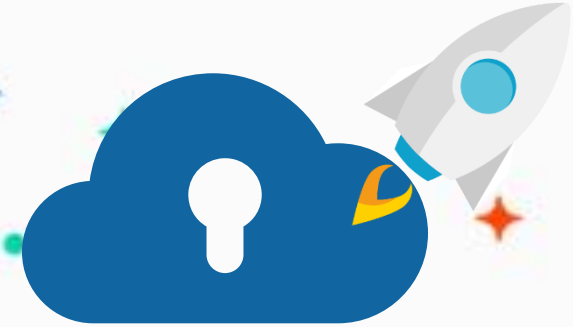

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Lesson 2. Curling Game

Lecturer:

Lesson Objective

Learning Objectives

1. Learn about the sport of curling and build a curling robot.
2. Use variables to control the curling robot to push the curling stone and change the speed of movement.
3. Use photoelectric sensors to control the timing of the curling robot pushing the curling stone.

Possible Difficulties

1. Setting and calling variables in the program
2. Application of controller touchscreen
3. Controller screen coordinates and their settings.



Background

Background Knowledge | Curling



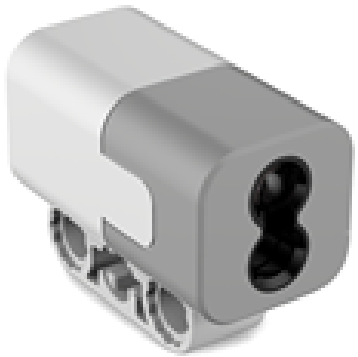
Curling is a throwing competition played by teams on the ice. It is known as the "chess" on the ice. It tests the physical and mental strength of participants, shows the beauty of movement and stillness, and the wisdom of choice. It is a competition event of the Winter Olympics.

Curling is like playing marbles on ice!



Introduction

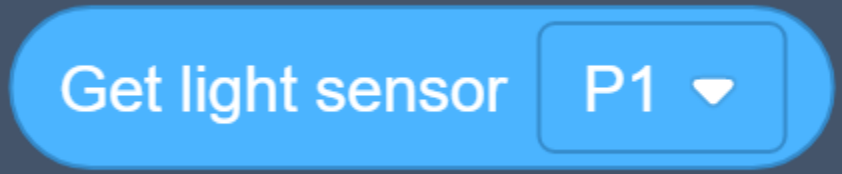
Introduction



When the photoelectric sensor (as known as light sensor) works, it emits a beam of white light and shines on objects of different colors. Since different colors absorb light differently (for example, the darker the object, the more light it absorbs, and vice versa), resulting in different intensity of reflected light. Therefore, the photoelectric sensor can distinguish the shades of different colors based on reflected light.

In the curling robot, we can use photoelectric sensors to determine whether the robot reaches the throwing line.

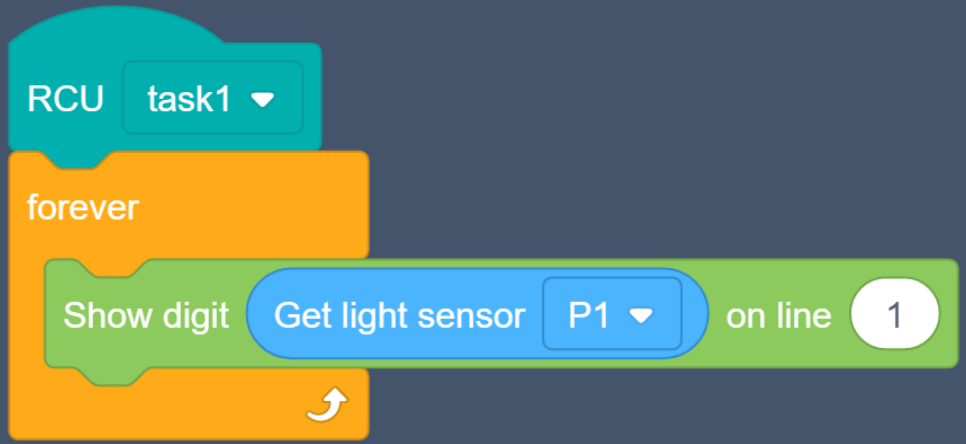
Introduction



This module is used to read the color depth of the detected object and return the data parameters. The valid value is between 0-4095.

