

## Qoopers series course

Section 11  
《Scorpiod B》

# Curriculum objectives

## **Knowledge and skill**

1. Learn to use computer-end programming, learn conditional judgment statement and loop statement;
2. Learn to use programming application of ultrasonic sensor;

## **Process and methods**

1. Through curriculum, learn programming statement, exercise students' logical thinking;

## **Emotional attitude and values**

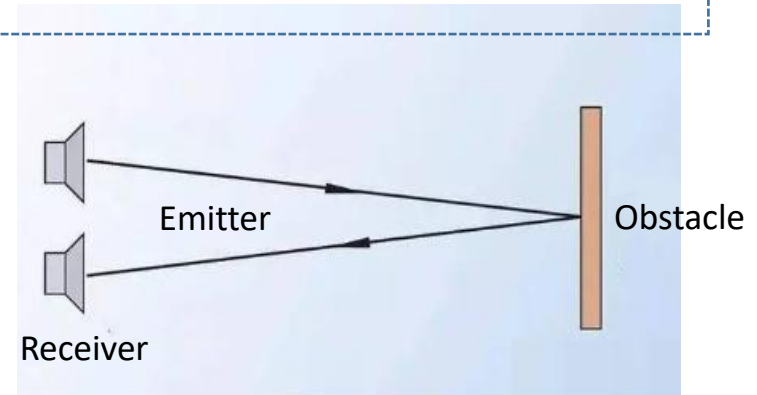
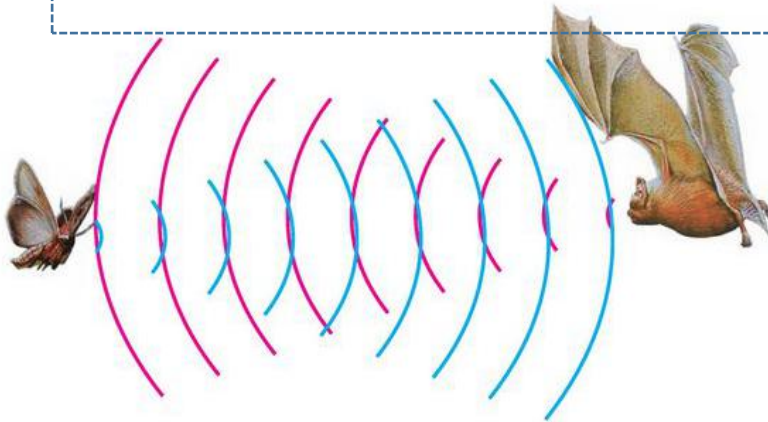
1. Stimulate students' learning interest toward physics by learning ultrasonic.



When Scorpiod meet unknown obstacle in implementing patrol task in the evening, it will warn itself that " dangerous". At the same time, it can convey dangerous information by sound and light signal.

## Popularize general knowledge

Scorpion is very fit for dark life, though its vision is weak, differentiate sound ability is very high, because its ear is ultrasonic positioning structure, relying on ultrasonic that itself send to guide flying, if meet insect, ultrasonic will return to scorpion's ear to ensure prey location, then catch it.



Ultrasonic sensor mainly consists of ultrasonic probe that installed RGB light and port that transmit signal.

One ultrasonic probe radiates ultrasonic, and another receive return wave. It will form return wave when meet obstacle after ultrasonic radiate to front, then return wave, which received by probe, transformed into electric signal that send to main control board to deal with through connection port.

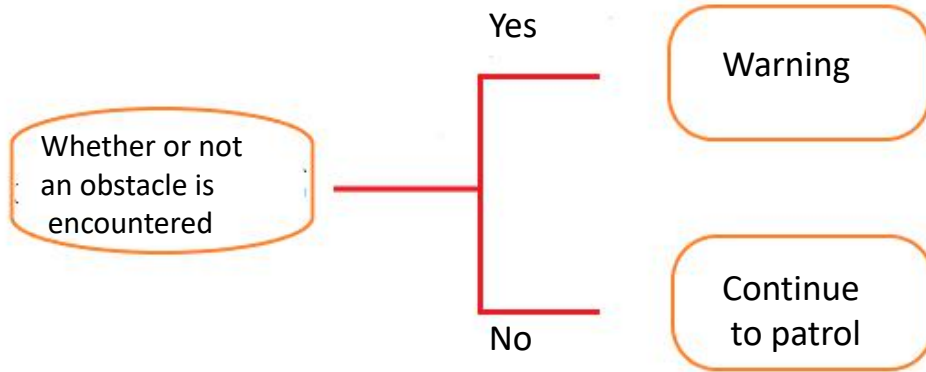


# Knowledge explanation

The effective detection distance of ultrasonic sensor is between 5cm -250cm, the closer distance between ultrasonic sensor and obstacle, the shorter is the effective detection distance.



