

# Chapter 15

## Firefighting Robot

Firefighting is a highly dangerous occupation. When an emergency response call comes, firefighters must get themselves dressed in the appropriate gear and onto the emergency vehicles quickly to arrive at the fire scene, and then extinguish the fires. Firefighters are risking their lives to defend our cities and country. So everybody, can we use what we learned to help to reduce the risk? How about a firefighting robot? Let's make a firefighting robot with Maqueen, and let it complete three actions: Call out, Firefighting, Mission done. Flame sensor and servo will be used in this project. Maqueen Plus has 8 GPIO ports and 3 servo ports for connecting Gravity module and servos. Everything is ready, let's start!

## Goal



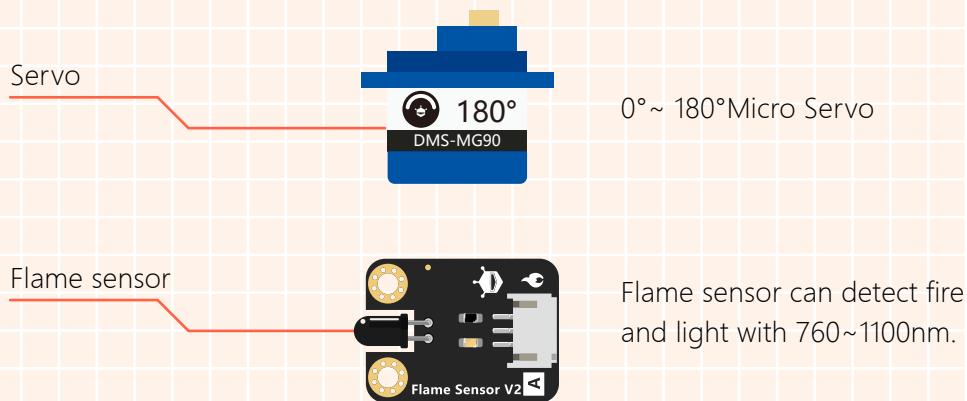
Learn how to drive a servo

Learn how to use a flame sensor

## Electronic Component



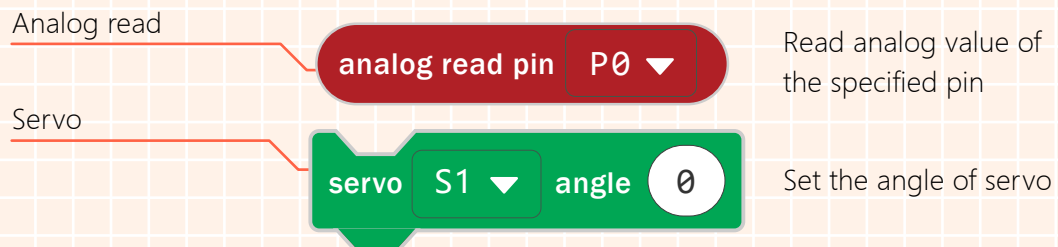
### Figure of the servo and the Flame sensor