Introduction





Please write a program to display the value of the photoelectric sensor on the controller screen, test whether the sensor is working properly, and see what the reflection values of white and black are.

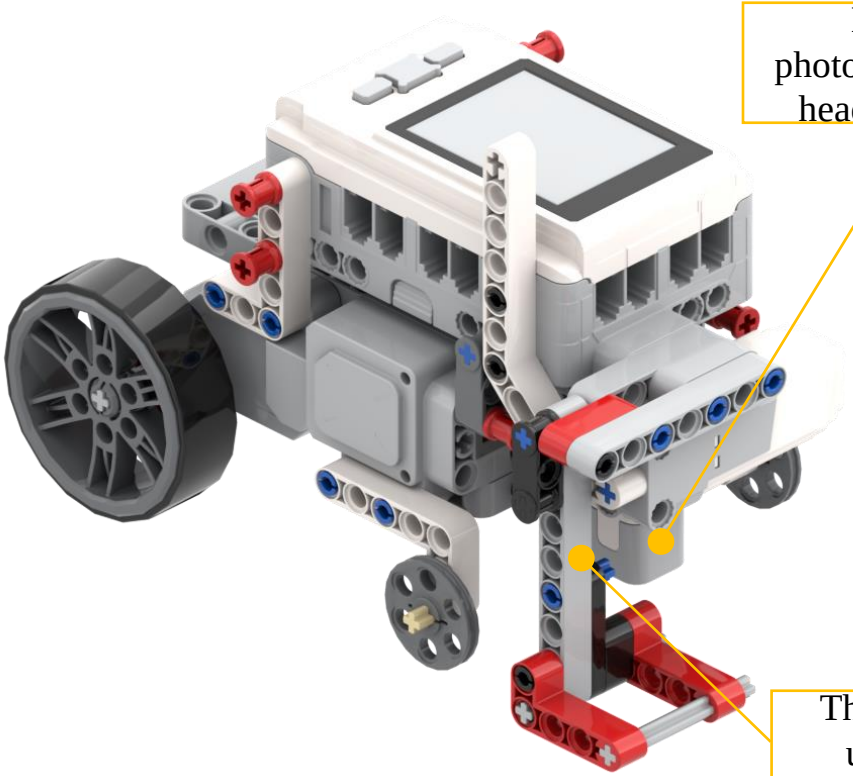


Practice



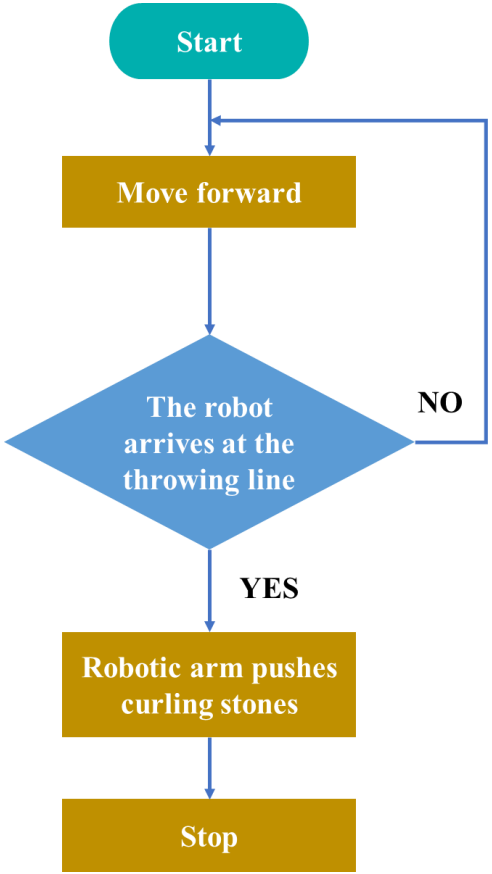


Practice | Robot Building



Build the curling robot according to the building manual and choose the port to connect to.

