B - Robot Police

Make a program using your Sparkle and buzzer modules, that turns your robot into a police robot to keep the planet safe.

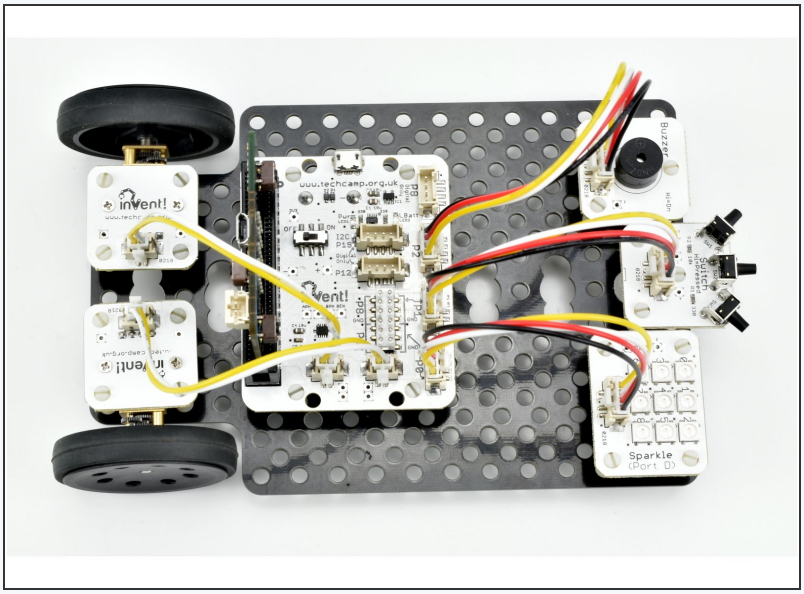
INTRODUCTION

Make a program using your Sparkle and buzzer modules, that turns your robot into a police robot to keep the planet safe.

Step 1

Assemble the Robot

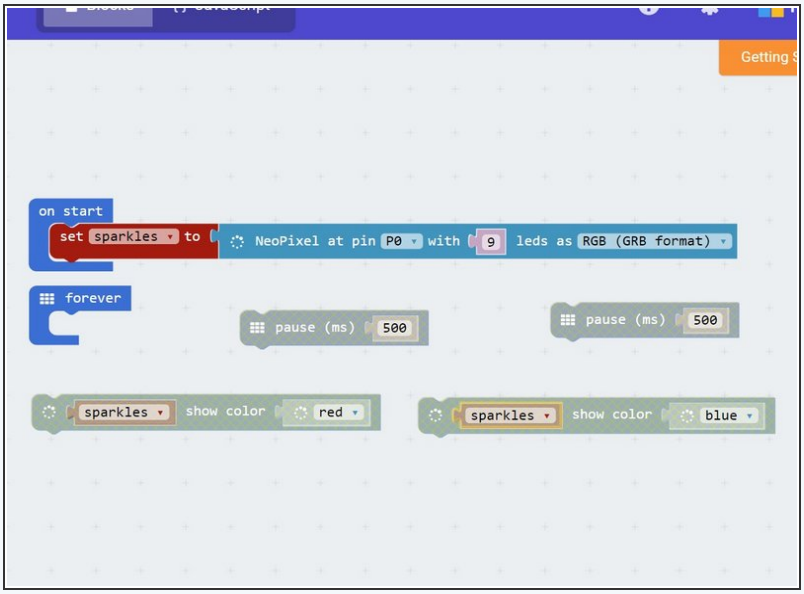
- We're going to be using a **lot of modules** to turn our robot into a police car!
- **Carefully** assemble your robot like the picture. The connections should be:
  - Buzzer > **P2**
  - Switch > **P1**
  - Sparkles > **P0**
  - Left Motor> **M1**
  - Right Motor > **M2**



Step 2

Reds and Blues

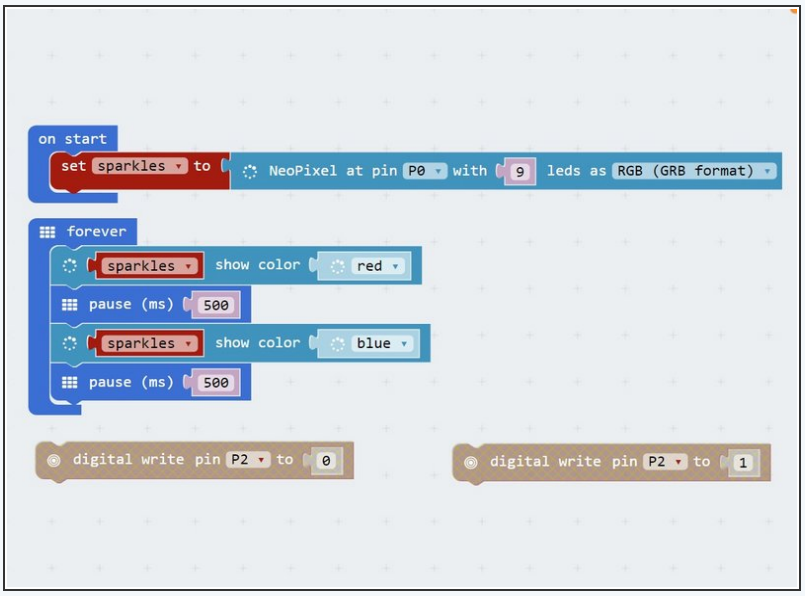
- Now we know how to use the **sparkle module,** let's start by programming all the sparkles to **flash red and blue** like a police car.
- Your program should:
  - Turn all sparkles **red**
  - Wait **half a second**
  - Turn all sparkles **blue**
  - Wait **half a second**
  - **Repeat** this forever!
- Make sure to **test your program** works - there are some **hints** about the blocks your will need in the picture if you need help.



Step 3

Add the Siren

- Let's add the **buzzer** to the flashing lights to make a **siren!**
- **Add some blocks** to your program so the buzzer is:
  - **Buzzing** when the sparkles are **red**
  - **Off** when the sparkles are **blue**
- Again, there are some **hints** in the picture if you can't remember which blocks to use.

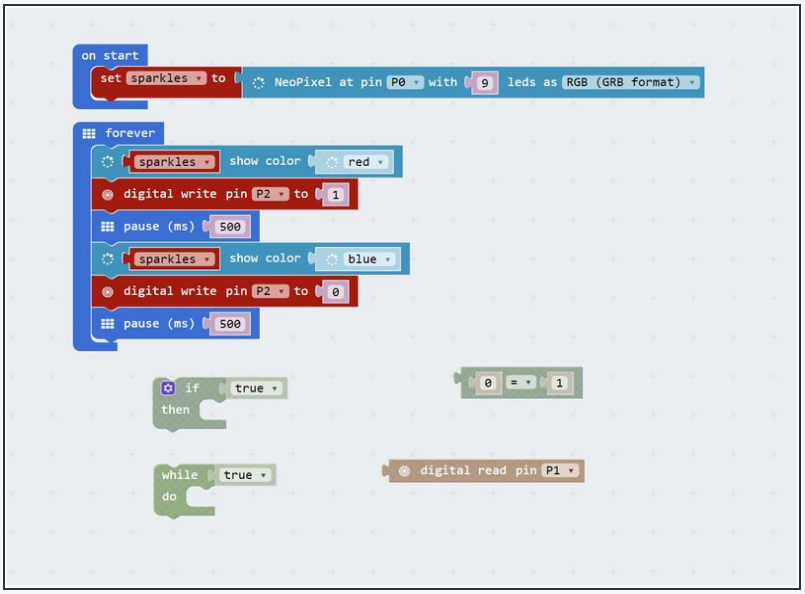


Step 4

Switch Activation

- Police cars don't have their lights and sirens on **all the time,** that would be very irritating!
- Let's **add a switch** so the police robot only flashes and buzzes when we **press** it.
- Add an **IF block** that checks if the **switch** is pressed.
- Put your flashing/buzzing code inside a **while true** loop from the **loops menu** (this will just loop forever), and put this inside the **if block**.
- That way, it will only start when the switch is pressed! There are some more **hints** of the blocks you need in the picture.

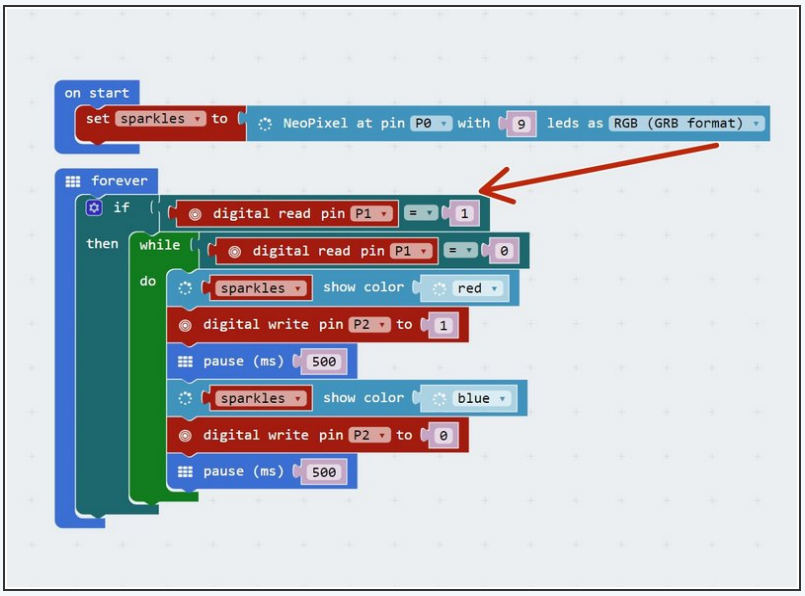
⚠ Don't forget, make sure your if block is inside the main **forever loop**, so the switch isn't just checked once!



Step 5

Switch De-activation

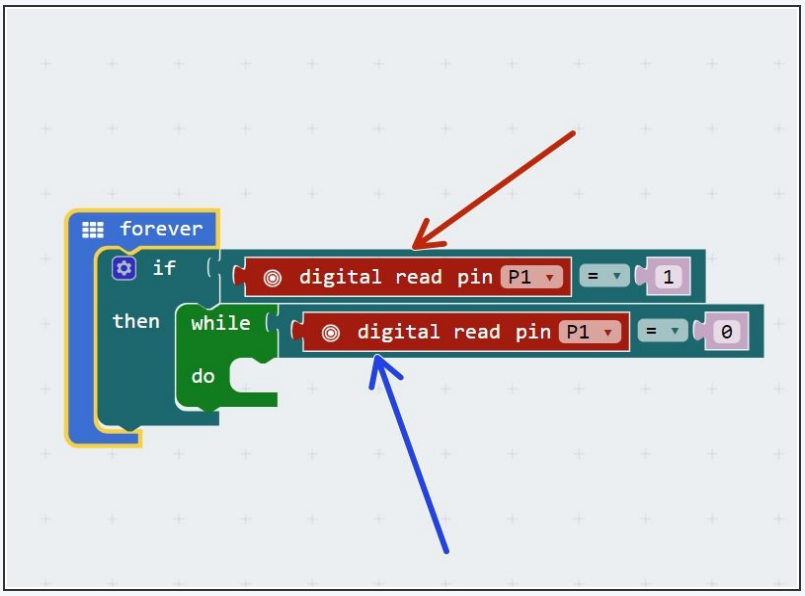
- Now we can **activate** the police robot with the switch, but we can't **turn it off** again!
- We can fix this by changing the **while loop**.
- So far, we have just used the while loop like the **forever** loop. But it is much more useful than that.
- While loops work just like an **if block** - they have a **condition**, and they will **repeatedly run the code inside them**, all the time the condition is **true**.
- So a while loop with **true** as the condition will just run forever!
- Change the while loop condition to be **while digital read P1 = 0** - that way, the code in the loop will run all the time we are **not** pressing the switch!
- Now our code should **start** the siren when we press the switch, and **stop** the siren when we press it again. **Test it out** - does it work as expected?