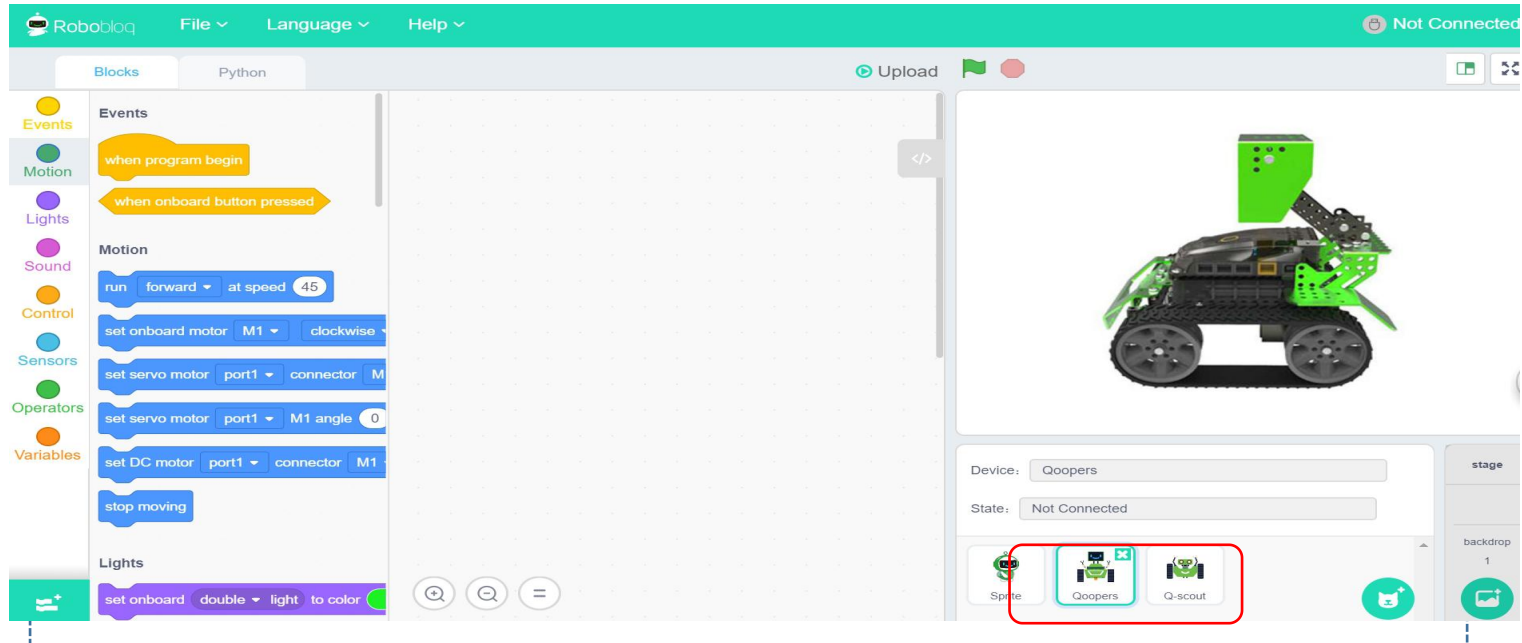




Scorpiod's ultrasonic sensor constantly operate while patrolling, and the function is that help scorpiod see obstacle clearly in the evening, judge whether the condition that "whether or not an obstacle is encountered" is right, and response relative command action on the basis of that condition.

# Knowledge explanation



We will learn programming with computer-end software. Open programming software, choose "Qoopers" icon on the lower right corner of interface to get in Qoopers programming.