Practice | Flowchart



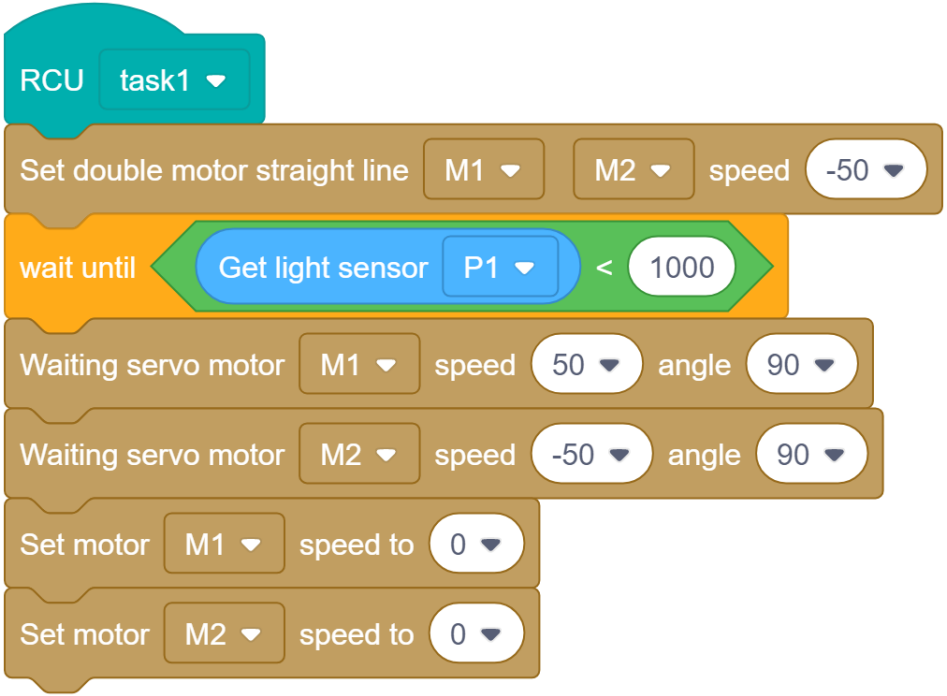
Test, observe, and think:

1. How to use the photoelectric sensor to determine whether the throwing line has been reached?

2. When reaching the throwing line, should the robot stop first and then push the curling stone, or push the curling stone first and then stop? What's the difference between the two?

Please optimize and complete the programming of the walking robot, and then play freely on this basis.

Practice | Programming



Please set the speed at which the robot moves and pushes the curling stone and the judgment value for reaching the throwing line.



Exploration



Exploration | Discussion

Please tell me what problems you found while building the robot and programming.

Is it difficult to adjust the movement speed and curling speed?

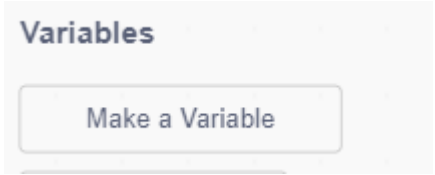
Too much trouble to set different speeds?

How to judge the value of photoelectric sensor?

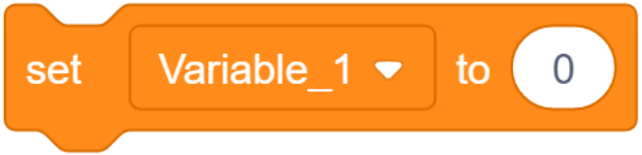
Exploration | Discussion

So, how to solve these problems and make improvements?

