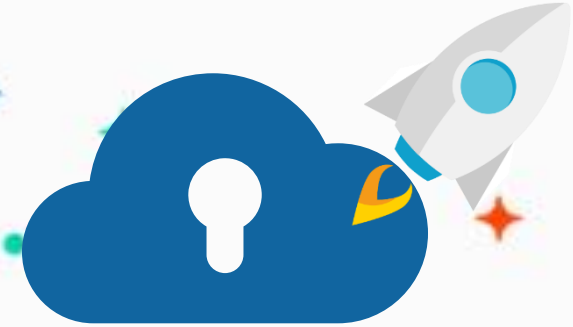

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Lesson 9. Personal Bodyguard

LECTURER:

Lesson Objective

Learning Objectives

1. Understand the technology of laser ranging.
2. Learn to use the Laser Ranging Sensor.

Possible Difficulties

1. The following range of the robot.
2. Mobile strategy of the robot.



Background Information



Context Import



With the explosive development of robots, we are increasingly inseparable from robots. All kinds of robots are becoming more and more popular in the market, ranging from delivering a courier to assisting in the operation of factories. They can be found in different scenes.

Context Import



Among them, transport robots are the most common, and they can greatly reduce the stress of people carrying heavy objects, how do they work?

In the beginning of transport robots, we need to control them to move by wired control or wireless remote control, at this stage, transport robots are not so popular.

Context Import



Thanks to various sensors, people have endowed robots with various perception capabilities. They can "hear", "see", and "smell" to help us better perform specific tasks.

Today, we will make a follower robot and give the robot "sight".



Knowledge Introduction

New Knowledge



The following robot is not a magical robot. It observes through "eyes", determines the distance to the target, and adopts different moving methods at different distances to realize the following function.

To endow robots with vision, there are many sensors to choose from. Ultrasonic, infrared, laser, etc. are all very good choices, and each has its own advantages in different scenarios.

Today we will use the laser ranging sensor to implement the following function.

New Knowledge

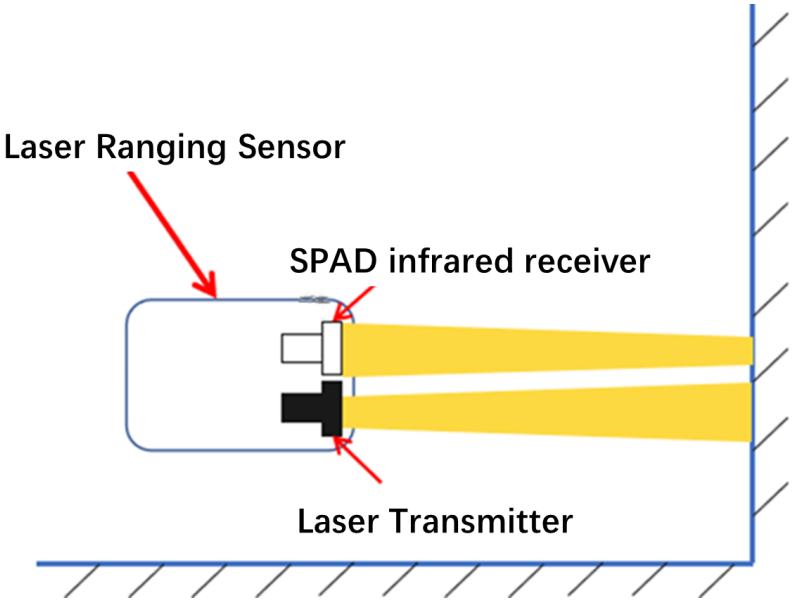


A laser ranging sensor is an electronic component that can measure the distance between the body and the object to be measured. By recording and processing the time elapsed from the time the laser is emitted until the return is received, the distance to the target can be determined.

The laser distance sensor has two detection modes:

1. Standard mode: the longest detection distance in standard mode is 1.2m.
2. Long-distance mode: the longest detection distance in long-distance mode is 2m.

New Knowledge



The Laser Ranging Sensor integrates the chip module of the laser transmitter and the SPAD infrared receiver, and calculates the distance by calculating the time of transmitting and receiving the laser. The accuracy of the detection distance reaches 1mm, and under normal circumstances, the detection range is 2-120cm. On objects of different colors, the reflectivity of laser light is different. In the case of the same laser intensity, the reflection efficiency of laser on white objects is higher than that on dark objects. In short, the whiter the object, the higher the reflection efficiency of the laser.