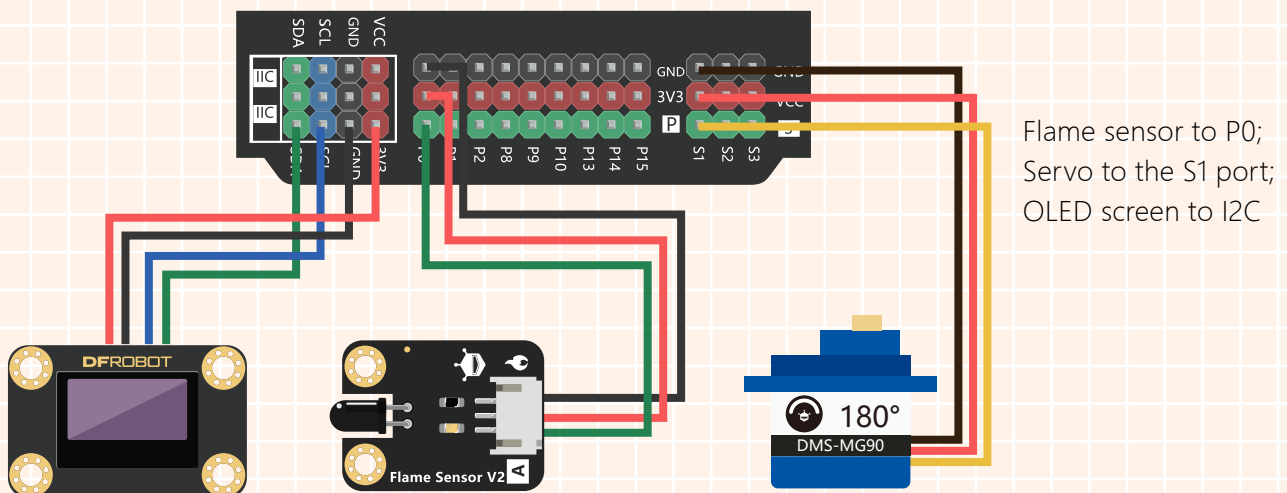
## Command Learning



### Block Brief



### Firefighting Robot Hardware Connection



# Hands-on Practice

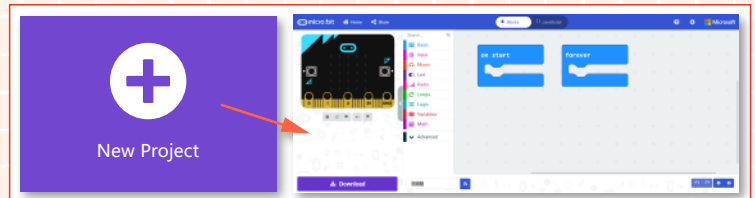


## Step 1 Create a New Project

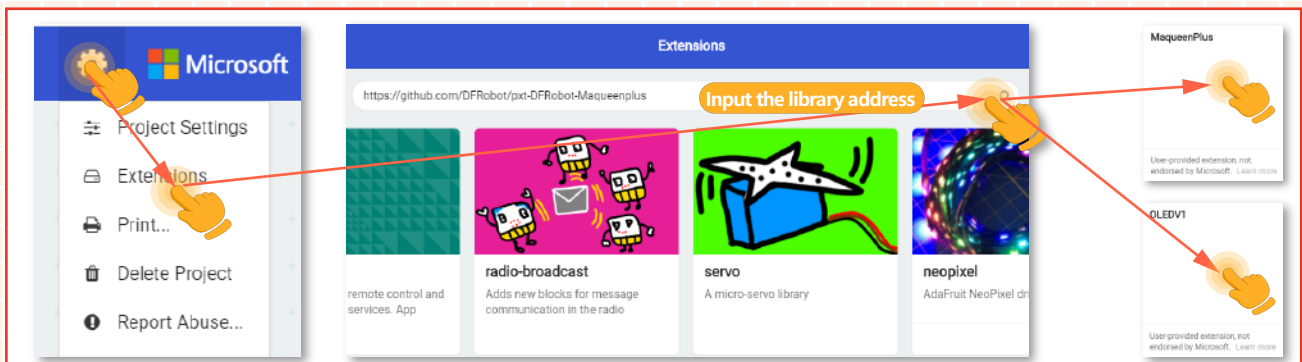
1. Input <https://makecode.microbit.org/> into your browser to enter MakeCode editor.
2. Click "new project" to enter MakeCode programming interface.
3. Add the Maqueen Plus library: <https://github.com/DFRobot/pxt-DFRobot-Maqueenplus>
4. Click "Setting"->"Extension", input the following address and click the result OLED1.  
<https://github.com/DFRobot/pxt-OLEDV1>



1. Enter MakeCode editor



2. Enter programming interface



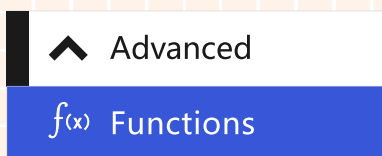
3. Add the extension library

## Step 2 Programming

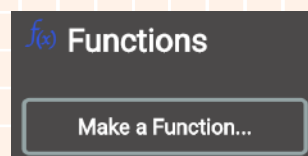
1. Generally, there are three parts to the firefighting process.

- ① Received the emergency call, go to the fire scene.
- ② Arrived at the scene, extinguish the fire.
- ③ Mission completed.

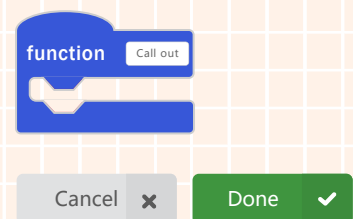
So, we will create three functions: "Call out", "Firefighting", "Mission done". Take the first one as an example.