Exploration | Variable



Create a new variable



Set the value of the corresponding variable

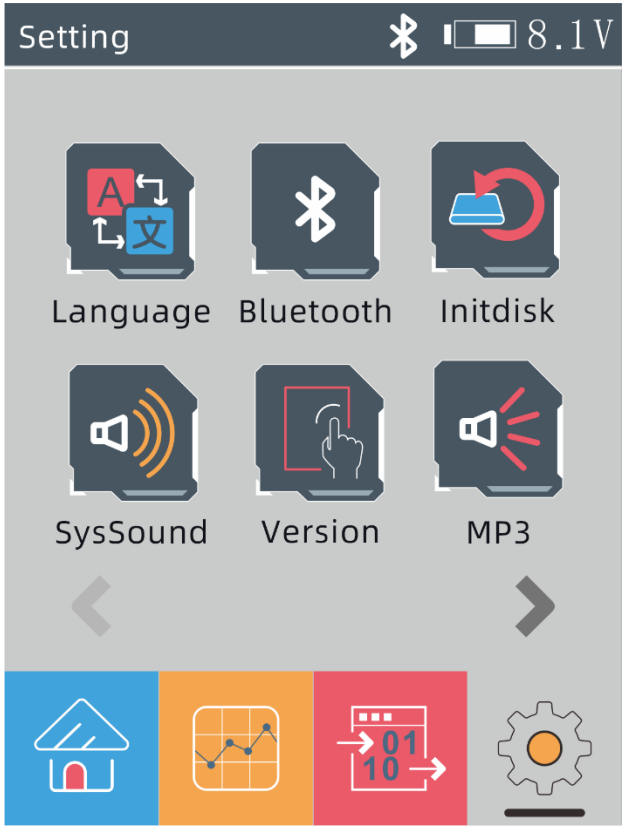


Change the value of the corresponding variable

When programming, variables can be used to store data, and at the same time, variables can be called and modified, which greatly facilitates people's program optimization.

For the curling robot, we can use variables to control the robot's moving speed and the force of pushing the curling stone and adjust the required speed value by modifying the variables.

Exploration | Touchscreen



With the development of technology, computer input methods have gone through four stages, from the original paper tape input to keyboard input, to mouse input, and then to touch input. The touchscreen is an interactive input device. The user only needs to touch a certain position on the screen with a finger or a light pen to control the operation of the computer.

Touchscreen is easy to operate and flexible to use, allowing more people to use computers.

The screen of our robot is also a touch screen. In the ice hockey robot, we use the touch screen to change the values of variables that control the movement of the robot and push the curling stone.

Exploration | Touchscreen



Is screen touched?

This module can judge whether the controller screen has been touched, and the returned result is yes or no.

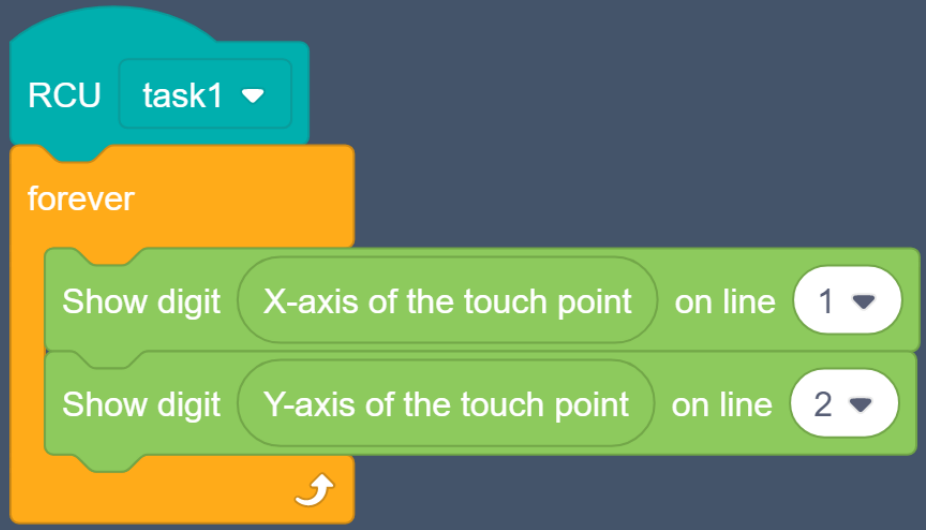
Y-axis of the touch point

X-axis of the touch point

These two modules can read the position coordinate value of the controller screen when it is touched, and the returned result is a numerical value.