New Knowledge | Laser Ranging Sensor



Read the distance value between the Laser Ranging Sensor and the object in front.

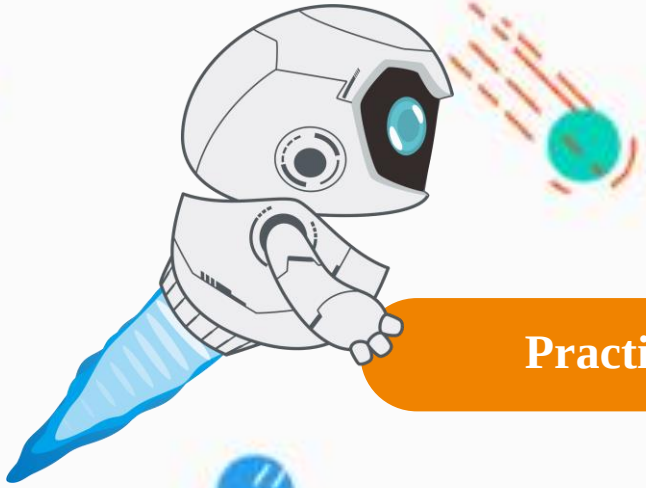
Parameter value: 1-8, sensor connection port

Parameter value: 1-2, divided into standard mode and long distance mode

Return value: 20-2000, unit millimeter (mm)

Tips:

When the measurement range is exceeded, the return value of the laser sensor is 8888.

