Signal Builder: DIY Traffic Lights

Overview

In this exciting project, we will transform everyday materials into a working traffic light system! Using cardboard, copper tape/Aluminium foil, and LEDs connected to a micro:bit, you will build your own traffic light controller from scratch.

What you will Learn

By the end of this project, you will understand:

- ☐ How LEDs work and how to connect them safely
- ☐ How to create circuits using copper tape
- ☐ How to program light sequences using a micro:bit
- ☐ The basics of traffic light systems

What you will Need

- 1 x Red LED
- 1 x Yellow LED
- 1 x Green LED
- 1 x Piece of cardboard
- Copper tape / aluminium foil and glue
- 4 x Crocodile / alligator leads
- 1 x micro:bit (version 1 and 2 will work)
- 1 x Micro USB cable
- 1 x Battery pack for the micro:bit (optional)

Let's move on to creating our traffic circuit.

Developing the Circuit

What is an LED

Cathode (-) | Anode (+)

An LED (Light Emitting Diode) is a small light bulb that lights up when electricity flows through it. It's just like the tiny lights you see on your toys, TV, or Christmas decorations!
Every LED has two legs:

- A longer leg (called the positive or + side)
- A shorter leg (called the negative or - side)

Think of these legs like the LED's feet - they need to be connected the right way around for the LED to work. Just remember: Long leg = Positive (+), Short leg = Negative (-). If you connect them the wrong way around, your LED won't light up!

Creating the Circuit

1. Place the bit of cardboard on the desk

2. Take the red LED and bend the legs out to the sides. Place the LED on the cardboard with the longer leg to the right.

3. Take a bit of copper tape or glue and some aluminium foil over the long leg of the red LED.

4. Complete steps 2 and 3 for the yellow and green LEDs.

5. Take a longer bit of copper tape or foil and tape/glue all three of the short legs of the LEDs together.
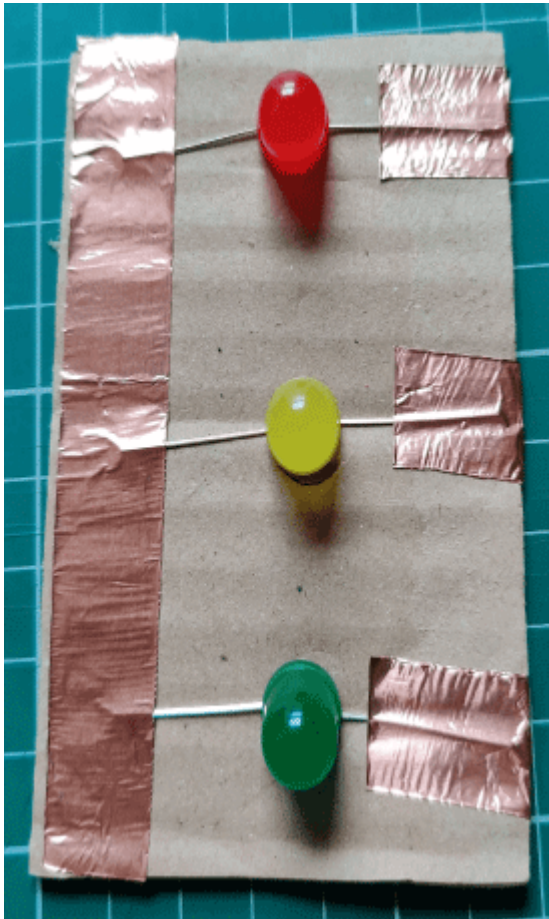
Connecting the micro:bit

1. Take one of the crocodile/alligator leads and clip one end to the long piece of copper tape/aluminium foil covering the short legs of the LEDs and clip the other end to the GND pin of the micro:bit.

2. Take another crocodile/alligator lead and clip one end to the copper tape/aluminium foil of the longer leg of the red LED and attach the other end to pin 0 on the micro:bit.

3. Take another crocodile/alligator lead and clip one end to the copper tape/aluminium foil of the longer leg of the yellow LED and attach the other end to pin 1 on the micro:bit.