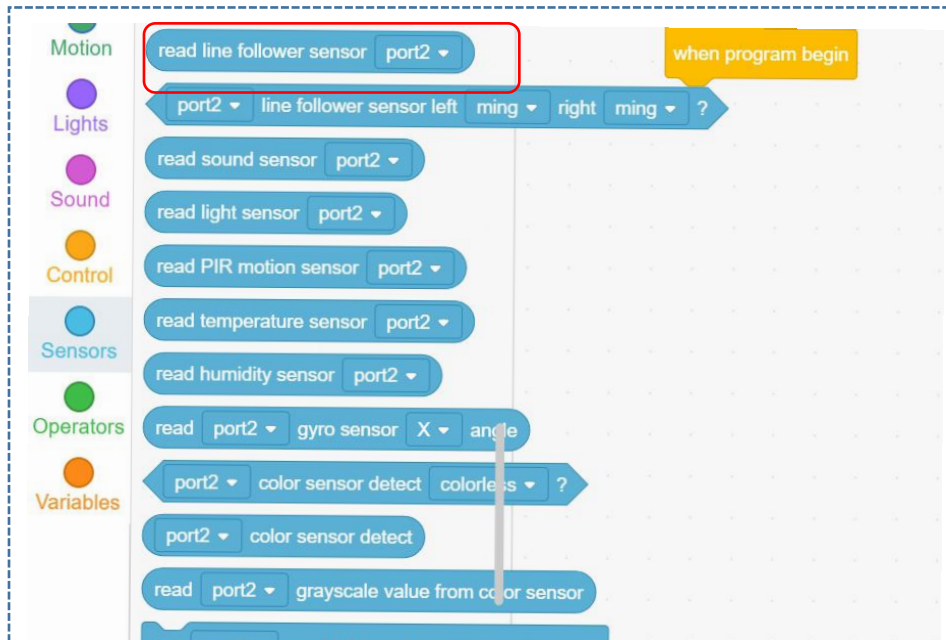


The screenshot displays the Roboblog web interface. The top navigation bar includes 'Roboblog', 'File', 'Language', and 'Help' menus, along with a 'Not Connected' status indicator. The main workspace is divided into three sections: a left sidebar with categorized block palettes (Events, Motion, Lights, etc.), a central script editor containing a sequence of programming blocks, and a right-hand preview area showing a 3D model of a Qoopers robot. The script in the editor includes the following blocks: 'when program begin', 'when onboard button pressed', 'run forward at speed 45', 'set onboard motor M1 clockwise', 'set servo motor port1 connector M1', 'set servo motor port1 M1 angle 0', 'set DC motor port1 connector M1', 'stop moving', and 'set onboard double light to color'. In the bottom right corner, a red box highlights the 'Qoopers' icon in the device selection menu, which also includes 'Sprite' and 'Q-scout' options. The 'Device' dropdown is currently set to 'Qoopers' and the 'State' is 'Not Connected'.



# Knowledge explanation

In actual programming, we also need to set the condition of ultrasonic detect distance. Choose.  in the sensor of icon module; Choose.  in the operation to set condition of ultrasonic sensor.



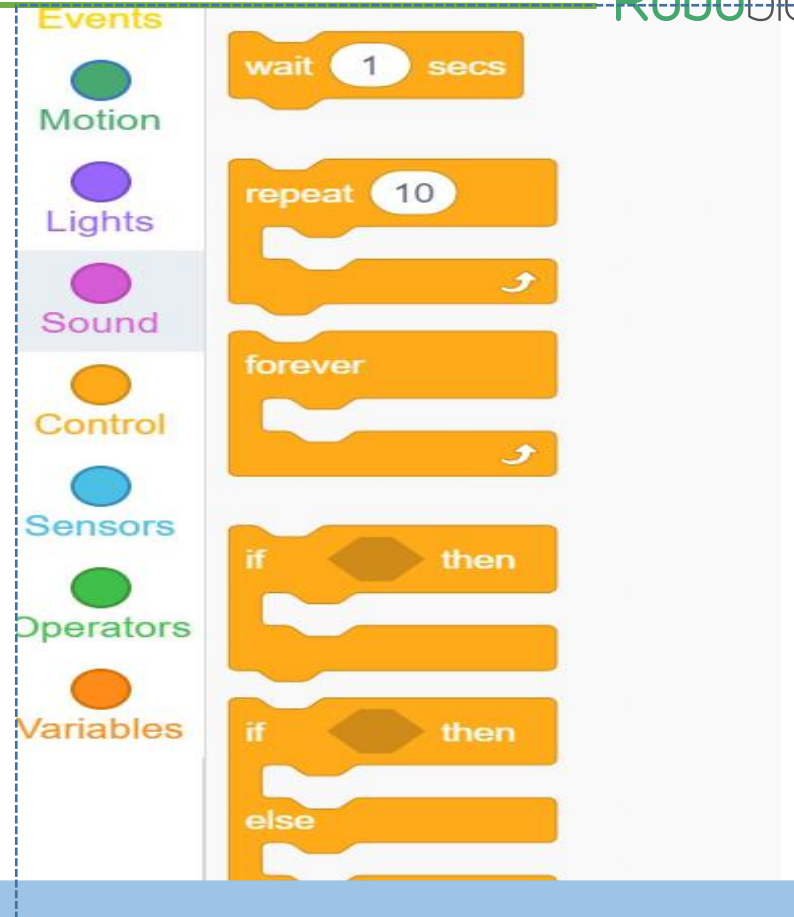
The image shows a Scratch code editor with a 'when program begin' block followed by several 'read' blocks. The 'read line follower sensor port2' block is highlighted with a red box. The 'read' blocks are: 'read line follower sensor port2', 'read sound sensor port2', 'read light sensor port2', 'read PIR motion sensor port2', 'read temperature sensor port2', 'read humidity sensor port2', 'read port2 gyro sensor X angle', 'read port2 color sensor detect colorless', 'read port2 color sensor detect', and 'read port2 grayscale value from color sensor'. The left sidebar shows categories: Motion, Lights, Sound, Control, Sensors, Operators, and Variables.