Step 6

Waiting for Switches

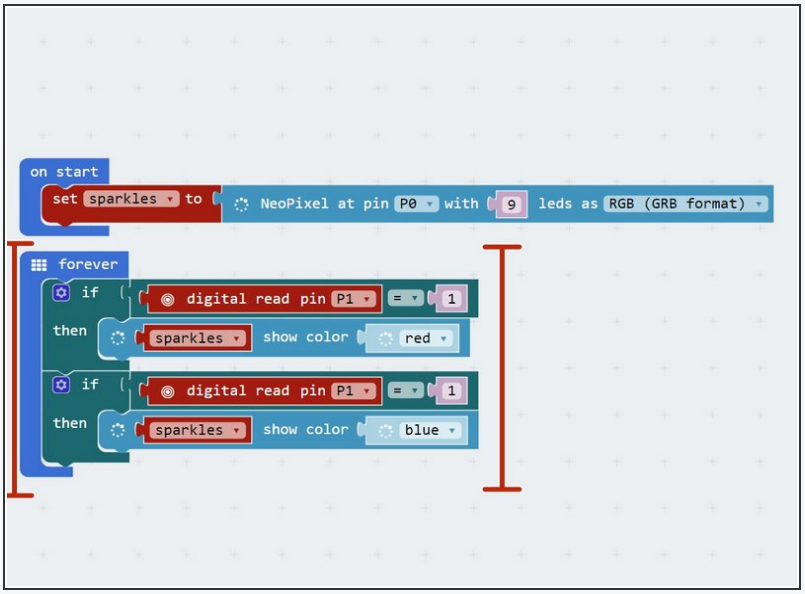
- You have probably found that we can't turn the siren on anymore!
- Our problem is that the robot runs the program **very, very fast.**
- Even if we just tap the switch, the robot thinks so quickly it thinks we are **holding it down.**
- Look at the simplified version of the code in the picture:
  - As soon as we press the switch, the **conclusion** of the if block is run
  - The robot **checks** the condition of the while loop **before we can possibly have time to take our finger off the switch,** so the loop stops and the program goes back to the red arrow.
  - So the siren **never gets activated!**



Step 7

Waiting for Switches

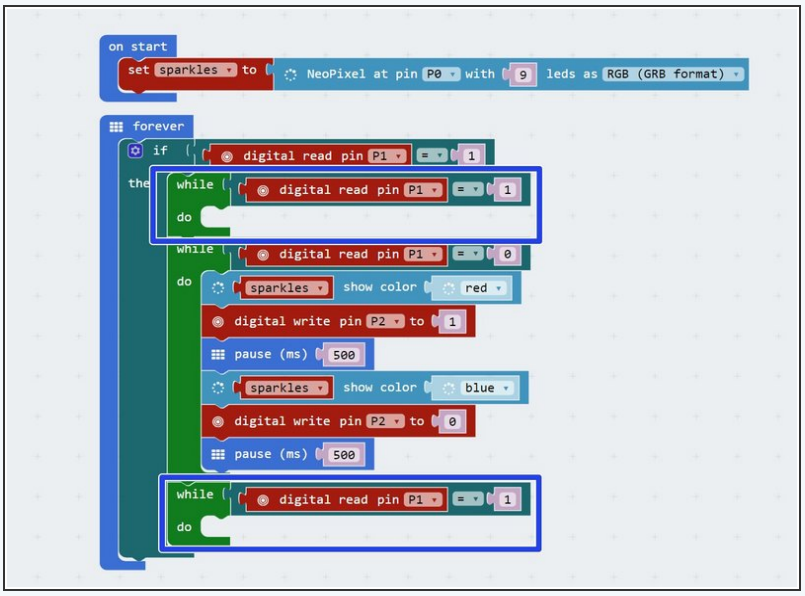
- This can be **hard to understand!** Let's make another short program to understand this problem with **an example.**
- **Drag** your police program to the side **(don't delete it!)** and build the program in the picture.
- This program turns the sparkles red if we press the switch, then blue if we press it again - **test it out!**
- It is **impossible** to accurately make the sparkles red or blue, as the robot is too fast - we need to make it **wait for us to let go of the switch** to fix this.