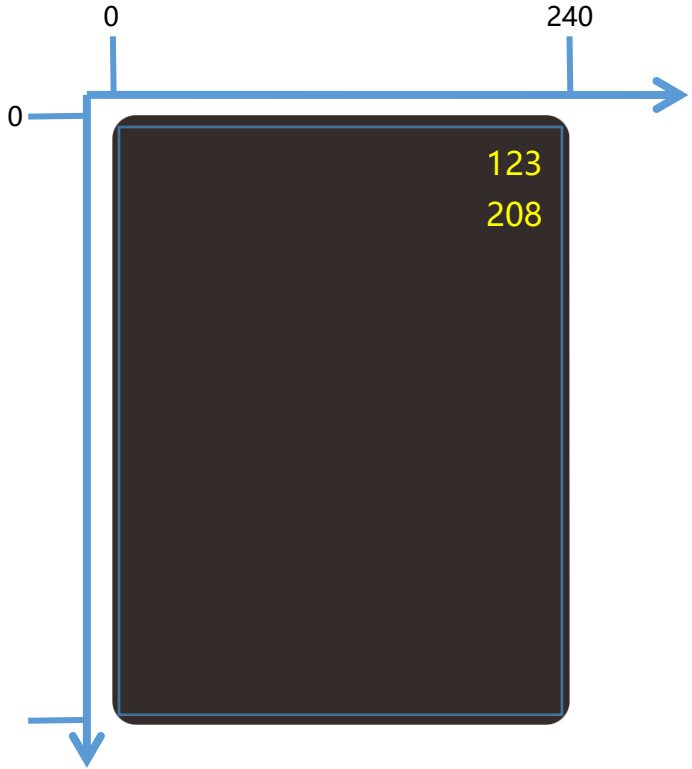
Exploration | Touchscreen





Please touch the controller display to confirm whether it can work normally, and display the touched coordinate data on the screen.

Exploration | Touchscreen

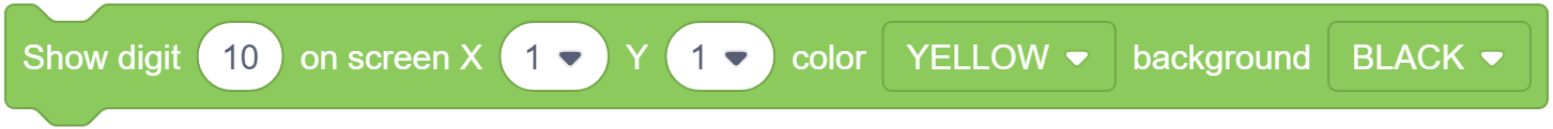


After testing, you can know:

Horizontal position X, range 0~240,

Vertical position Y, range 0~320.

Exploration | Show digit



Used to display numerical values on the controller screen.

Parameter:

X: displays a horizontal position

Y: displays a vertical position

10: displayed data

Yellow: font color

Black: background-color

If the font color is the same as the background color, the value will not be visible.

tips:

Color is expressed in the controller as a 6-digit hexadecimal value starting with #.

Common ones include:

#000000 black

#FFFFFF white

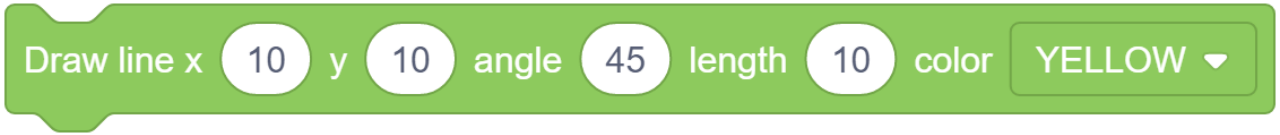
#FF0000 red

#00ff00 green

#0000FF blue

#FFFF00 yellow

Exploration | Draw a straight line



Used to draw a straight line in the controller screen.

Parameter:

x: horizontal position of the straight line’s starting point of

y: vertical position of the straight line’s starting point

45: Straight line angle

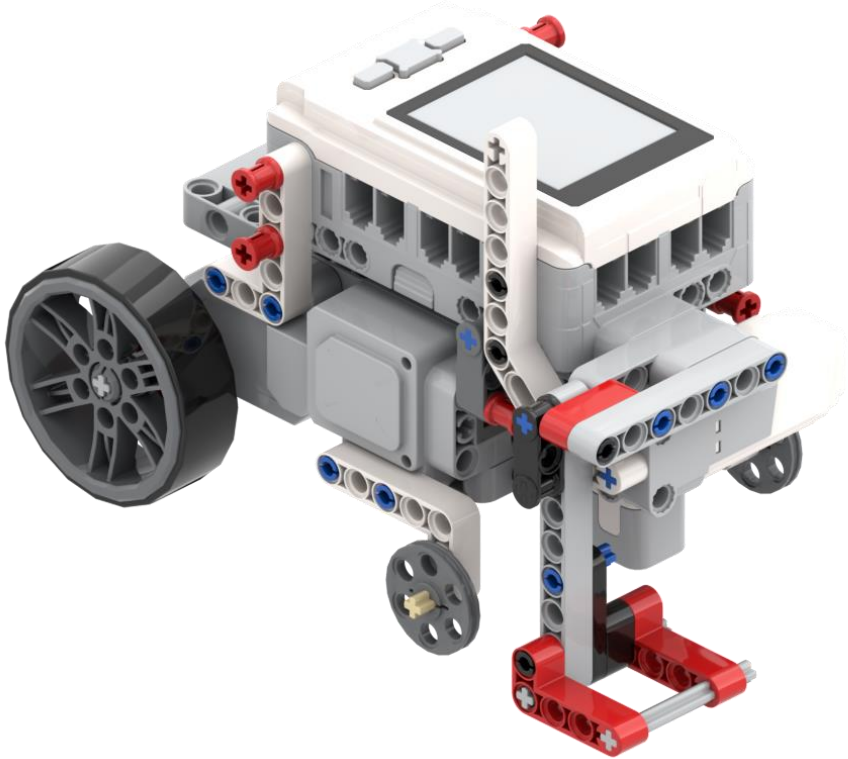
10: Straight line length

Yellow: straight line color



Optimization

Optimization | Analysis



Test, observe, and think:

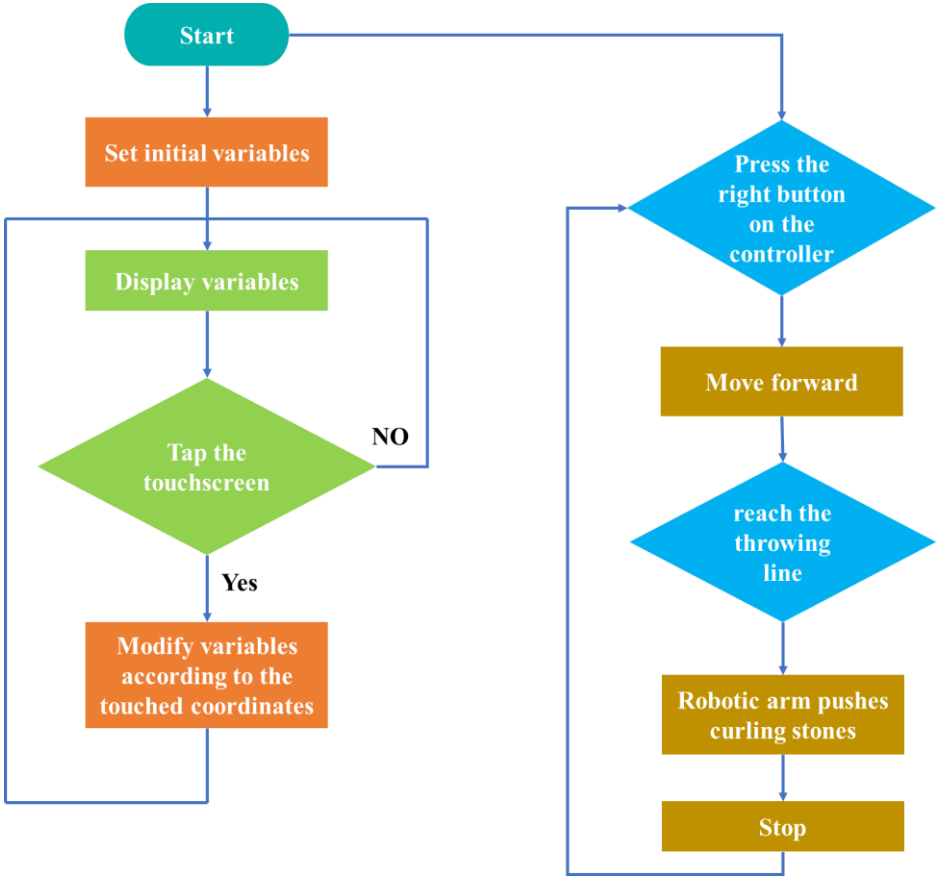
1. How many variables are needed? Where are they used?