1) Click "Advanced"->"Functions";

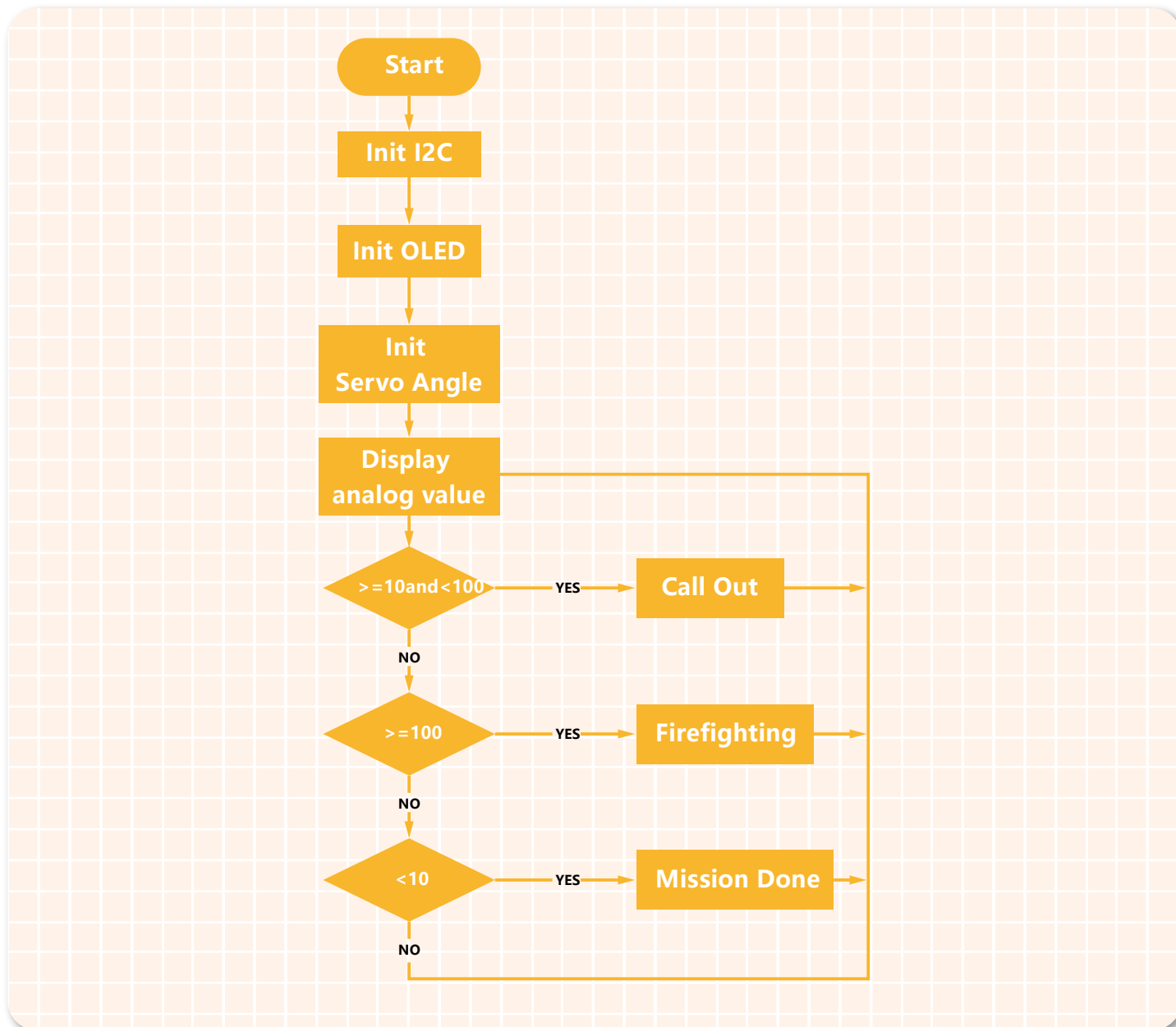


2) Click "Make a Function";

