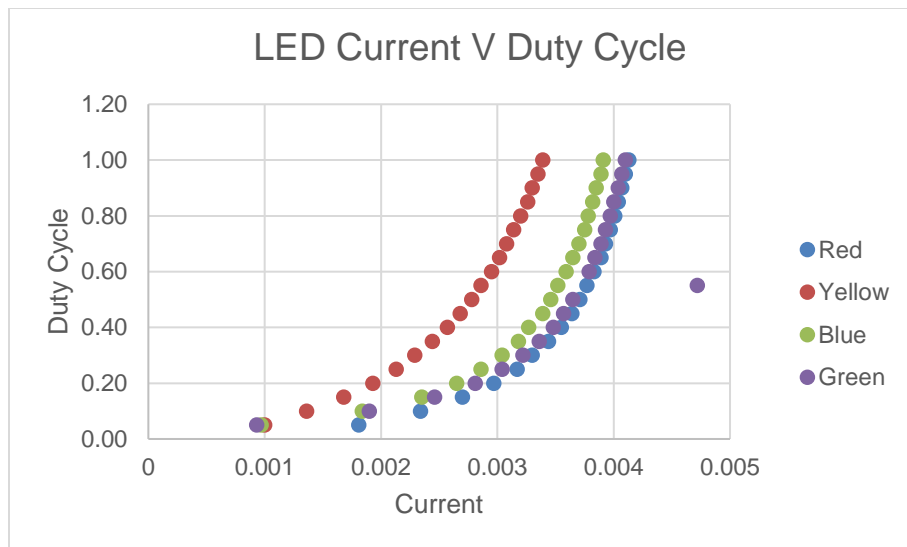
LED Resistance V Duty Cycle
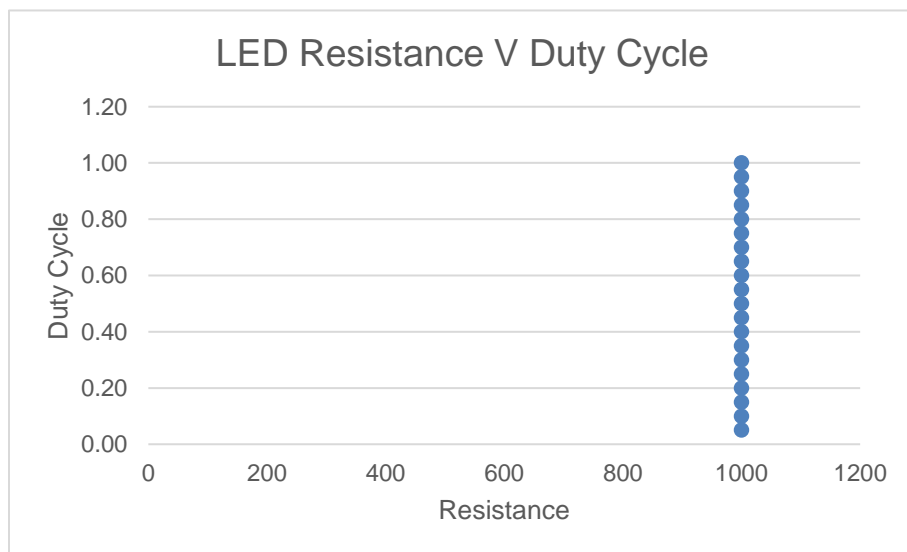
3. Photocell current v Duty cycle

Photocell Current Vs Duty Cycle

4. Photocell resistance v Duty cycle

Photocell Resistance V Duty Cycle

5. Photocell resistance v LED current

Photocell resistance v LED currant

6. Photocell current v Photocell voltage

Photocell Current v Photocell Voltage
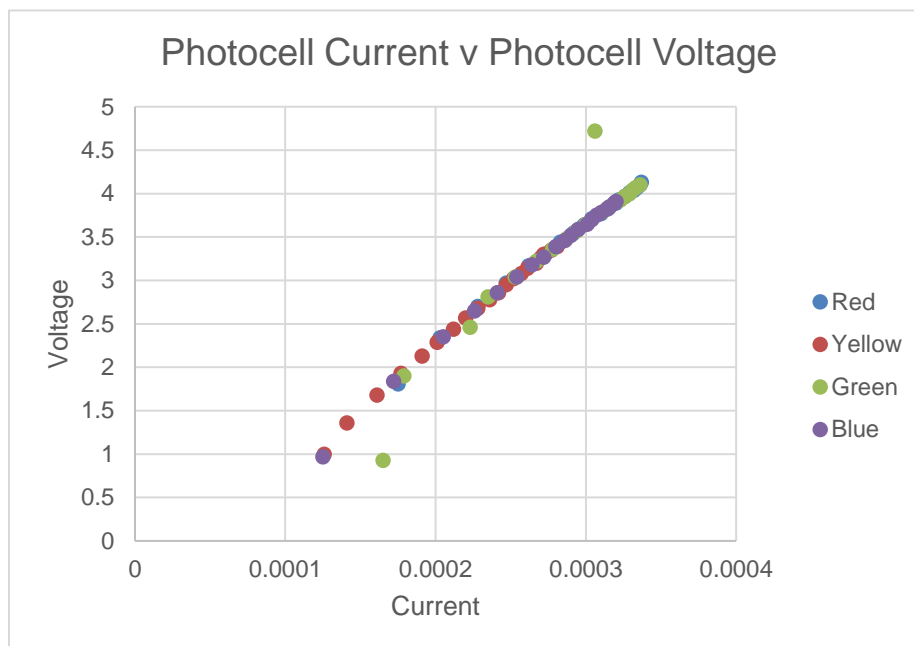
Recommendation

This was a mostly simple lab that required a bit of understanding of how the analog read and analog write worked but after that it was simple tracking data points and plotting the graphs.

```cpp
#include <Arduino.h>

#include "DigitalPin.h"


DigitalPin::DigitalPin(int pin)

{

  pinMode(pin, OUTPUT);

  _pin = pin;

}


void DigitalPin::set_ICR(){

  if(_pin == 6){

        TCCR4A = (1<<WGM41) | (1<<COM4A1);

        TCCR4B = (1<<WGM43) | (1<<CS40);

        ICR4 = 255;

        OCR4A = 50;

        TCNT4 = 0;

  }


}


void DigitalPin::set_duty_cycle(int num){

  if(_pin == 6){

        OCR4A = (num * 255) / 100;
```

```cpp
    }

}
#ifndef DigitalPin_h
#define DigitalPin_h

#include <Arduino.h>

class DigitalPin
{
public:
  DigitalPin(int pin);


  void set_ICR();
  void set_duty_cycle(int val);
};
#endif



#include <Arduino.h>
#include <DigitalPin.h>


DigitalPin LED(6);
```

```
void setup() {

  LED.set_ICR();

  Serial.begin(9600);

}


void loop() {

  for (int dutyCycle = 0; dutyCycle <= 100; dutyCycle += 5) {


    LED.set_duty_cycle(dutyCycle);

    delay(1);

    float photo = (analogRead(A1)* (5 / 1023.0));

    delay(100);

    float LED = (analogRead(A0)*(5 / 1023.0)) ;


    Serial.print("Duty Cycle:");

    Serial.print(dutyCycle);

    Serial.print("Photocell Voltage: ");

    Serial.print(photo);

    Serial.print("LED PIN Voltage: ");

    Serial.print(LED);


    delay(500);

  }
```

}