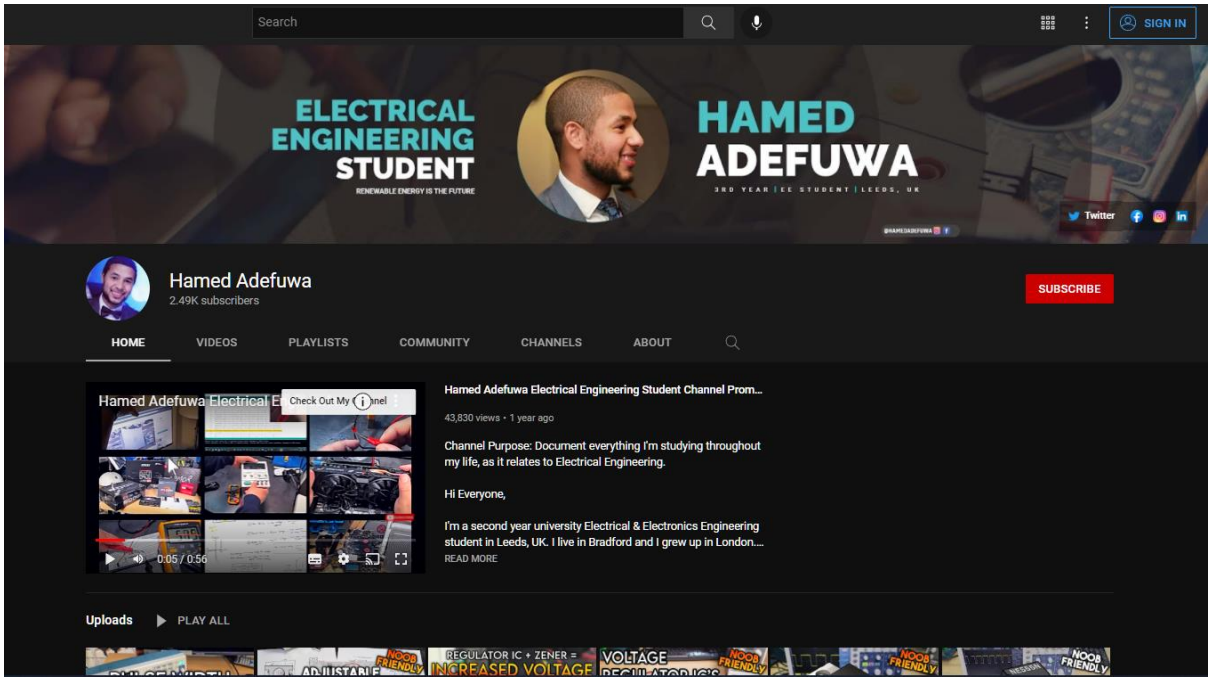
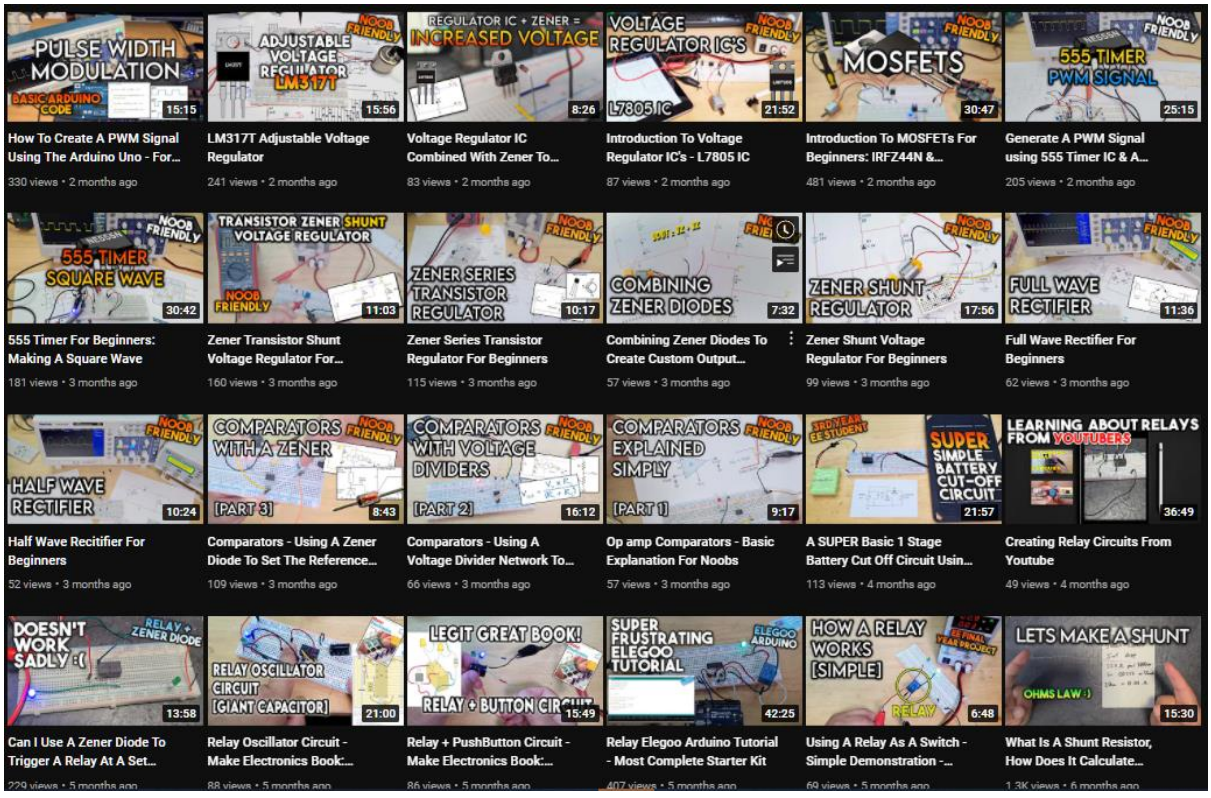
Hamed Adefuwa Portfolio

YouTube Channel

I started a YouTube channel in my first year on university to document my studies and projects. The channel has 250+ videos and 2500+ subscribers, amassing over 200,000 views. The theme of the channel is DIY electronics.