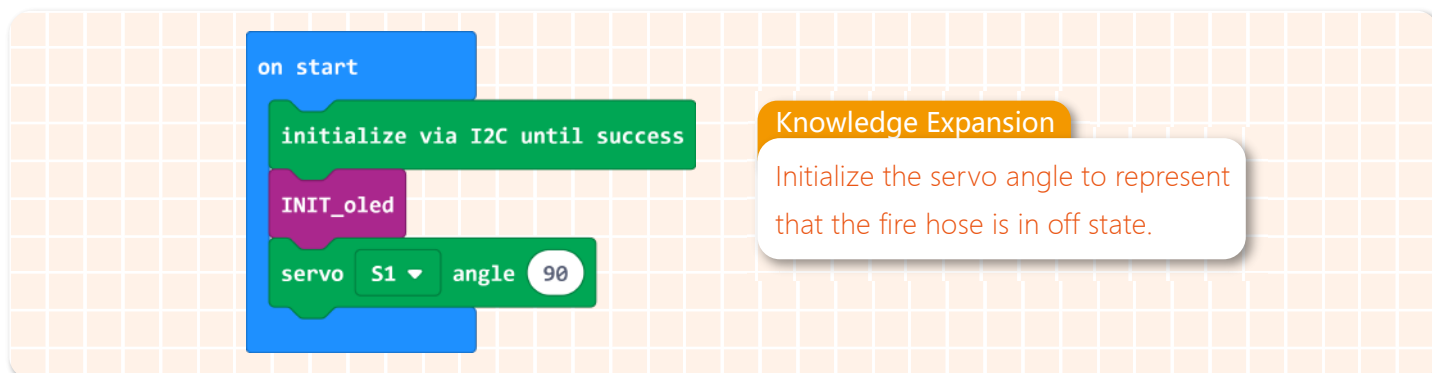


3) Name the function as "Call Out";  
4) Click "OK".

2. Create another two functions in the same way above. Then do condition judgment as the flowchart shown below:



3. Initialize the I2C, OLED, Servo angle when the program starts.



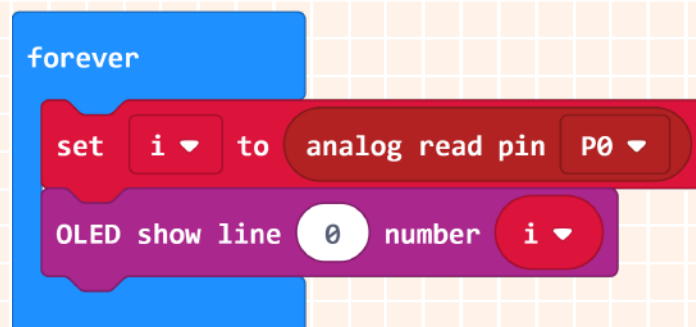
4.Create a variable "i" to store the analog value read from the flame sensor.  
Make a variable "i".



When calling the value of flame sensor, directly use the variable "i".

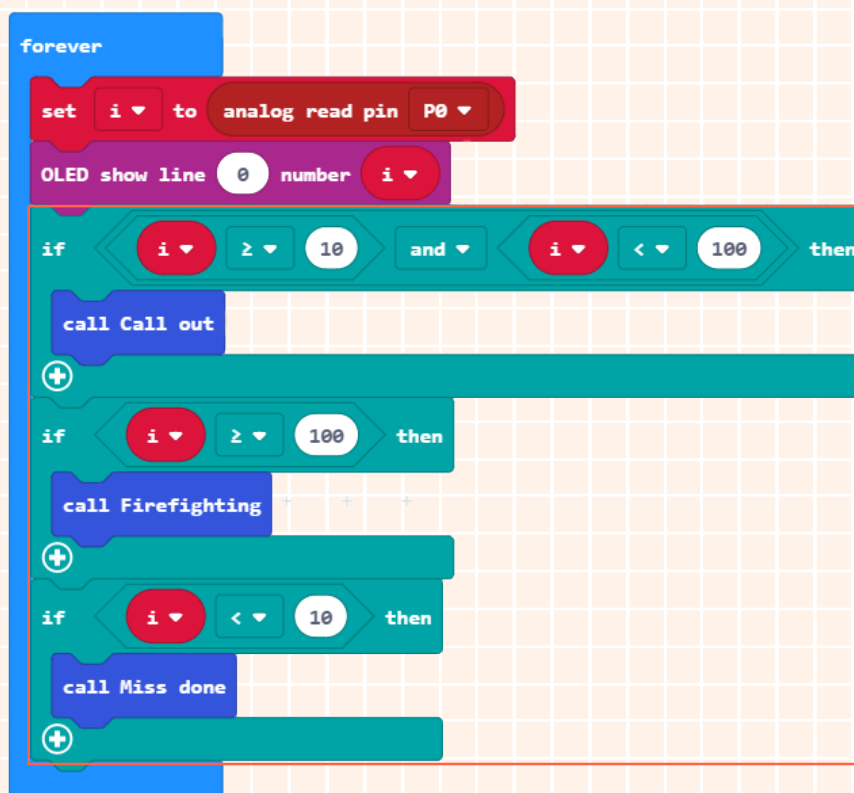


5.Display the analog value of the flame sensor on the first line of the OLED screen.