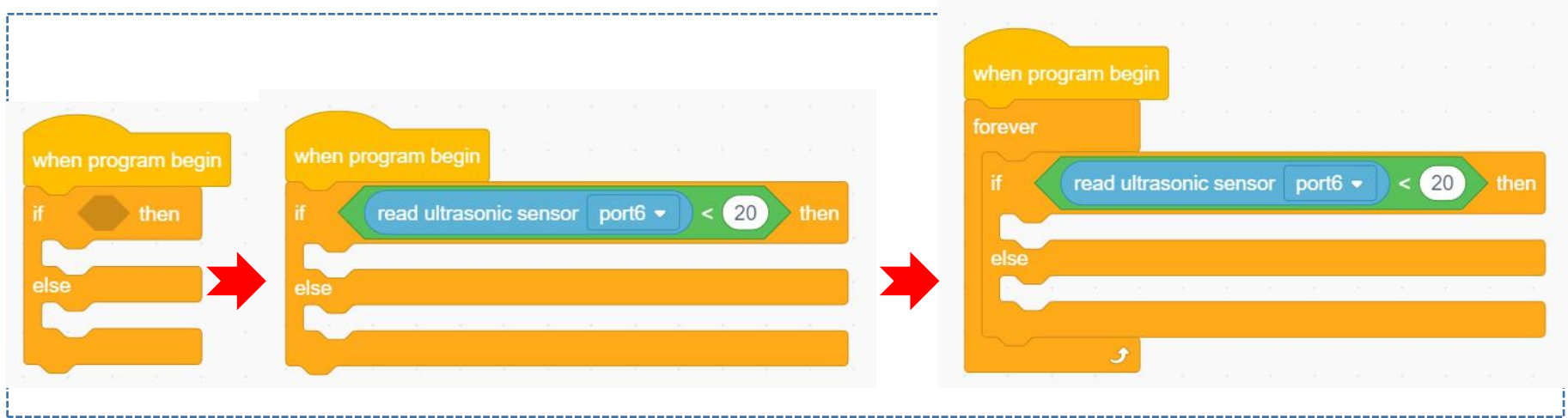
The image shows the Scratch Operators palette and a code editor snippet. The palette lists operators: +, -, \*, /, <, =, >, and, or, not, and pick random 1 to 10. The '<' operator is highlighted with a red box. The code editor snippet shows a 'when program begin' block followed by a green 'less than' operator block with '端口6' (port6) and '超声波传感器数值(cm)' (ultrasonic sensor value in cm) on the left, and '20' on the right.

The procedure of patrol task need to use conditional judgment statement and loop statement.

In the icon module area, conditional judgment statement includes "if...then..." , "if...otherwise..."; loop statement includes "implement repeatedly ( ) times", "implement repeatedly."