4. Take the last crocodile/alligator lead and clip one end to the copper tape/aluminium foil of the longer leg of the green LED and attach the other end to pin 2 on the micro:bit.
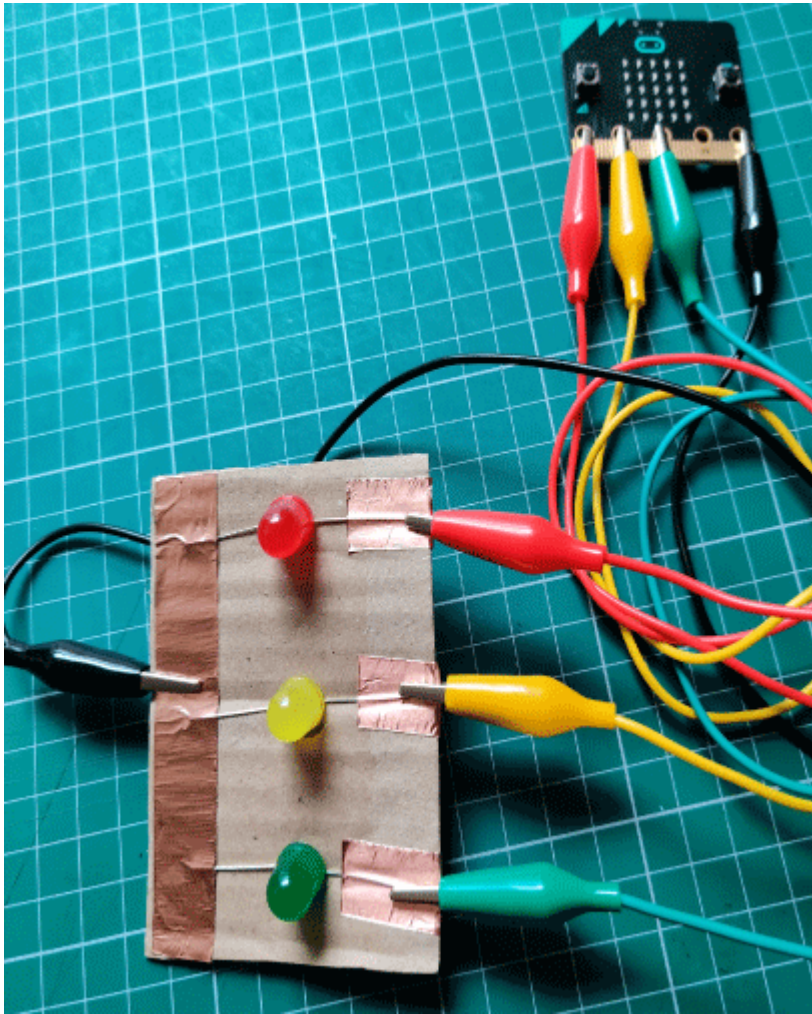
Let's move on and open up our code editor.

Navigating to EduBlocks

1. Open your favourite browser (we recommend Google Chrome).

2. Within the address bar of the browser type app.edublocks.org or on a tablet or phone press create code.
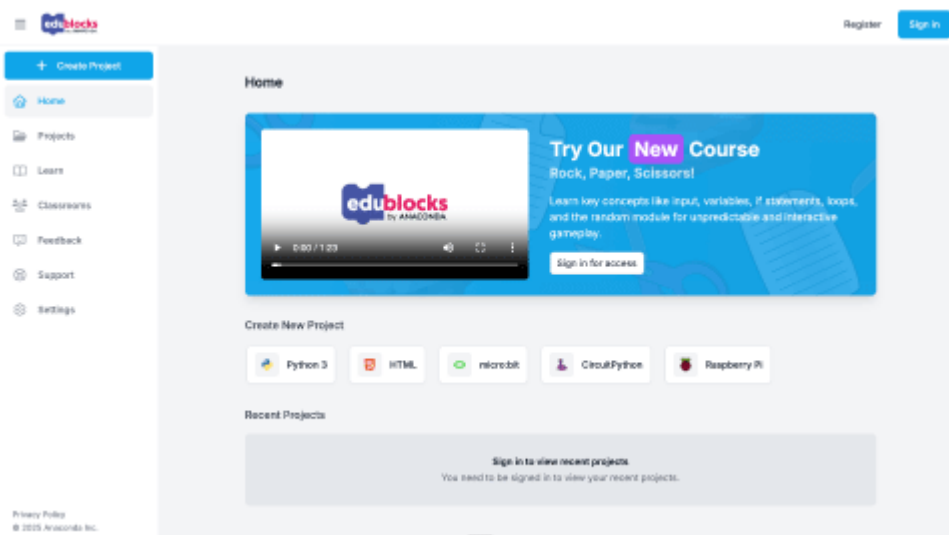
3. Select micro:bit under **Create New Project** to open the micro:bit coding editor. Name your project **DIY Traffic Lights** and make sure you have **Blocks** selected under **Type**. See the image below.
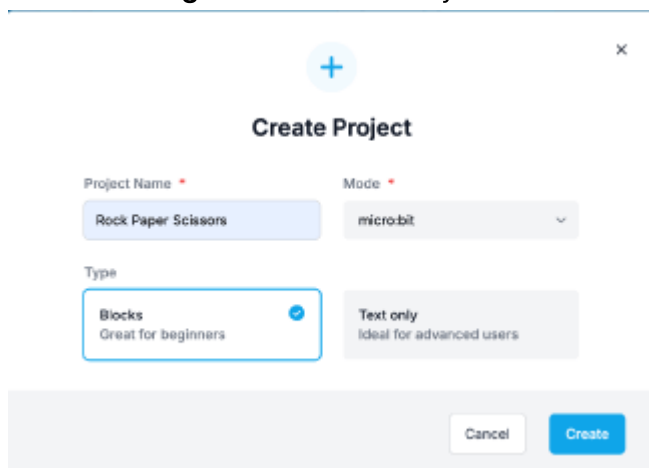

4. Select **Create** to open the micro:bit editor.
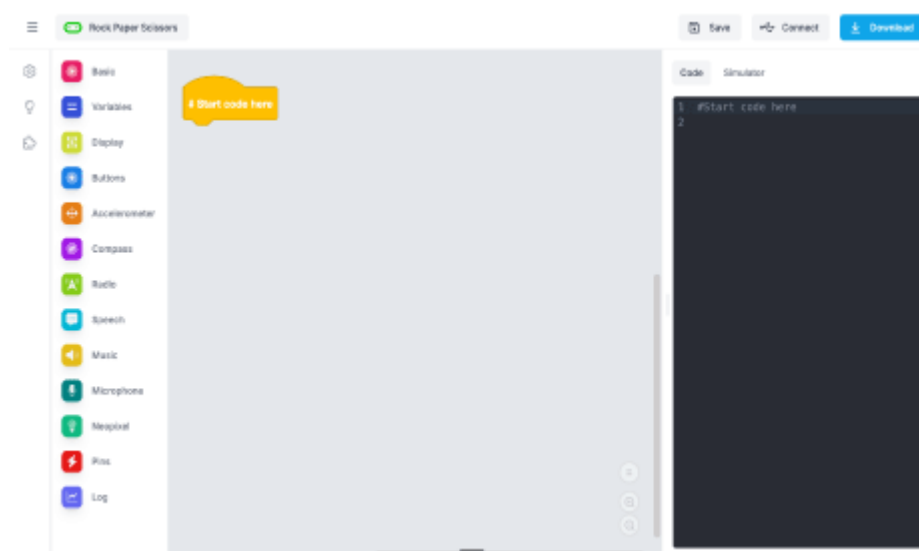
We are now ready to start coding!

Coding

1. From the Imports menu within the Basic menu, select and drag a `from microbit import *` block to the code area and attach it to the `# start code here` block.

2. From Loops within the Basic menu, select and drag a `while True:` block to the code area and attach it under the `from microbit import *` block.

3. From the Pins menu, select and drag a `pin0.write_digital(0)` block to the code area and attach it within the `while True:` block.

4. Change the **2nd 0** within the `pin0.write_digital` block and type **1**.

5. From Statements within the Basic menu, select and drag a `sleep (1000)` block to the code area and attach it under `pin0.write_digital(1)` block.
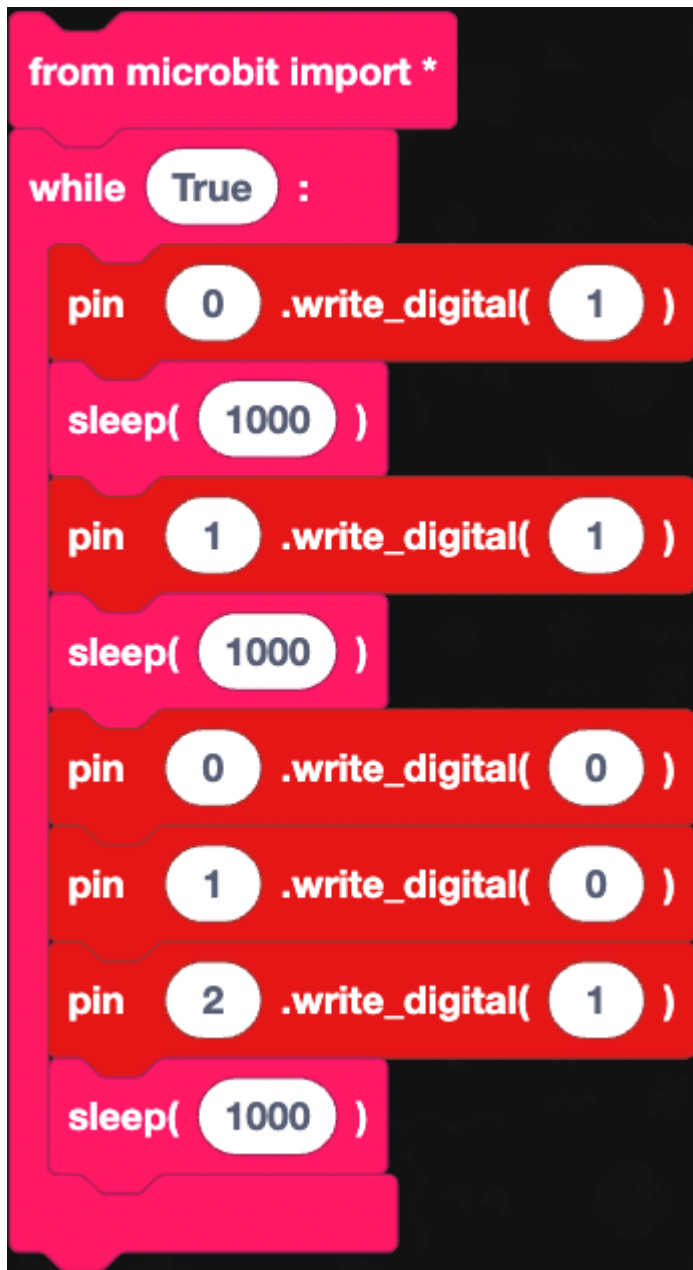
Your code should look like this:
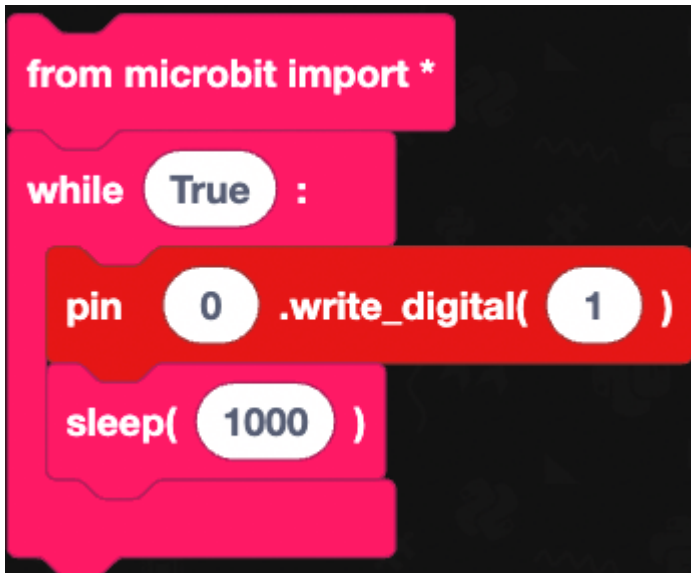
6. Right-click on `pin0.write_digital(1)` block and select **duplicate** attach the **duplicated** block under `sleep (1000)` block. Change the **0** to **1**.

7. Right-click on `sleep (1000)` and select **duplicate** attach the **duplicated** block under the `pin1.write_digital(1)` block.


8. Right-click on the `pin0.write_digital(1)` and select **duplicate** attach the **duplicated** block under `sleep (1000)`. Change **1** to **0**.

9. Right-click on `pin1.write_digital(1)` and select **duplicate** attach the **duplicated** block under `pin0.write_digital(0)` block. Change the **2nd 1** to **0**.

10. Right-click on `pin1.write_digital(1)` block and select **duplicate** attach the **duplicated** block under `pin1.write_digital(0)` block. Change the **1st 1** to **2**.

11. Right Click on `sleep (1000)` and select **duplicate** attach the **duplicated** block under `pin2.write_digital(1)`.

1. Right-click on `pin2.write_digital(1)` and select **duplicate** attach the **duplicated** block under `sleep (1000)`. Change the **1** to **0**.

2. Right-click on `pin1.write_digital(1)` block and select **duplicate** attach the **duplicated** block under `pin2.write_digital(0)` block.

3. Right-click on `sleep (1000)` and select **duplicate** attach the **duplicated** block under `pin1.write_digital(1)` block.

4. Right-click on `pin1.write_digital(0)` block and select **duplicate** attach the **duplicated** block under the `sleep (1000)` block.

Completed code:

```
from microbit import *

while True :
    pin 0 .write_digital( 1 )
    sleep( 1000 )
    pin 1 .write_digital( 1 )
    sleep( 1000 )
    pin 0 .write_digital( 0 )
    pin 1 .write_digital( 0 )
    pin 2 .write_digital( 1 )
    sleep( 1000 )
    pin 2 .write_digital( 0 )
    pin 1 .write_digital( 1 )
    sleep( 1000 )
    pin 1 .write_digital( 0 )
```
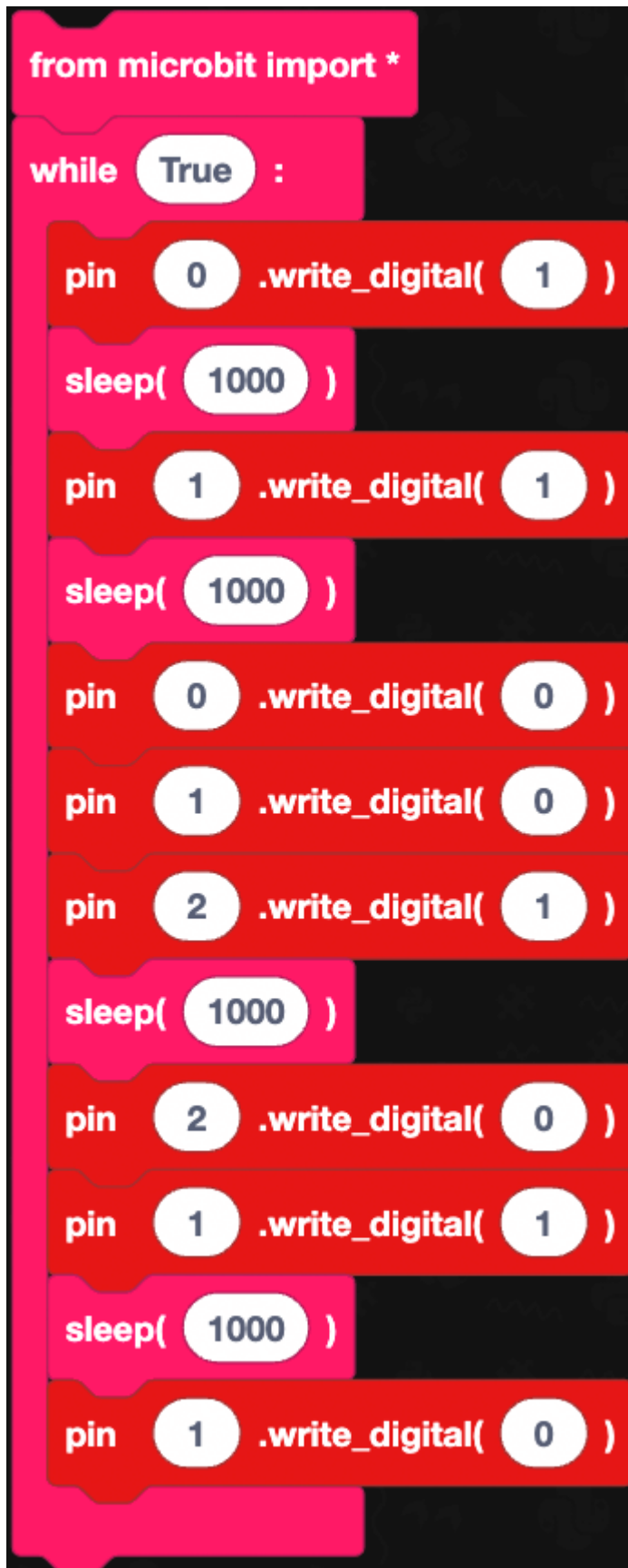
Lets move on and download our code to the micro:bit.

Downloading the code to the micro:bit

1. Take the micro USB cable and connect the micro:bit to the computer.

2. Select **Connect** and follow the pop-ups on screen to pair the micro:bit to the web browser.

3. Select the **Download** button to download your code to the micro:bit.

How to Play

Using the micro:bit

Once the code is dowloaded to the micro:bit you should see the LEDs light up in the pattern of traffic lights. If the LEDs aren't lighting up try pushing the copper tape/foil on to the leg to get a better connection.

If you find they are turning on/off in the wrong order check the pin numbering within the code.

- P0 = red
- P1 = yellow
- P2 = green

You can also change the speed that the LEDs turn on and off by changing the timing of the pause blocks.