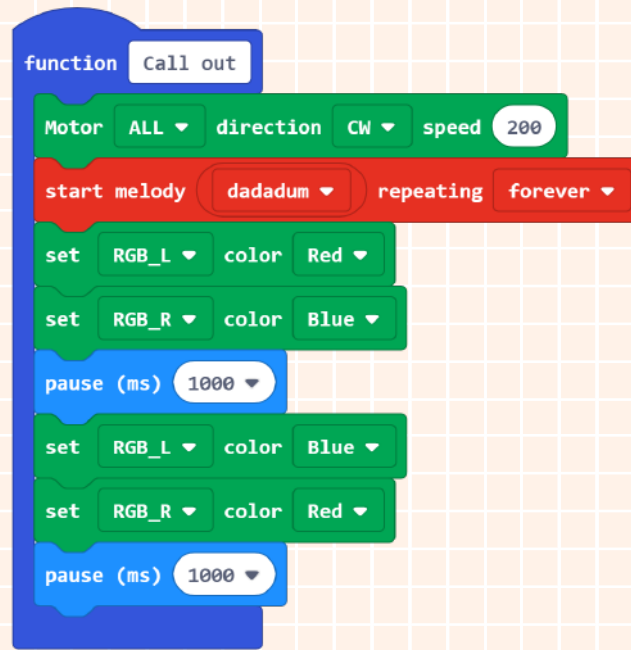


6.Call the related functions according to the program flowchart.

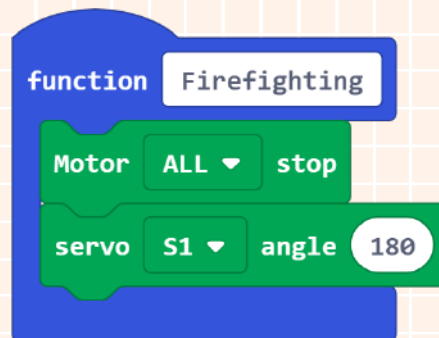
When the analog value detected by the flame sensor is between 10~100, it means that there is a certain distance between the firefighting robot and the fire scene, and the robot has to go forward to the scene; if the value is larger than 100, the robot has arrived at the fire scene, and starts to extinguish the fire; when it is less than 10, the firefighting mission is done.



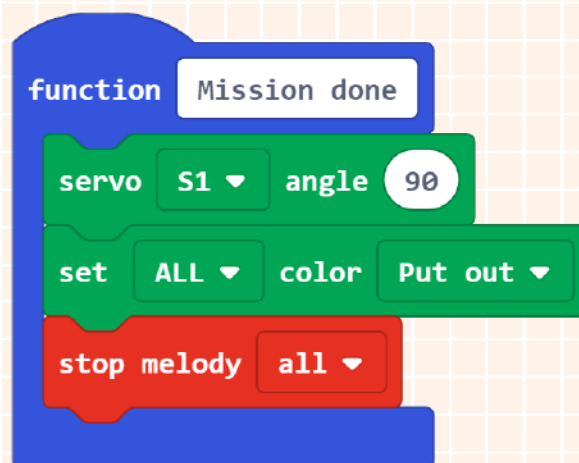
7.The realization of the“Call out” function: when the firefighting robot drives to the fire scene, the two LEDs flash red and blue alternatively, meanwhile, the keep the siren blaring (use the sound “dadadum” to simulate the siren).



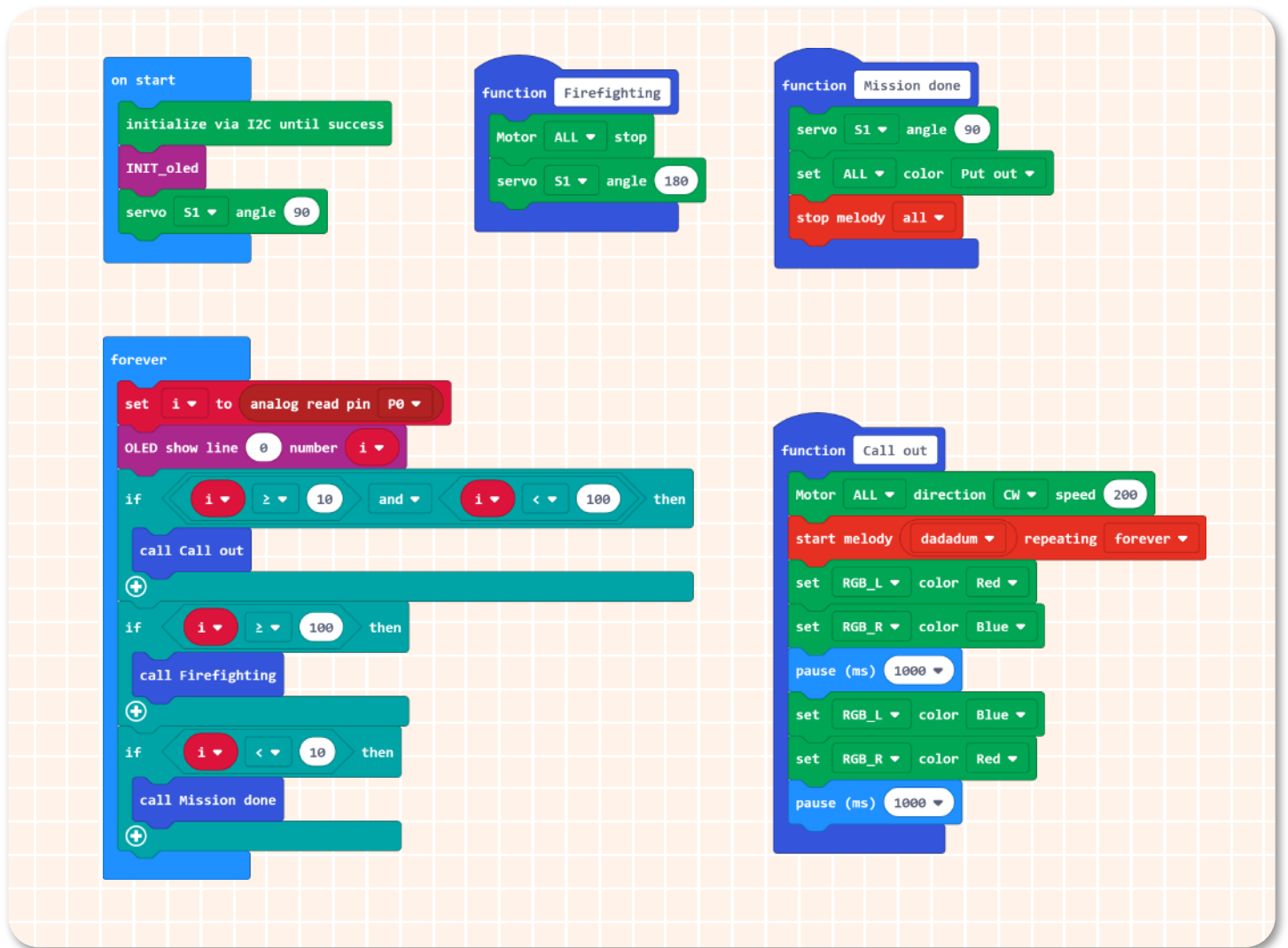
8.The realization of the function “Firefighting”: when the firefighting robot arrived at the scene, turn on its fire hose to put out the fire (change the angle of the servo to simulate this process).



9.The function “Mission done”: turn off the fire hose, LEDs, and siren.



10.The complete program is shown below.



11.Name your project as "Firefighting robot", and download it into Maqueen Plus.

### Step 3 Effect Display

Turn on the power switch when completed all the steps above. Then the analog value the flame sensor detects will be constantly displayed on the OLED screen. When the value is in 10~100, the firefighting robot moves forward at the speed of 200 with its light flashing and siren blaring; when it is more than 100, the robot car stops, and its servo rotates 180 degrees; when less than 10, the servo back to 90 degrees, stop playing sound and turn off the RGB LEDs.

Note: we can use a lighter to imitate the fire scene. Although the flame sensor can detect fire, it is not fireproof. Please make sure the sensor always keeps a certain distance from the fire.

This project involves dangerous action, please complete this chapter with the assistance of guardians or teachers.

## Think & Explore

We all know that smoking is not only harmful to our own health but effecting others. Therefore, smoking is forbidden in some public places. Can we make an "Anti-smoking robot" to monitor smoking in real-time?

Tip: add a gas sensor based on this project.