2. How to use the touchscreen to modify variables?

3. How should the swinging arm be installed?

Please improve your robot, complete the function of controlling the speed of the robot, and play freely based on this.

Optimization | Analysis



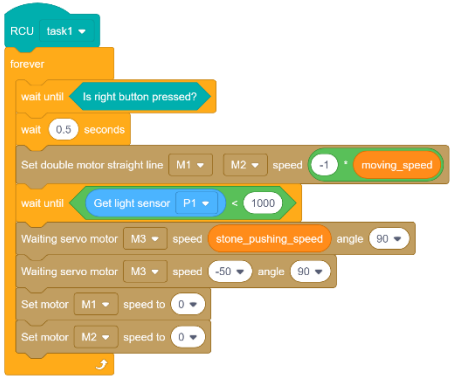
Test, observe, and think:

1. How to use ultrasonic sensors to determine the location of obstacles in front of the robot?

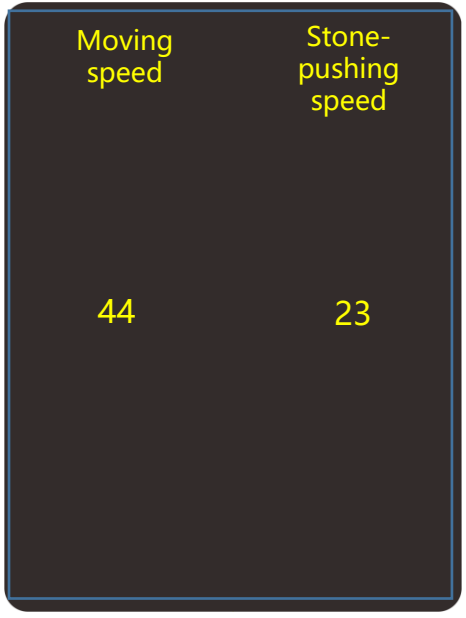
2. Which module can be used to make the robot's legs swing synchronously?

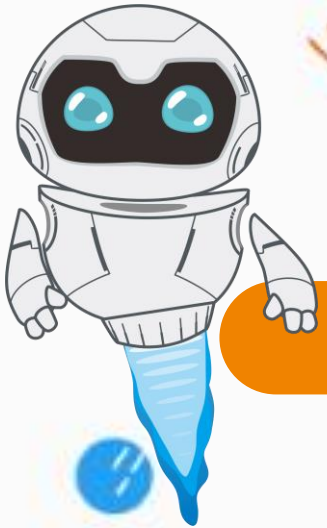
Please optimize and complete the programming of the robot, and then use it to play freely.

Optimization | Analysis









Result



Result | Curling Games

Let’s have a robot curling game!

Result | Display Your Robots

Please introduce your robots.

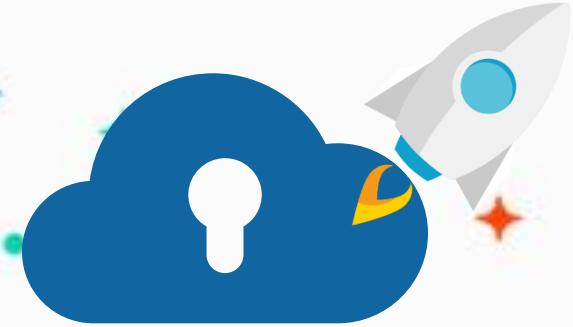
- Start with an interesting, powerful, and informative introduction to yourself
- Describe the building steps and program implementation process (problems encountered and solutions)
- Run the program to display your robot
- Explain the highlights of the work (add explanations for creative effects)

Result | Further Reading



After the curling stone is released, no one is allowed to touch it, so after throwing it, can we just leave it to fate? If the intensity is too high or too low, is there any chance to adjust if the line is crooked?

The answer is by sweeping the ice surface! The curling surface is not a completely flat ice surface but has numerous small bumps on the ice. After the curling stone is thrown, the friction coefficient of the ice surface can be adjusted by brushing the ice to achieve the purpose of adjusting and controlling the curling distance; the friction coefficient at different positions and directions on the curling route can also be adjusted to adjust the curling route and The purpose of the direction of rotation.



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Thanks!

LECTURER: