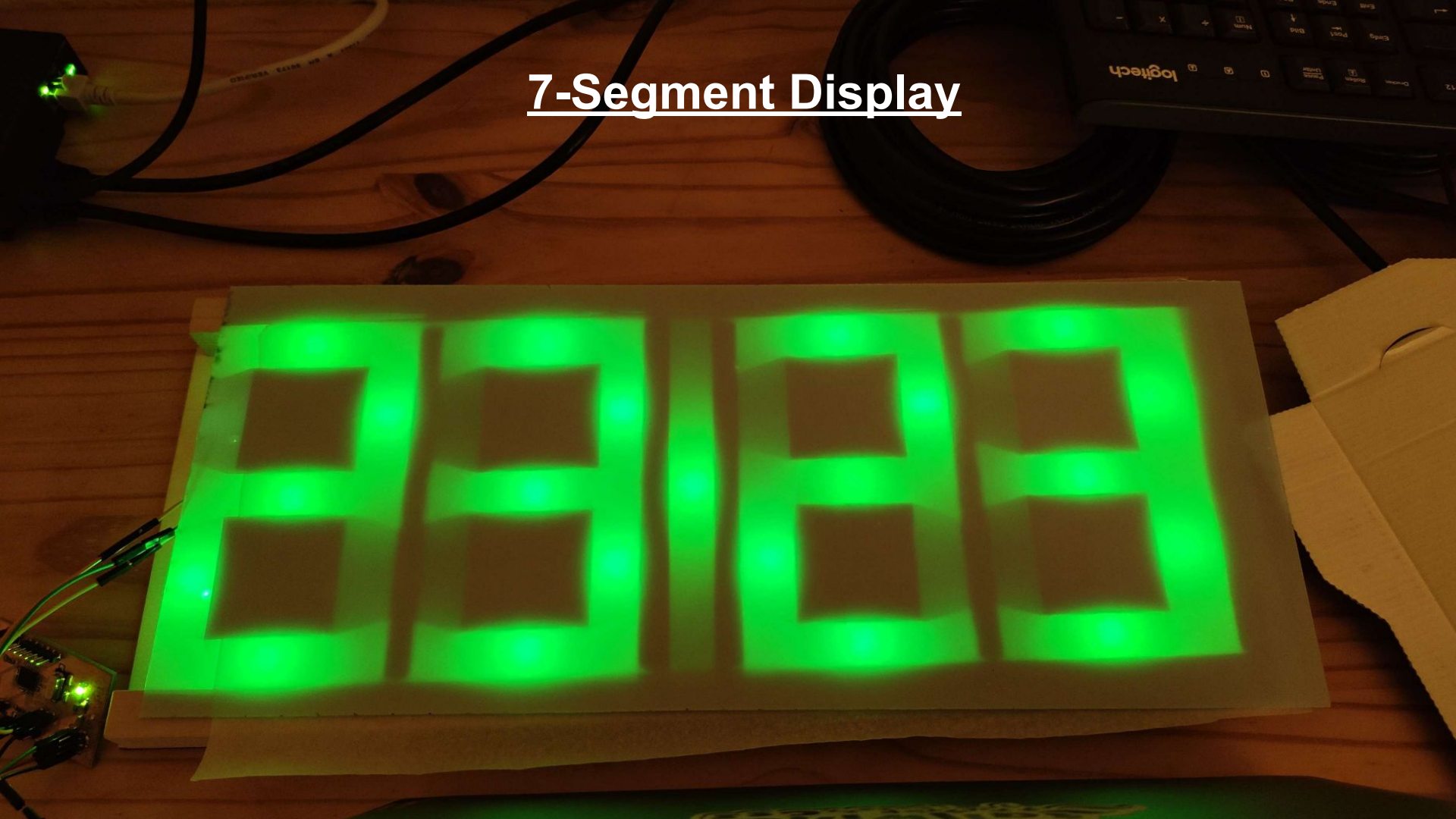
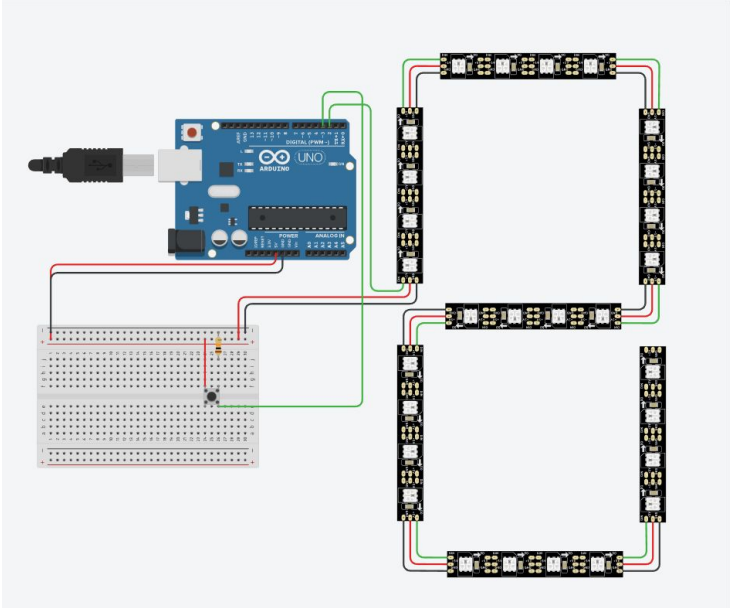
7-Segment Display