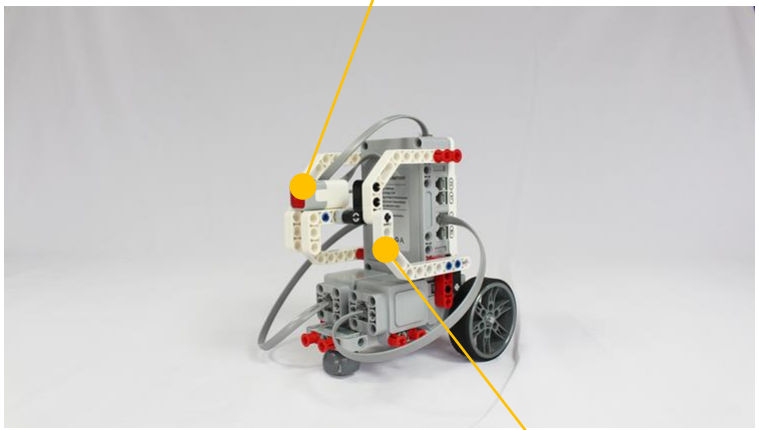


Practice



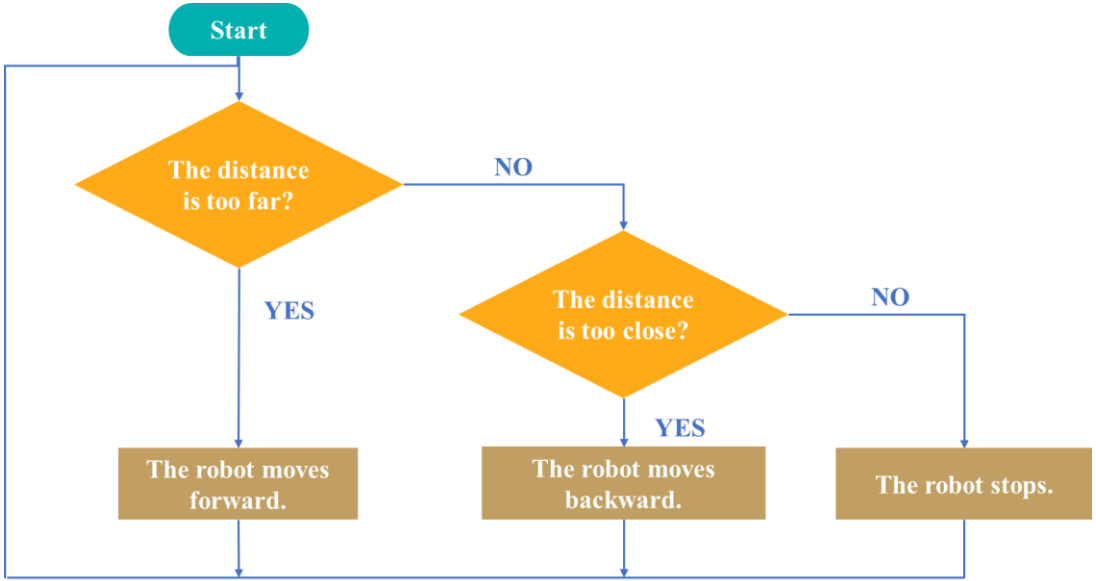


New Knowledge



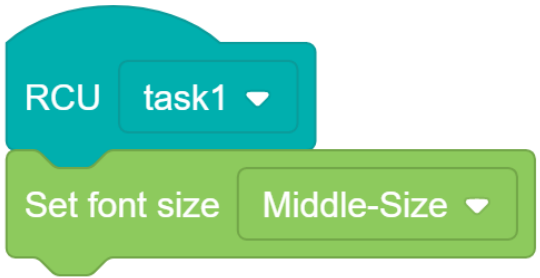
Assemble a following robot according to the building manual to realize the function of moving or stopping when the robot detects different distances.

Practice | Programming



When the laser ranging sensor detects different distances, the following robot will move forward or backward according to the program to realize the following function.

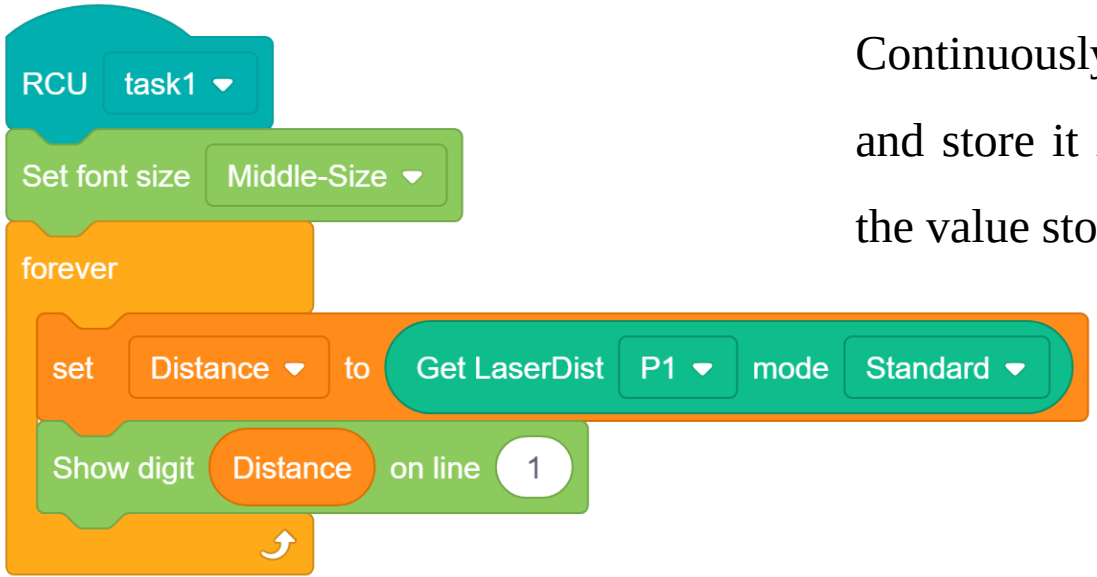
After starting the program, the program judges according to the value of the laser ranging. When the distance between the object and the robot is far, the robot moves forward; when the distance is close, the robot moves backward.



Initial Settings

Sets the font size of the displayed distance value to medium.