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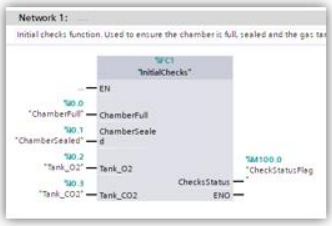
FBD PLC Programming Using The Siemens TIA Portal

Using the Siemens TIA Portal and function block diagram programming, I created an atmosphere control system that simulated an apple storage system. The program was integrated with a development board by Kaftan. The program checks for 4 input switches and sets a status flag to start the atmosphere control. The program then reads the temperature (external temperature sensor) and simulated o2/co2 levels (potentiometers). If faults are detected, for example the temperature rises, an alarm is triggered, activating the on-board buzzer and PWM controlled Motor.

This project involved;

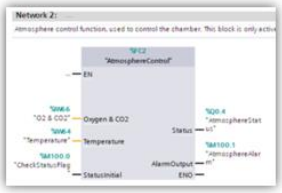
- PLC Programming (FBD)
- PLC Hardware
- Sensors
- PWM Motor Control

PLC: Initial Checks

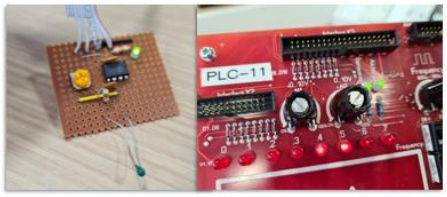


The InitialChecks block uses the first four physical switches.

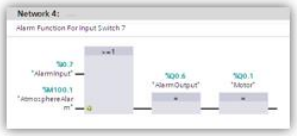
PLC: Atmosphere Control



The Atmosphere Control uses an external temperature sensor circuit and the onboard potentiometer as inputs.



PLC: Alarm



The alarm block uses the onboard buzzer, switch 7 and the attached motor board.

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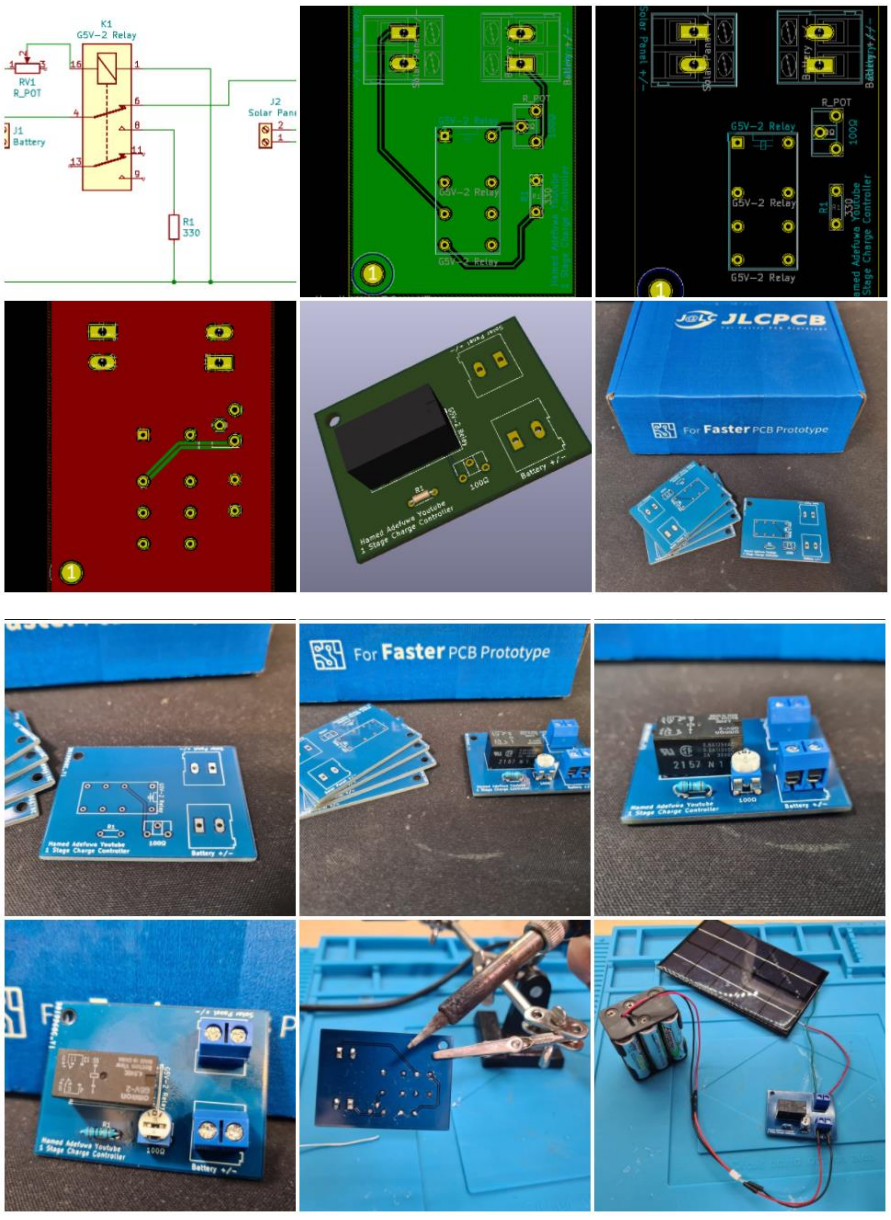
1 Stage Charge Controller Circuit - PCB Design & Print – KiCad

I designed a simple 1-stage charge controller circuit schematic and PCB. This was then manufactured in China using JLC PCB and then the circuit soldered and tested by myself. The circuit uses a relay to disconnect the solar panel from the circuit, when the battery voltage reaches a set voltage level. The voltage level is set by the potentiometer, using resistance to increase the trigger point of the relay.

This project involved the following skills and techniques;

- Multisim Simulation Software
- KiCad Software
- Circuit Analysis
- Soldering



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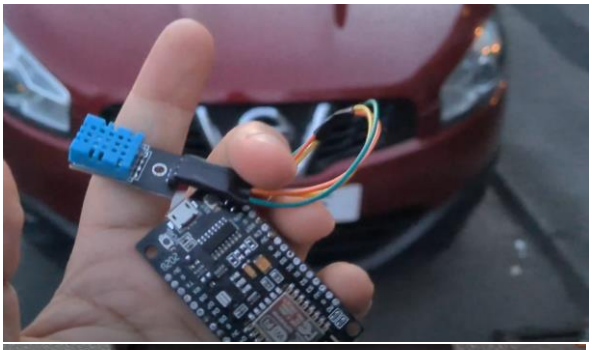
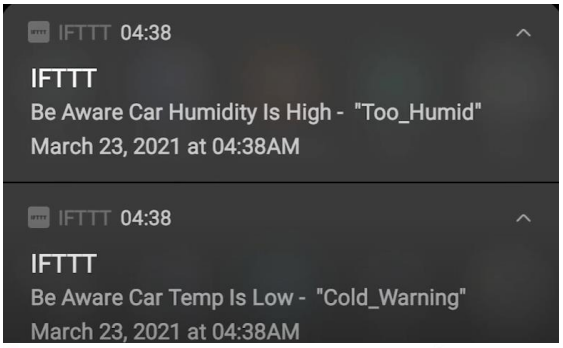
DIY Car Temperature & Humidity Sensor – ESP8266 Arduino Module

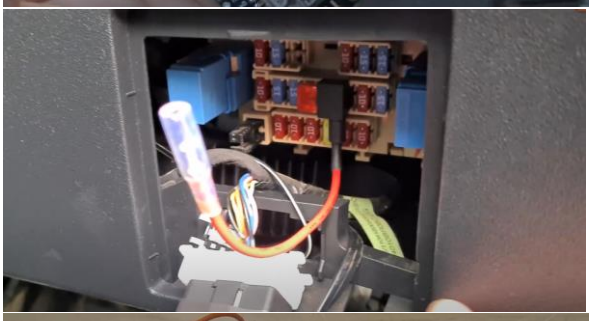
In this project I decided to install a temperature & humidity sensor in my car. I was having a problem throughout winter, not knowing if my car's windscreen was frozen. So I used an ESP8266 hard-wired into my fuse box using a 12V-5V regulator, to detect my windscreens temperature and humidity. I then sent the data to ThingSpeak, an IoT analytics platform, to send a webhook to IFTTT, which then alerts me on my phone via their app.

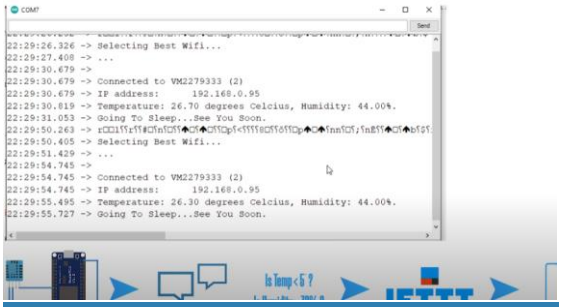
This project involved the following skills and techniques;

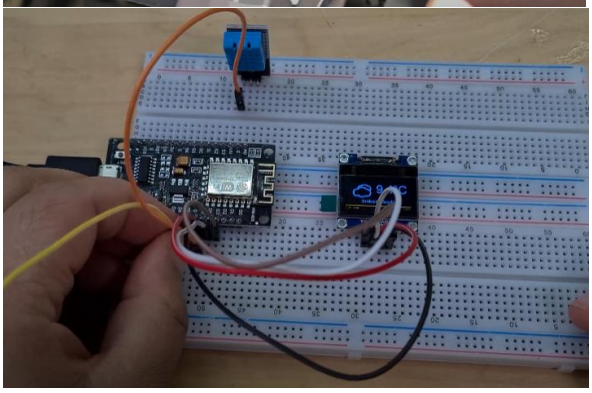
- Car Electrical Circuits
- Battery Management
- Arduino
- Programming
- IoT Analytics

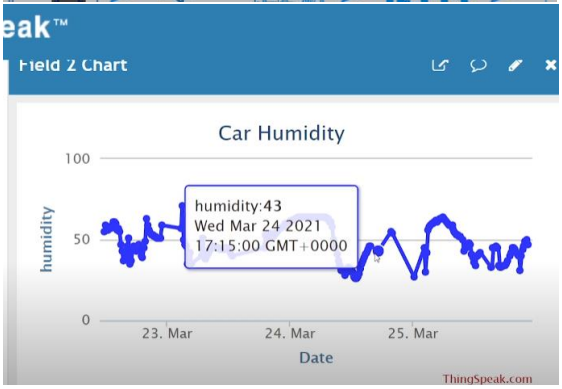












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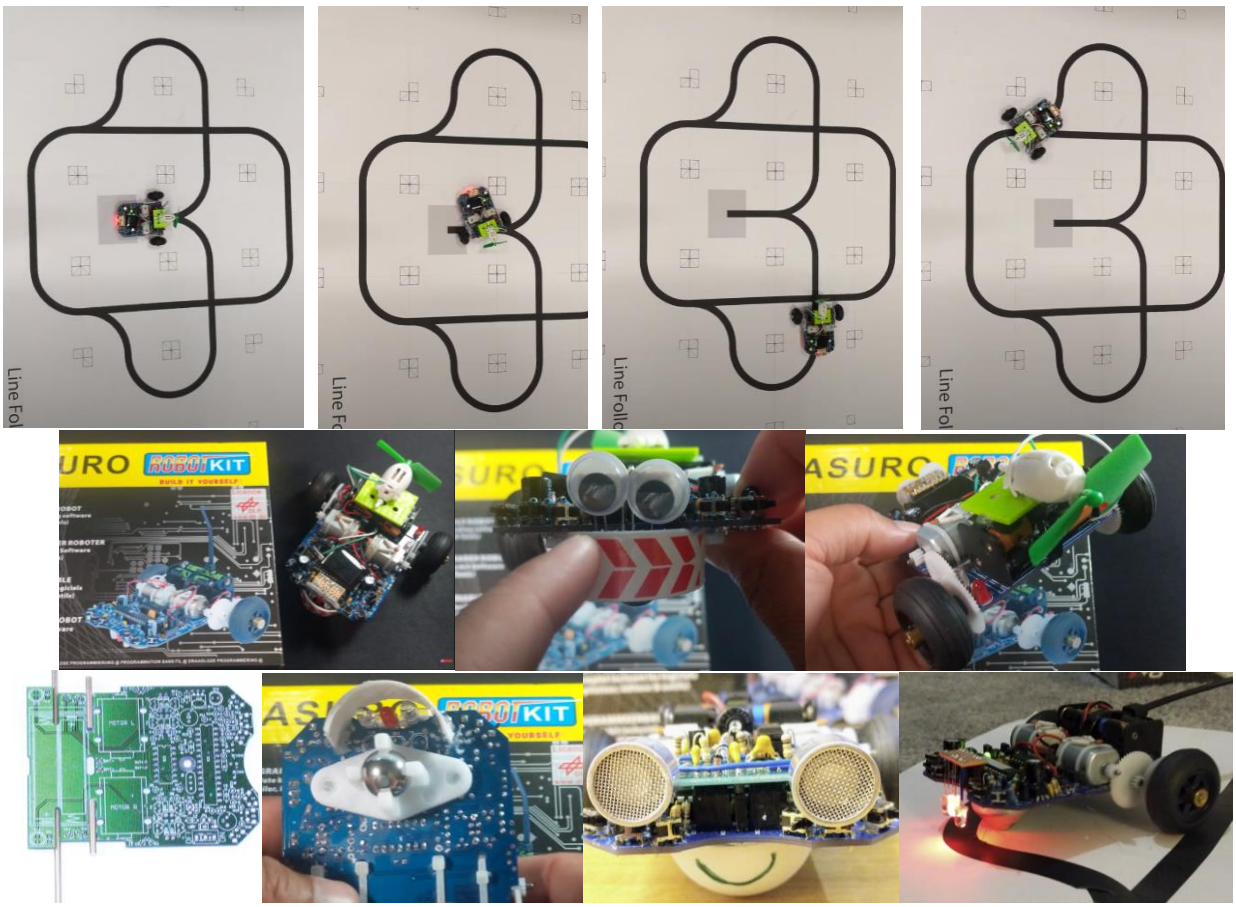
Asuro Line Following Robot

The Asuro robot was developed as part of an engineering teaching kit, programmed in C. The kit comes completely dissembled with PCB and through-hole components. Once soldered, I created the algorithms on paper and programmed it in C, which involved compiling it with Make files and flashing it to the robot via infrared. The robot follows a line using an infrared transmitting LED & phototransistors and has tactile sensors to detect collisions. I also upgraded the robot with ultrasonic sensors, a solar panel, propeller, and my favourite, googly eyes.

This project involved the following skills and techniques;

- Soldering
- C Programming
- Git Version Control
- Putty Software
- Make Files
- Algorithms
- Solar Power
- Battery Management
- Hardware Interrupts (8 Bit Microcontroller)
- Engineering Design Process

Asuro Completing Line Following Course: https://www.youtube.com/watch?v=5dY-dQaILbw



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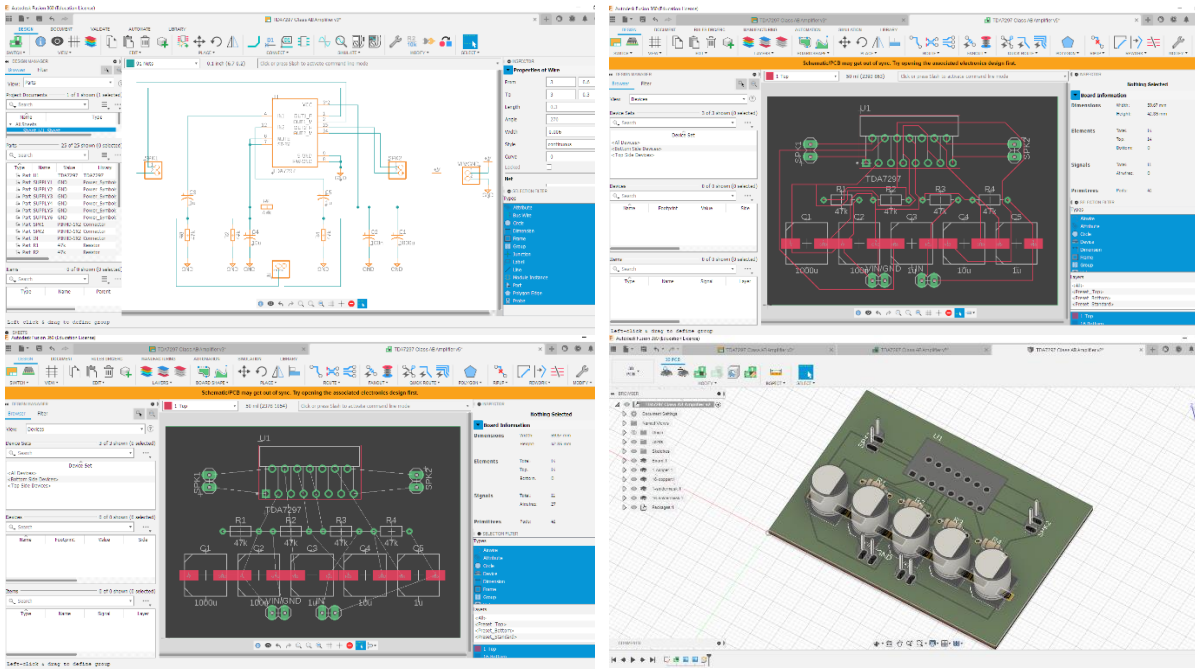
TDA7297 Class AB Audio Amplifier PCB Design - Autodesk Fusion 360

Using Fusion 360, I created a Class AB amplifier with the TDA7297 at the heart of the amplifier. The circuit boosts a low power audio signal to one strong enough to be driven by headphones or speakers. The TDA7297 has a good power output of 30W and as such is ideal for fairly large speakers.

The project involved;

- Fusion 360
- Circuit Design
- PCB Design



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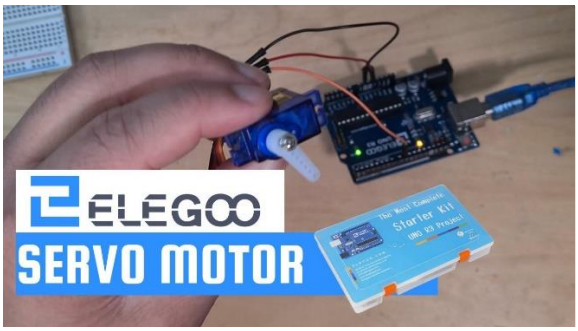
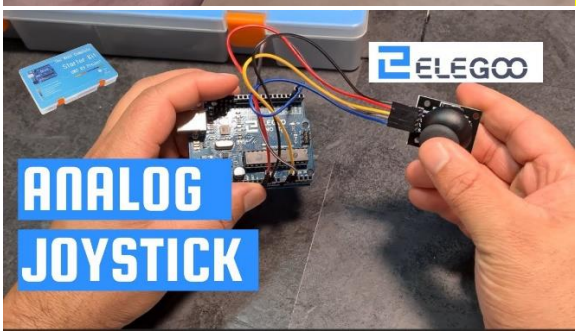
Elegoo Arduino Starter Kit - Video Tutorial Creation

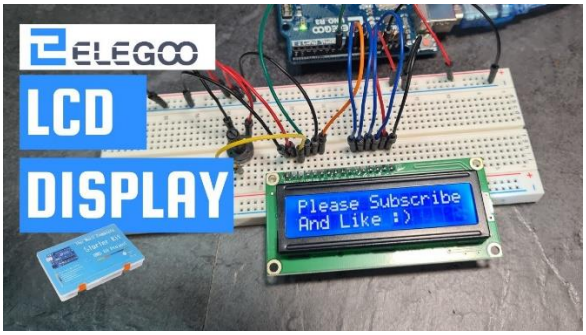
Elegoo, a Chinese company, created a starter kit Arduino clone. The kit is fantastic but only comes with PDF tutorials that (in my opinion) were sub-par. I decided to create a series of video tutorials, whereby I built each circuit, programmed it to work correctly and then explained the functionality.

This project involved;

- Arduino
- C Programming
- Prototyping
- Videography & Graphic Design







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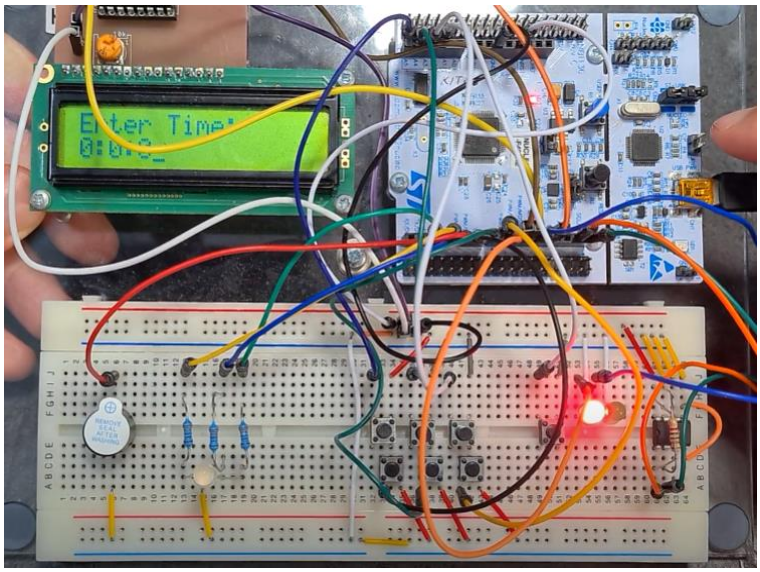
STM32 Nucleo Embedded Systems Clock & Temperature Project

I created a hardware system using the STM32 Nucleo board. The STM32 was mounted on a glass plate, alongside an LCD and a breadboard. The breadboard includes a buzzer, buttons and a DS1631 temperature sensing IC. The system can display the current temperature on the LCD, displaying the current time and the ability to set the time. The challenge in this project was implementing external interrupts and exceptions.

This project involved the following skills and techniques;

- Electronics Prototyping
- STM32 Hardware
- STM32 Programming
- Hardware Interrupts & Exceptions



```c
#include "mbed.h"
#include "platform/mbed_thread.h"
#define CMDDELAY 500 //delay for command in ms

// I2C connection
I2C temp_sensor(D14, D15);

// I2C address of temperature sensor DS1631
const int temp_addr = 0x90; //default address with all address pins low

char cmds[] = {0x51, 0xAA}; //commands for start temperature conversion

//read temperature
char read_temp[2];

int main()
{
    char str[32];
    while(1){
        //Write 0x51 to 0x90 to start temp conversion
        temp_sensor.write(temp_addr, &cmds[0], 1);

        thread_sleep_for(CMDDELAY);

        //Write 0xAA to 0x90 to read the last converted temperature
        temp_sensor.write(temp_addr, &cmds[1], 1);
        // Read the temperature into the read_temp array
        temp_sensor.read(temp_addr, read_temp, 2);

        //Convert temperature to Celsius
        float temp = (float((read_temp[0] << 8) | read_temp[1]) / 256);

        //Print temperature to the serial monitor
        printf("Temp = %.2f\n", temp);
    }
}
```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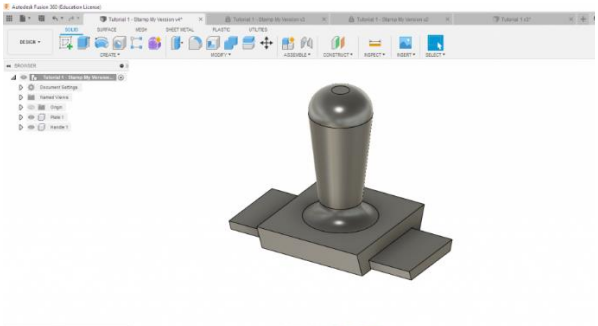
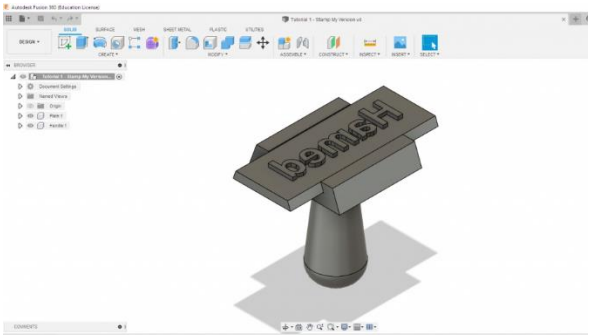
Fusion 360 Stamp: 3D Printed

Using Autodesk's Fusion 360, I created a two-component model. I then 3D printed the model using 'Slic3r' software and an Ender 3 printer.

This project involved the following skills and techniques;

- Fusion 360 Software
- Computer-aided design (CAD)
- 3D Printing
- Slicer Software





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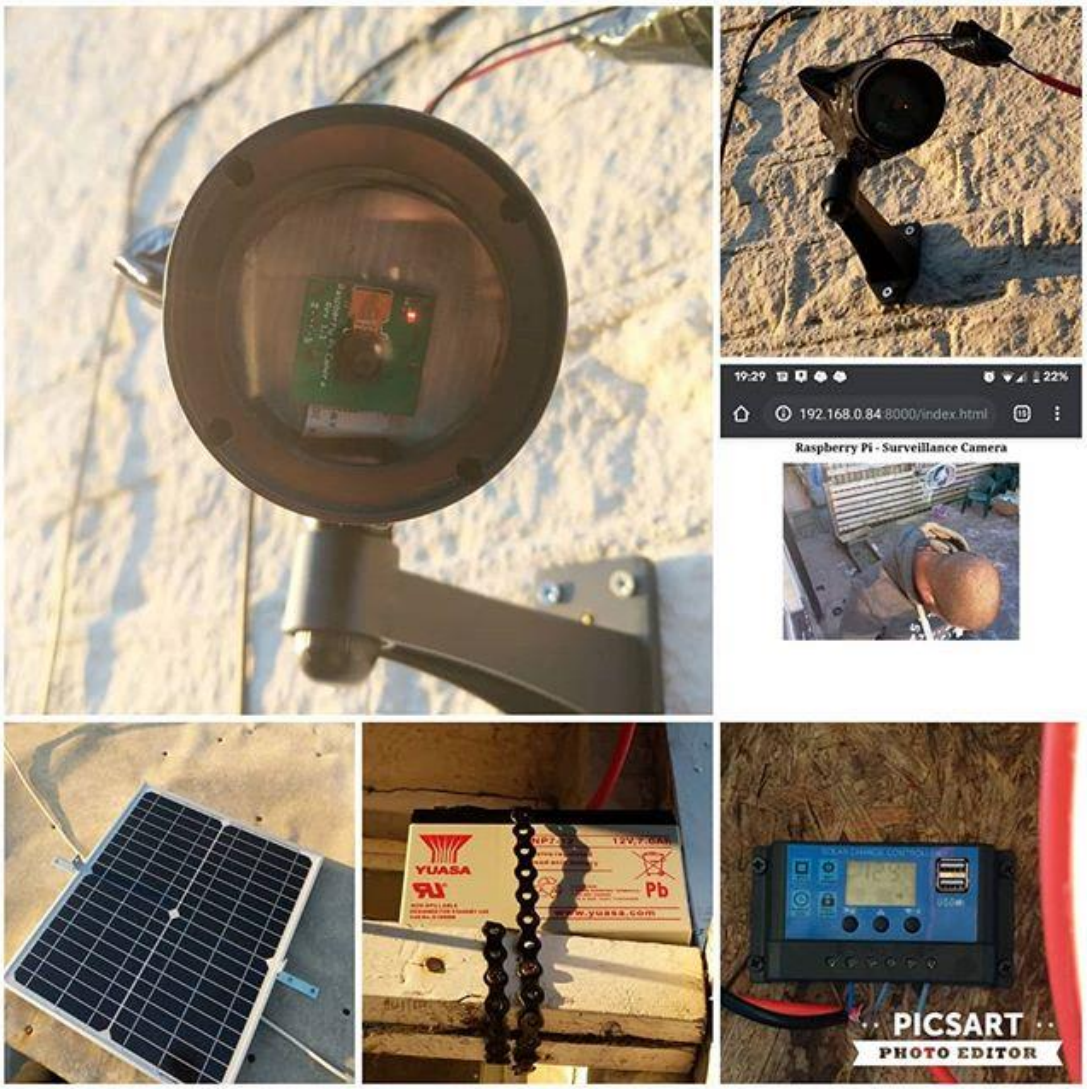
Raspberry Pi Security Camera

I wanted a way to view who was at the door without running down two flights of stairs (I work up in the loft). I purchased a dummy security camera, placed a Raspberry Pi Zero W within it and attached a Raspberry Pi camera module. Using a 20W solar panel, I mounted it above my door along with a solar charge controller and a 12V lead-acid battery. The Raspberry Pi was then connected to the solar charge controller via a 12V-5V buck converter. Using MotionEyeOS, a video surveillance operating system, the Raspberry Pi is capable of live streaming 24/7 and saving videos to the cloud.

This project involved the following skills and techniques;

- Electronics
- Solar Power Generation
- Battery Management
- Raspberry Pi
- Buck Converters



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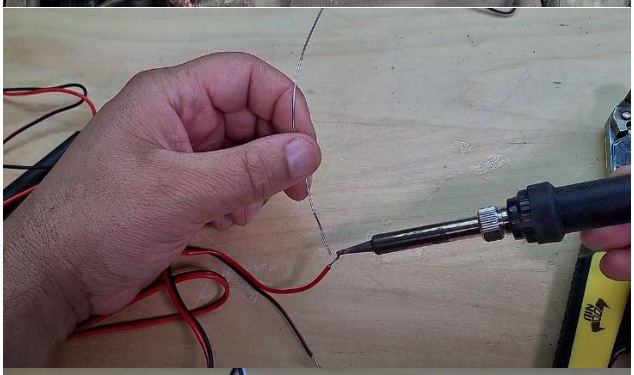
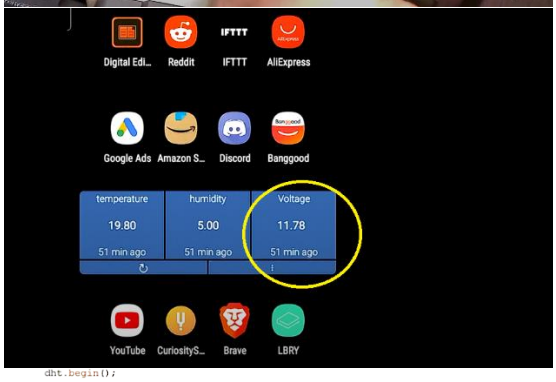
Wi-Fi Car Battery Voltage Monitor - Arduino ESP8266

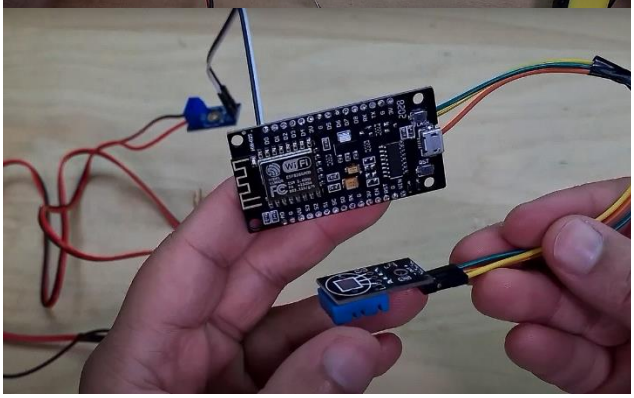
As an extension from the temperature and humidity sensor for my car, I then used a voltage divider resistor network between the microcontroller and my car's fuse box. This gave an accurate reading of my batteries voltage. This information was sent over Wi-Fi to my phone. It was a very helpful project during lockdowns when the car would sit for extended periods.

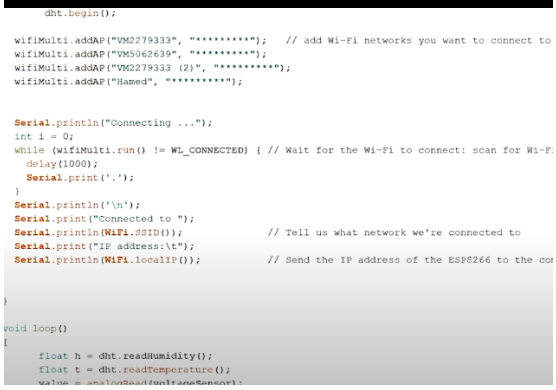
This project involved;

- Arduino / ESP Hardware
- C Programming
- Prototyping
- Car Electronics
- Electrical Wiring









```
    dht.begin();

  wifiMulti.addAP("VM2279333", "**********");   // add Wi-Fi networks you want to connect to
  wifiMulti.addAP("VM5062639", "**********");
  wifiMulti.addAP("VM2279333 (2)", "**********");
  wifiMulti.addAP("Hamed", "**********");


  Serial.println("Connecting ...");
  int i = 0;
  while (wifiMulti.run() != WL_CONNECTED) { // Wait for the Wi-Fi to connect: scan for Wi-F
    delay(1000);
    Serial.print('.');
  }
  Serial.println('\n');
  Serial.print("Connected to ");
  Serial.println(WiFi.SSID());              // Tell us what network we're connected to
  Serial.print("IP address:\t");
  Serial.println(WiFi.localIP());           // Send the IP address of the ESP8266 to the co


}

void loop()
{
    float h = dht.readHumidity();
    float t = dht.readTemperature();
```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The PiMac

I purchased a broken Apple iMac from 2006. I then purchased a replacement screen, removed the non-functional electronics, and installed a Raspberry Pi 4. After installing the 'iRaspbian' OS, which resembles typical Apple OS, the PiMac was born.

This project involved the following skills;

- Electronic Hardware
- Raspberry Pi
- Linux Software

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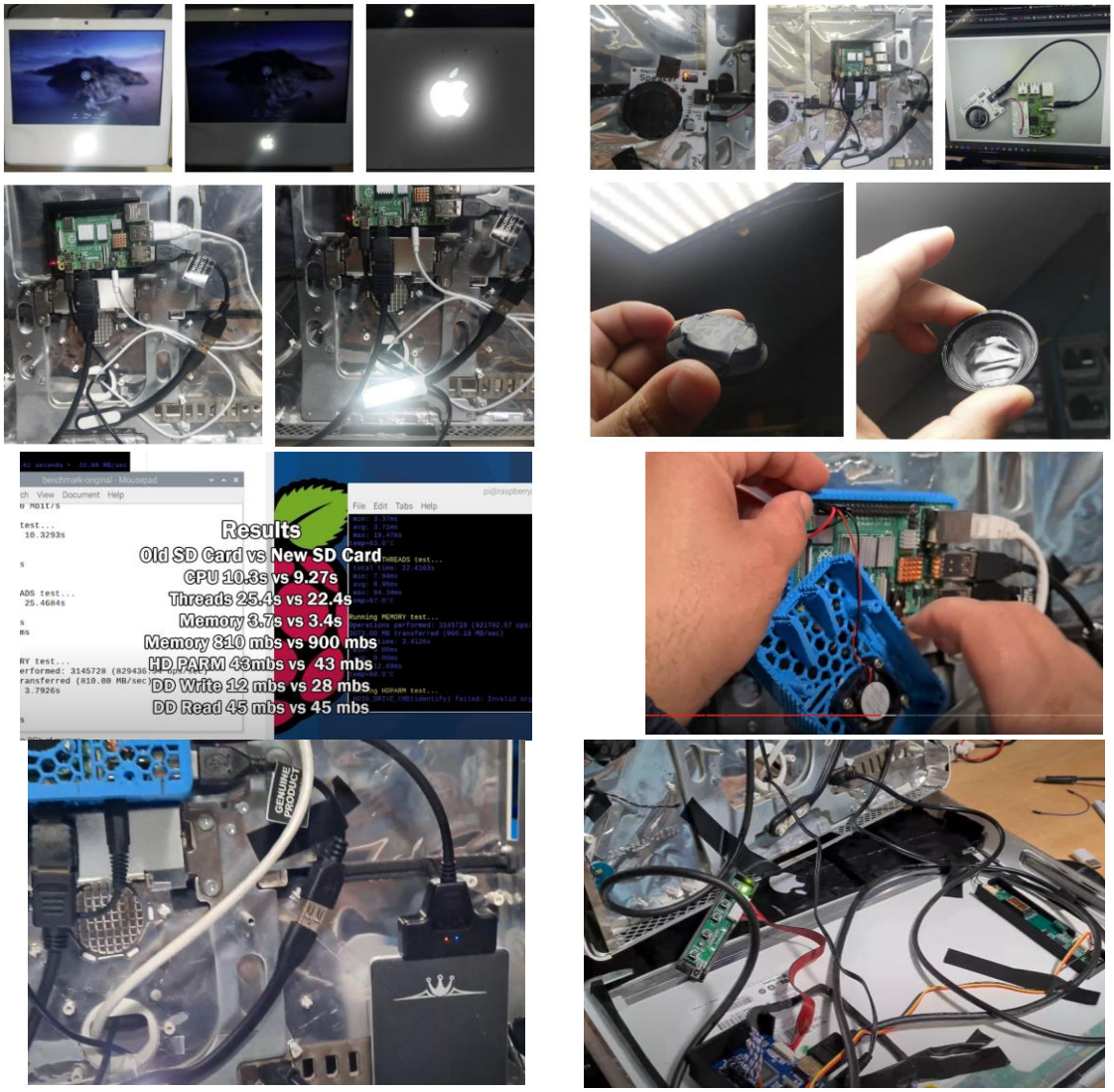
The PiMac – Upgraded

I installed a cheap USB LED to simulate the typical Apple logo illumination. As Raspberry Pi computers do not have speakers, I added a speaker module to add sound. I then 3D printed a case to improve the sound. In terms of performance upgrades, I overclocked the Raspberry Pi and then 3D printed a case and installed a fan to aid with thermal throttling. Finally I changed the bootloader on the Raspberry Pi to boot from an external SSD drive. All of which, greatly improved performance. The PiMac is now my go-to computer for all my electronic hobbyist work.

This project involved the following skills;

- Electronic Hardware
- Raspberry Pi
- 3D Printing
- CAD Design
- Configuration of Bootloader
- Benchmarking
- Testing



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Raspberry Pi Wall Display Calendar

I owned a broken 15” dell laptop and wanted to prevent all of it from going to landfill. I decided to convert it into an electronic display calendar.

So I removed the screen, purchased a control module, a Raspberry Pi Zero W, 3D printed cases for both and glued it all onto a piece of MDF. All mounted to the wall.

The Raspberry Pi boots immediately, opens a chrome browser automatically and launches my dashboard in full screen. The dashboard was created using Dakboard (free), which is connected to my google calendar and my google to-do list. It also displays an RSS news feed.

This project involved the following skills and techniques;

- Recycling Electronics
- 3D Print Design
- 3D Printing
- Raspberry Pi / Raspbian
- Scripting
- Headless Display

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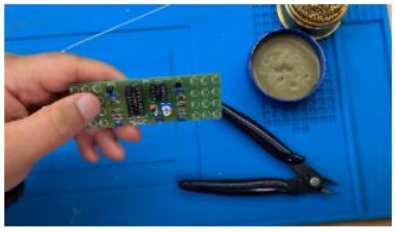
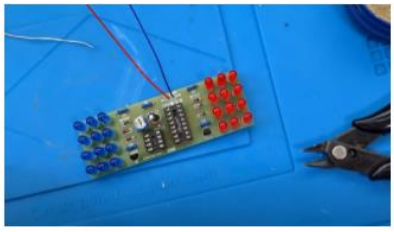
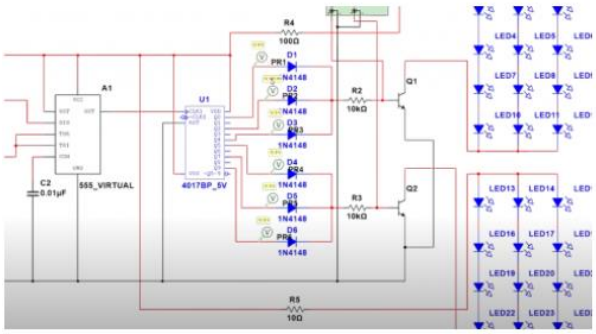
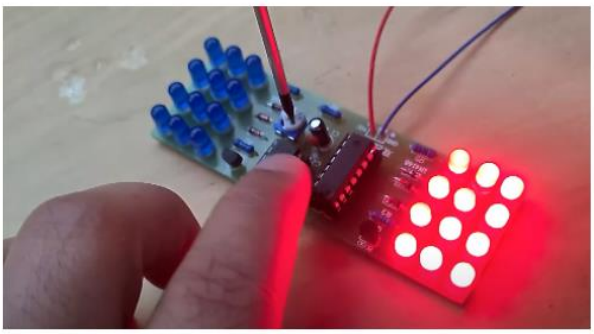
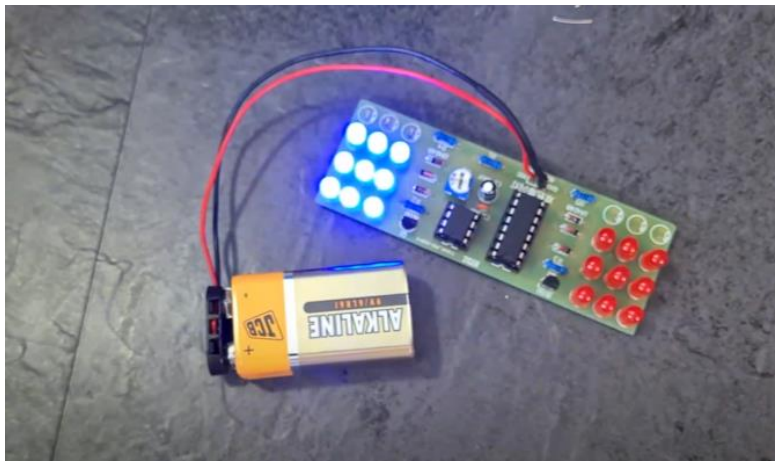
Police Strobe Light Electronics Kit

For this project I used a police strobe light electronics kit from AliExpress. The kit uses a 555 timer and a decade counter to create pulses that control the voltage between the red & blue LEDs.

The kit didn't work when initially soldered as there was a fundamental problem with the circuit, whereby the 9V battery could not provide enough power to the twelve blue LEDs. This problem was discovered whilst running simulations in Multisim.

This project involved the following skills and techniques;

- Soldering
- Troubleshooting / Fault Finding
- Multisim software
- Circuit Analysis

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