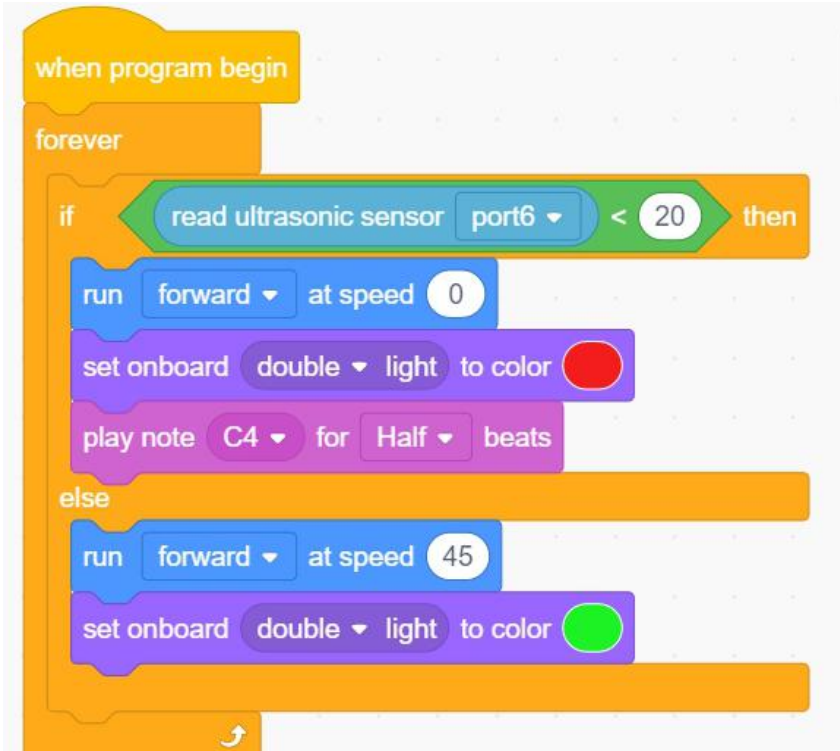


The complete procedure need to add "condition" in the conditional judgment statement, and detect the condition circularly to judge whether it or not right.





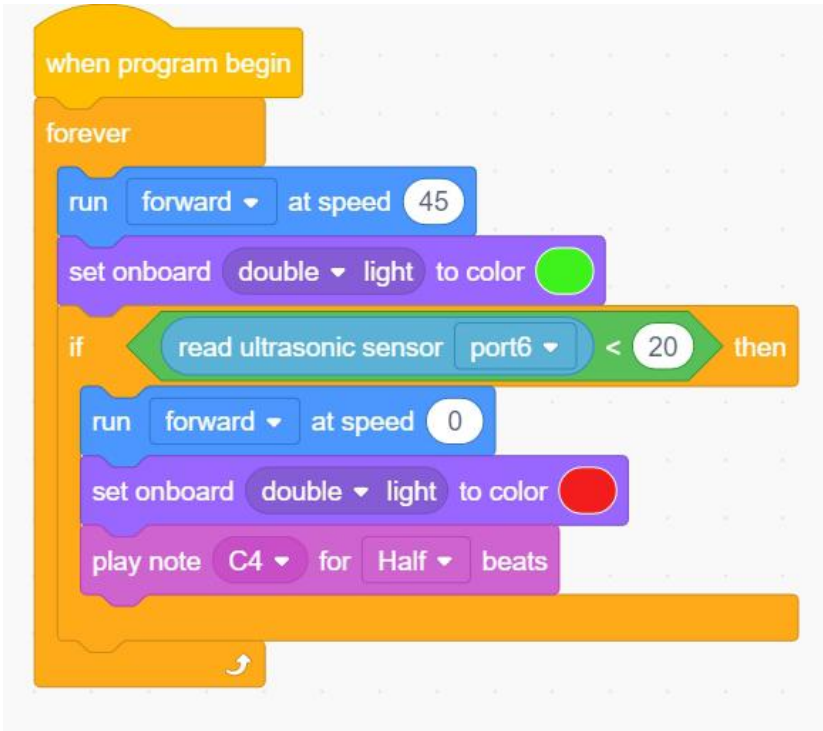
Scorpiod patrol in the route when condition is normal, but when it encounter unknown obstacle, ultrasonic sensor return signal and send dangerous signal.



Programming:

1. Set suitable distance condition of ultrasonic sensor, notice that the connection between sensor and port are corresponding;
2. When setted condition is right, that is to say when encountered obstacle, Scorpion stop motion, then light red lamp and phonating;
3. If condition is not right, scorpion move normally.

# Extends



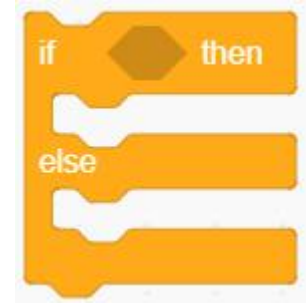
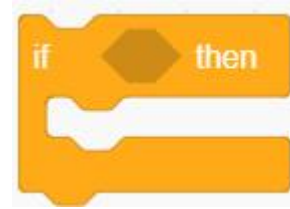
```
when program begin
  forever
    run forward at speed 45
    set onboard double light to color green
    if read ultrasonic sensor port6 < 20 then
      run forward at speed 0
      set onboard double light to color red
      play note C4 for Half beats
```

Compared that what is the difference between left program and before program, and are their operation effect same?

# Summary and rethink

1. Why ultrasonic sensor could detect the distance between it and obstacle?

2. Analysis that what is the distinction between "if... then..." and "if... otherwise..." these two statements in terms of usage in the programming.





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