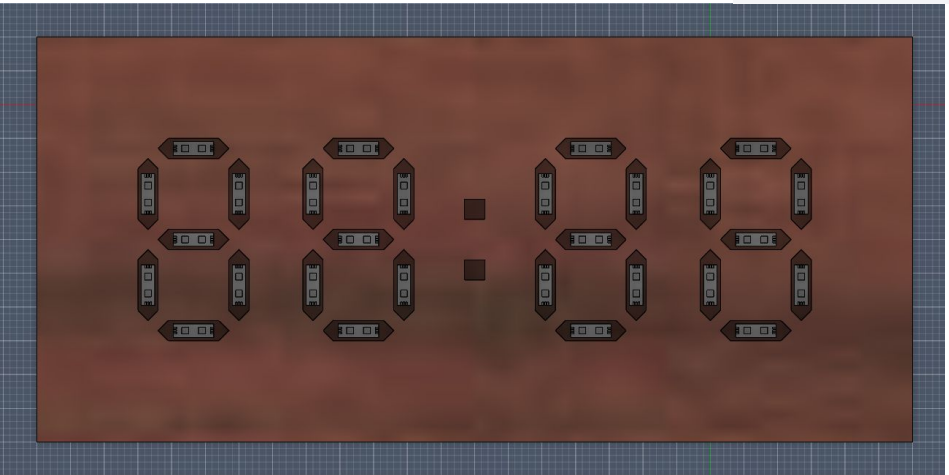
Inspiration

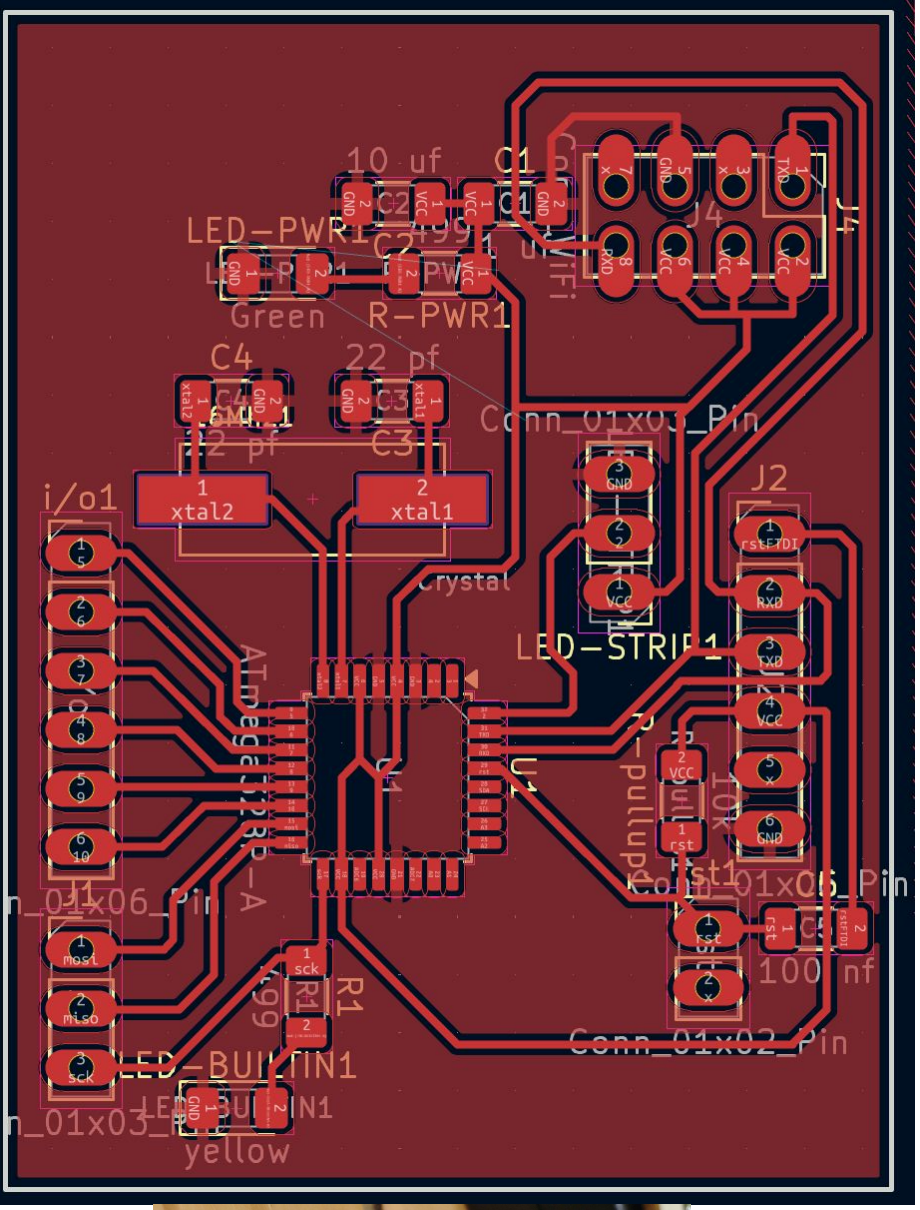

10:44
DIY DIGITAL CLOCK

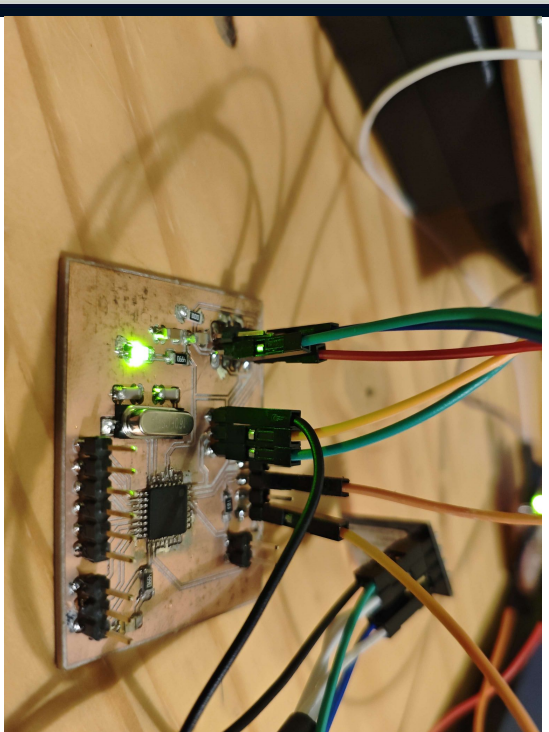
Process

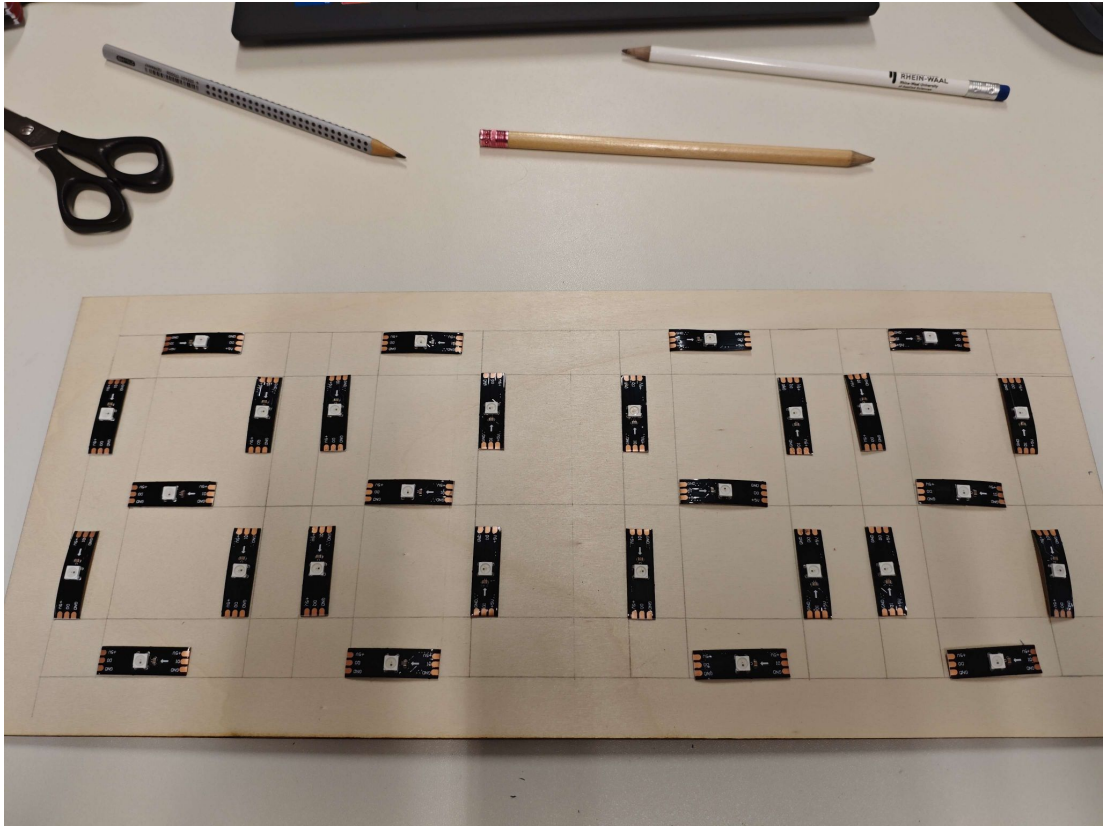


```
Text                                                    1 (Arduino Uno R3)

#include <Adafruit_NeoPixel.h>

#define PIN 2    // input pin Neopixel is attached to

#define NUMPIXELS      28 // number of neopixels in strip

Adafruit_NeoPixel pixels = Adafruit_NeoPixel(NUMPIXELS, PIN, NEO_

byte digits[10][7] = {
  {1,1,1,0,1,1,1}, // 0
  {0,0,1,0,0,0,1}, // 1
  {0,1,1,1,1,1,0}, // 2
  {0,1,1,1,0,1,1}, // 3
  {1,0,1,1,0,0,1}, // 4
  {1,1,0,1,0,1,1}, // 5
  {1,1,0,1,1,1,1}, // 6
  {0,1,1,0,0,0,1}, // 7
  {1,1,1,1,1,1,1}, // 8
  {1,1,1,1,0,1,1}  // 9
};

int counter = 0;

void setup() {
  pinMode(3, INPUT);
  pixels.begin();
  Serial.begin(9600);
}

void loop() {
  if(digitalRead(3) == HIGH) {
    // while-loop as debounce
    while(digitalRead(3) == HIGH) {

    }
    counter++;
    updateDisplay(counter);
  }

}

void updateDisplay(int counter) {
  pixels.clear();
  for (int i=0; i < 7; i++) {
    if(digits[counter % 10][i] == 1) {
```



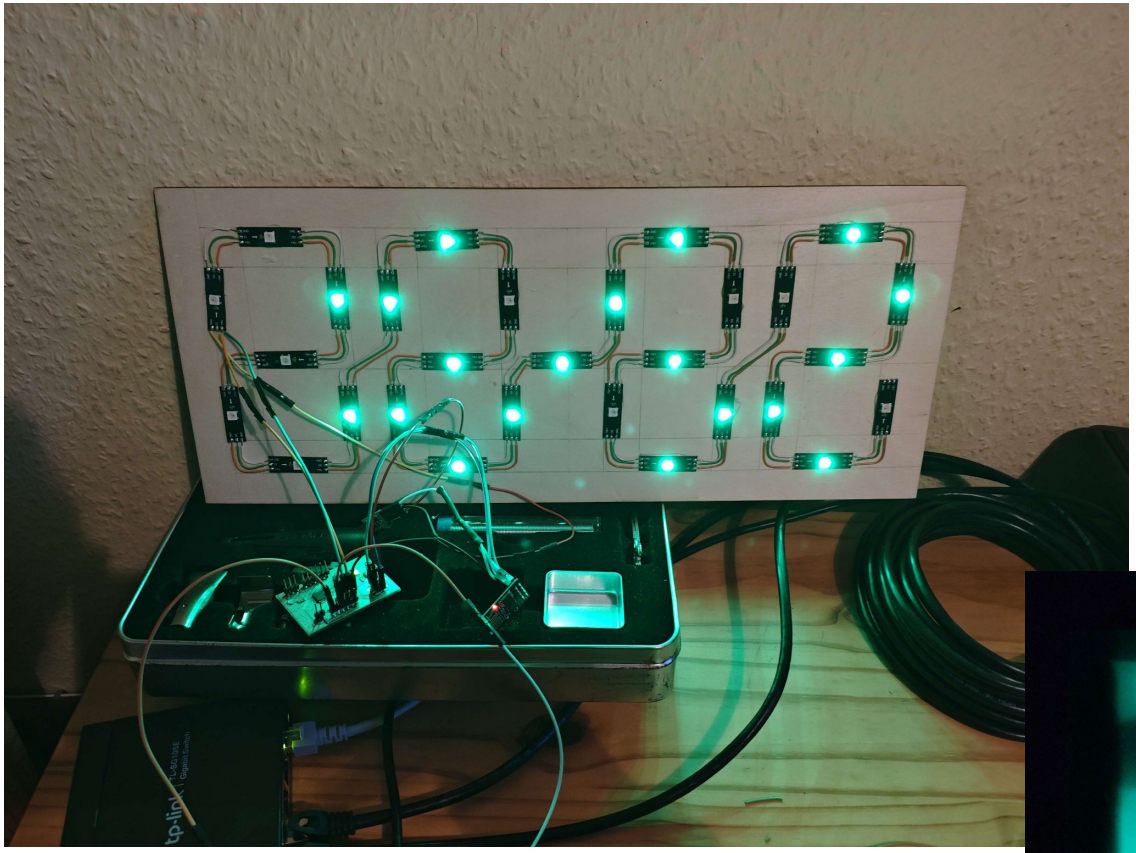

10 uf
C1
LED-PWR1
Green
R-PWR1
C4
22 pf
C3
xtal2
xtal1
Crystal
Conn_01x03_Pin
J2
i/o1
LED-STRIP1
ATmega328P-A
U1
Pullup
Conn_01x06_Pin
J1
mosi
miso
sck
R1
100 nf
Conn_01x02_Pin
LED-BUILTIN1
yellow
rst
rstFTDI
RXD
TXD
VCC
GND

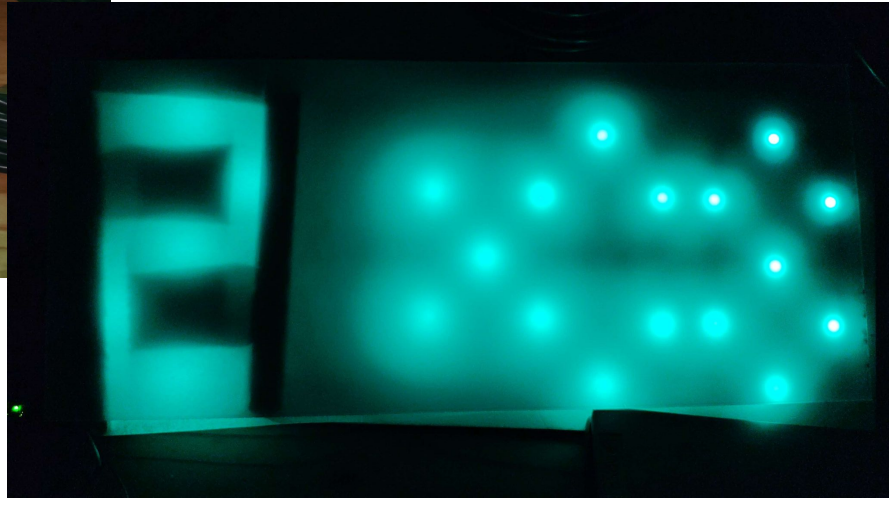




https://drive.google.com/file/d/1I3wozXqIJ4AQBI7Erfd1Um4vDjlIH1Y0/view?usp=drive_link

https://drive.google.com/file/d/1CXDUVnZN8uh4329QMpuGaTH_eDru693M/view?usp=drive_link



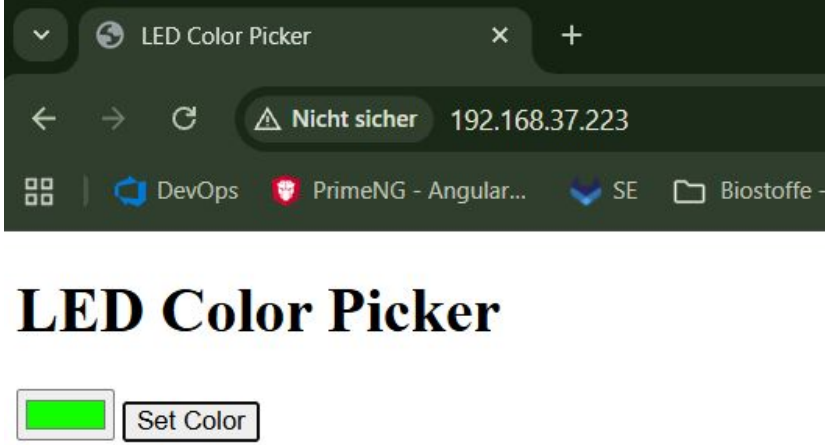



logitech

Features

- clock
- uses wifi to fetch the current time
- LED control via local webserver
- all kinds of configuration possible with web interface

Demo



Time Change:

https://drive.google.com/file/d/1hsRPOjgIVGJSd70qarPvxwJFiXFuXHhl/view?usp=drive_link

Color Change:

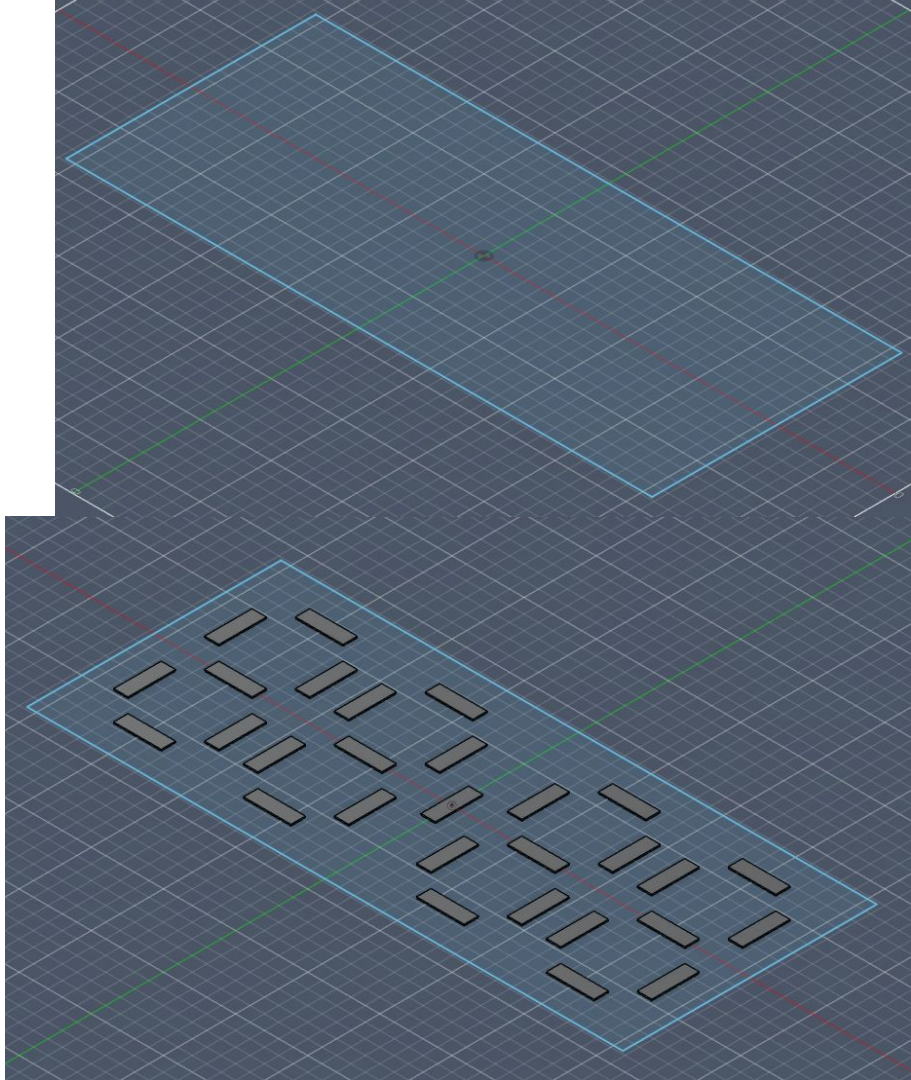
https://drive.google.com/file/d/1IASifjKCrkKbTUmPaP0_EpmgPt5cVSQk/view?usp=drive_link

Techniques

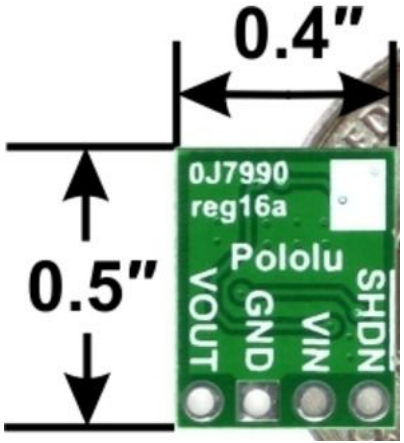
- Lasercutting => mdf baseplate + plexiglass front
- Bandsaw => walls for the segments
- Electronic Design/ Milling => printed circuit board/ soldering
- Embedded Programming => cpp code for main chip and wifi module

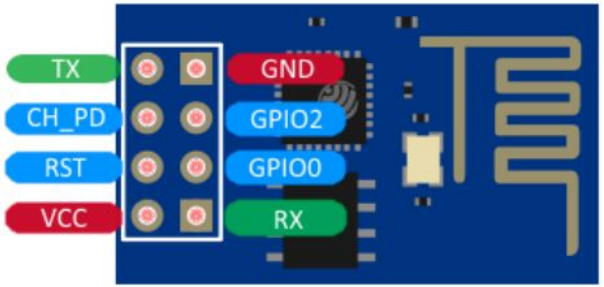
Lasercutting

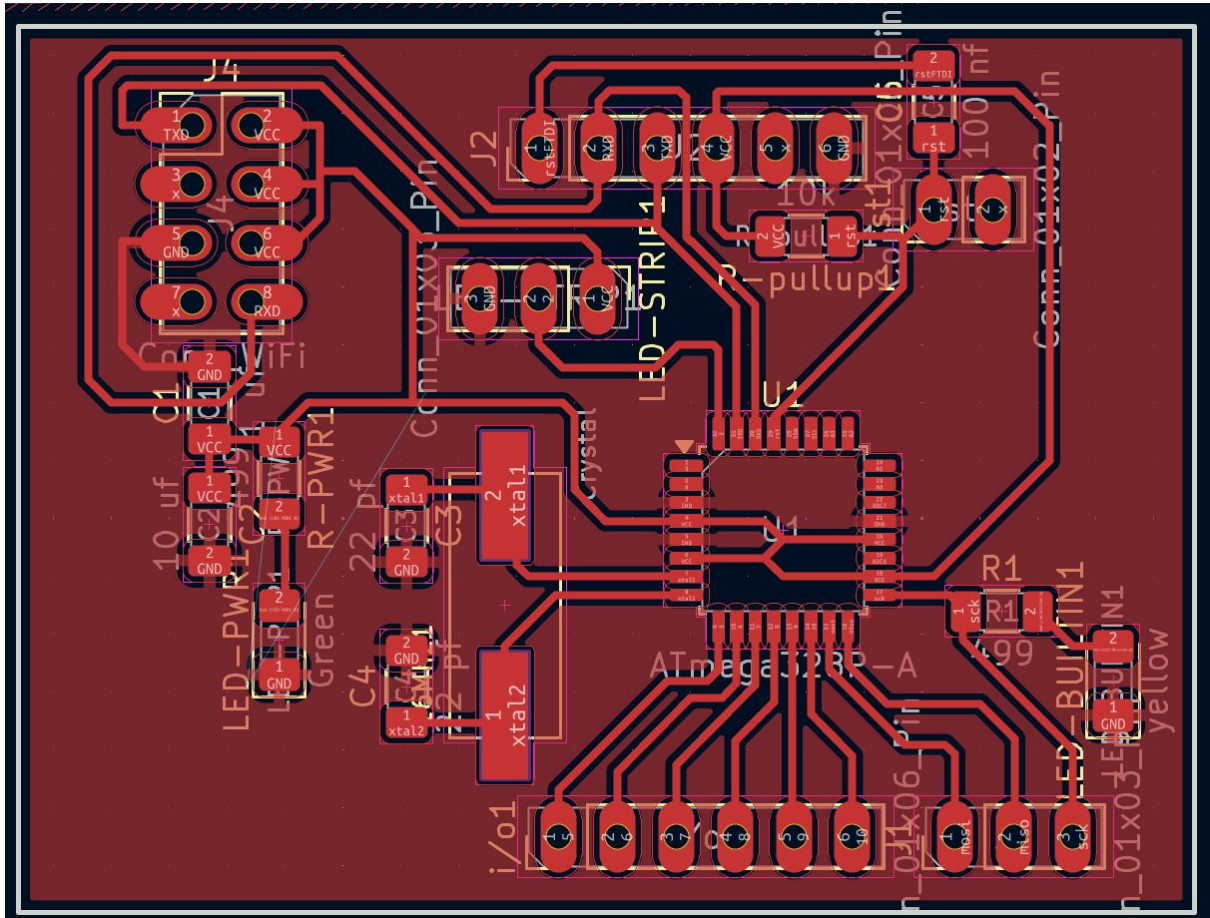
- LED Strip is 33mm*10mm
- bottom plate is 17.9cm*42cm



Electronic Design







Embedded Programming

```
#include <Adafruit_NeoPixel.h>
#include <SoftwareSerial.h>

#define PIN 2  // input pin Neopixel is attached to
#define NUMPIXELS 29 // number of neopixels in strip

Adafruit_NeoPixel pixels = Adafruit_NeoPixel(NUMPIXELS, PIN, NEO_GRB + NEO_KHZ800);

byte digits[10][7] = {
  {1,1,1,0,1,1,1}, // 0
  {0,0,1,0,0,0,1}, // 1
  {0,1,1,1,1,1,0}, // 2
  {0,1,1,1,0,1,1}, // 3
  {1,0,1,1,0,0,1}, // 4
  {1,1,0,1,0,1,1}, // 5
  {1,1,0,1,1,1,1}, // 6
  {0,1,1,0,0,0,1}, // 7
  {1,1,1,1,1,1,1}, // 8
  {1,1,1,1,0,1,1}  // 9
};

int red = 0;
int green = 255;
int blue = 0;

String command = "";

void setup() {
  pinMode(3, INPUT);
  pixels.begin();
  Serial.begin(115200);
}
```

```
#include <ESP8266WiFi.h>
#include <WiFiUdp.h>
#include <NTPClient.h>

const char* ssid = "phoneHotspot";
const char* password = "********";

WiFiUDP ntpUDP;
NTPClient timeClient(ntpUDP, "pool.ntp.org", 3600, 600000);
WiFiServer server(80);

int lastMinute = -1;

void setup()
{
  Serial.begin(115200);
  Serial.println();

  Serial.printf("Connecting to %s ", ssid);
  WiFi.begin(ssid, password);
  while (WiFi.status() != WL_CONNECTED)
  {
    delay(500);
    Serial.print(".");
  }
  Serial.println(" connected");

  server.begin();
  Serial.printf("Web server started, open %s in a web browser\n", WiFi.localIP().toString().c_str());

  timeClient.begin();
}
```

Embedded Programming

```
73  void loop()
74  {
75    WiFiClient client = server.accept();
76    if (client && client.available())
77    {
78        String request = client.readStringUntil('\r');
79        client.flush();
80
81        if (request.indexOf("/COLOR") != -1) {
82          int rIndex = request.indexOf("r=");
83          int gIndex = request.indexOf("g=");
84          int bIndex = request.indexOf("b=");
85
86          if (rIndex!=-1 && gIndex!=-1 && bIndex!=-1) {
87            int r = request.substring(rIndex+2, gIndex-1).toInt();
88            int g = request.substring(gIndex+2, bIndex-1).toInt();
89            int b = request.substring(bIndex+2).toInt();
90
91            Serial.printf("COLOR:%d,%d,%d\n", r, g, b);
92          }
93        }
94        client.println(prepareHtmlPage());
95        client.stop();
96    }
97
98    timeClient.update();  // fetch current time from NTP server
99
100   int hours = timeClient.getHours();
101   int minutes = timeClient.getMinutes();
102
103   if (lastMinute != minutes) {
104     Serial.printf("TIME:%02d,%02d\n", hours, minutes);
105     lastMinute = minutes;
106   }
107 }
```

```
34  void loop() {
35
36    int current = millis();
37
38    while (Serial.available()) {
39      char c = Serial.read();
40      if (c == '\n') {
41        handleCommand(command);
42        command = "";
43      } else {
44        command += c;
45      }
46    }
47  }
48
49  void handleCommand(String cmd) {
50    cmd.trim();
51
52    if (cmd.startsWith("TIME:")) {
53      parseTime(cmd.substring(5));
54    }
55    else if (cmd.startsWith("COLOR:")) {
56      parseColor(cmd.substring(6));
57    }
58  }
```

Mistakes

- should have done more research!!!
- think everything through
- question more => everything makes sense, it is not magic
- … read the data sheets thoroughly

Mistakes V2

Questions?

Sources

Idea: https://www.youtube.com/watch?v=1aNHF5tcTpw&t=560s

Burning Chip Picture: https://www.youtube.com/watch?v=IuLdSJvltgo

Pololu Schematic: https://www.pololu.com/product/2842

Wifi-Module Schematic: https://www.reichelt.com/de/en/shop/product/developer_boards_esp8266_wi-fi_module-192142