Step 8

Wait Until

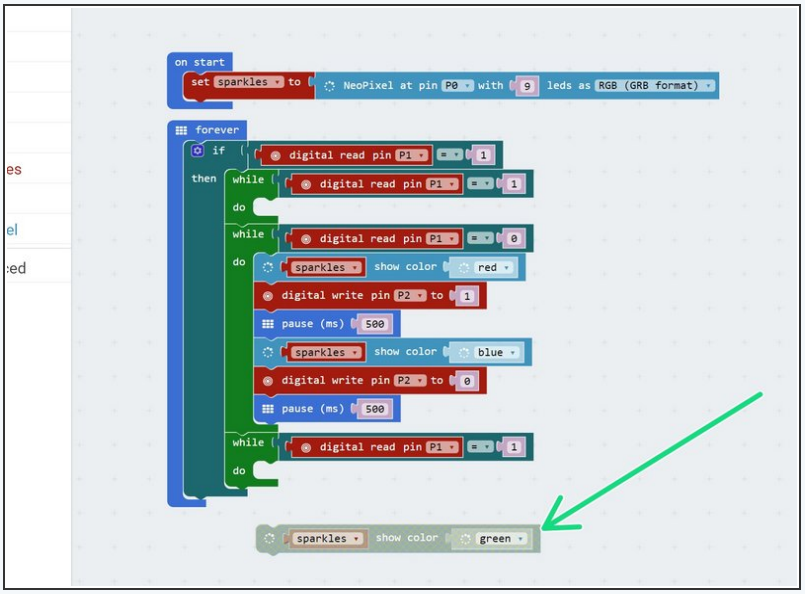
- Luckily, we can use **while loops** to fix this.
- If we have an **empty loop**, with a condition of the switch being **pressed**, the loop will run **all the time the switch is pressed**.
- This will effectively **pause** the program, until we let go of the switch!
- Put your code back, and **add two while loops** like in the picture, to wait for the switch to be released again before starting the siren, and turning it off again.
- **Test** out the program and **make sure you understand it before moving on.**



Step 9

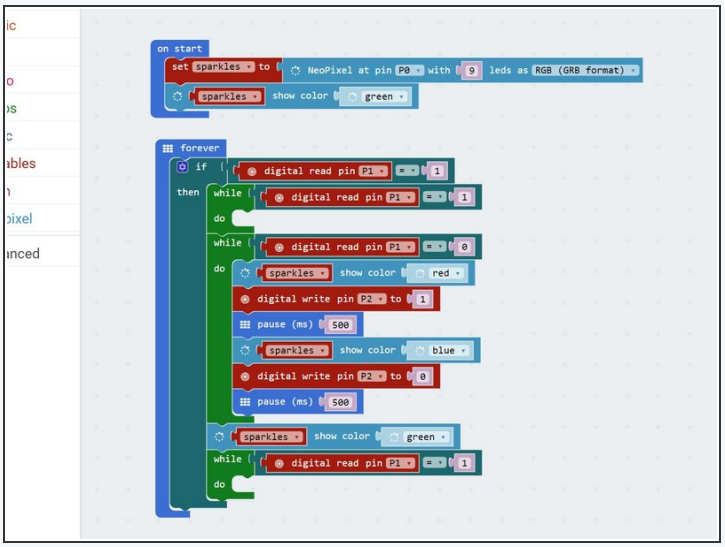
Business as Usual

- You may have noticed that the sparkles **stay blue** after we turn off the police lights and siren - let's change them so they are **green!**
- Add some more sparkle blocks so that:
  - The sparkles are set to **green** at the start
  - They are **reset** to green '"after the siren is turned off.



Step 10

Chase the Criminals



- The final part of our police program is to make the robot **chase** after our criminal!
- **Check the picture** for what your code should look like so far.
- **Add some blocks** to make your robot **drive forwards** at **full speed** when the switch is pressed and the sparkles are flashing, then **stop** when it is pressed again.

Step 11

Improve your Police Program

- For this extension challenge, you need to complete a few tasks:
- **Change the buzzer blocks** so that your buzzer beeps **faster than the sparkles change** to make it sound more realistic.
- When your robot is chasing the criminal, make it **turn left and right** in a **weaving motion** instead of just moving forwards.