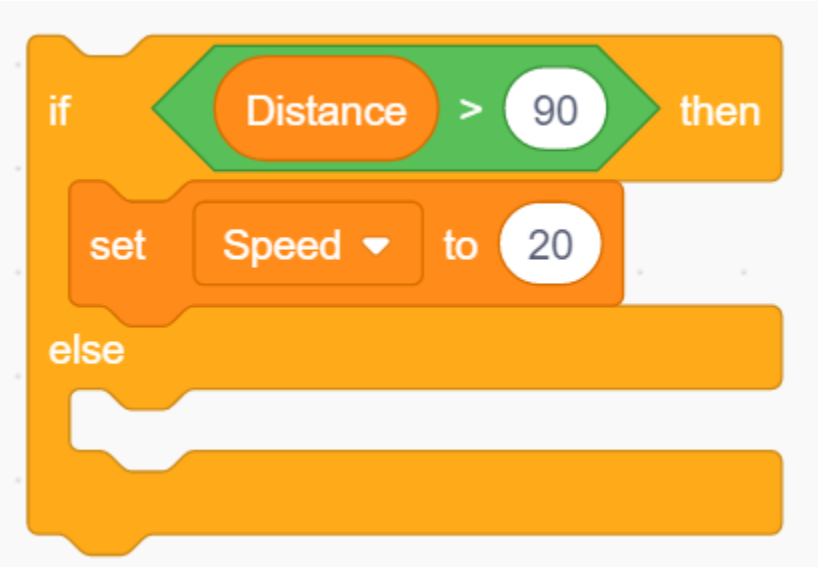
Practice | Programming



Display value

Continuously read the data of the sensor and store it in the variable, and display the value stored in the variable.

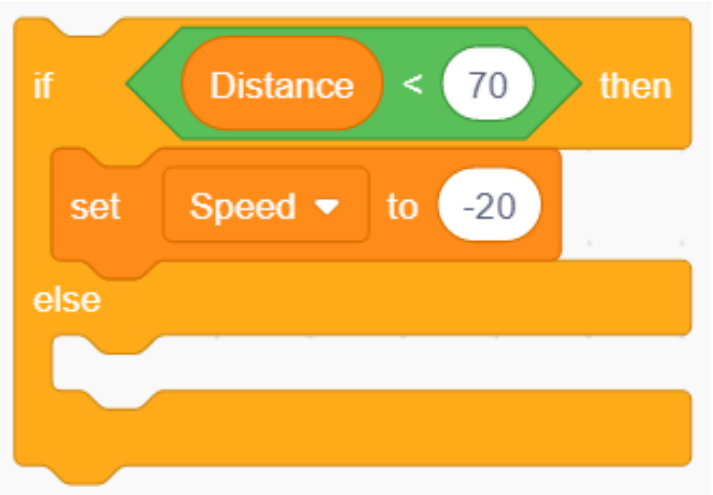
Practice | Programming



The judgment of distance

If the distance is greater than the set value, the robot will move forward.

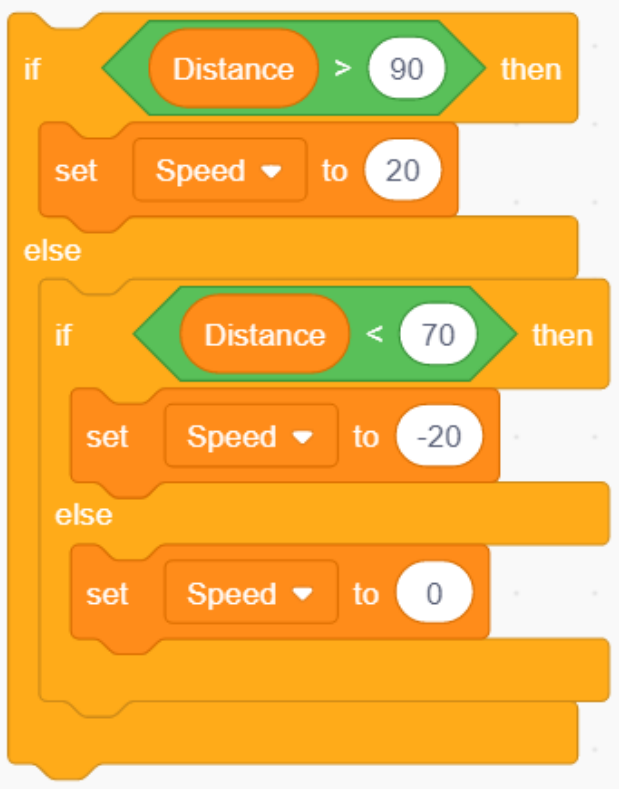
Practice | Programming



The judgment of distance

If the distance is greater than the set value, the robot will move backwards.

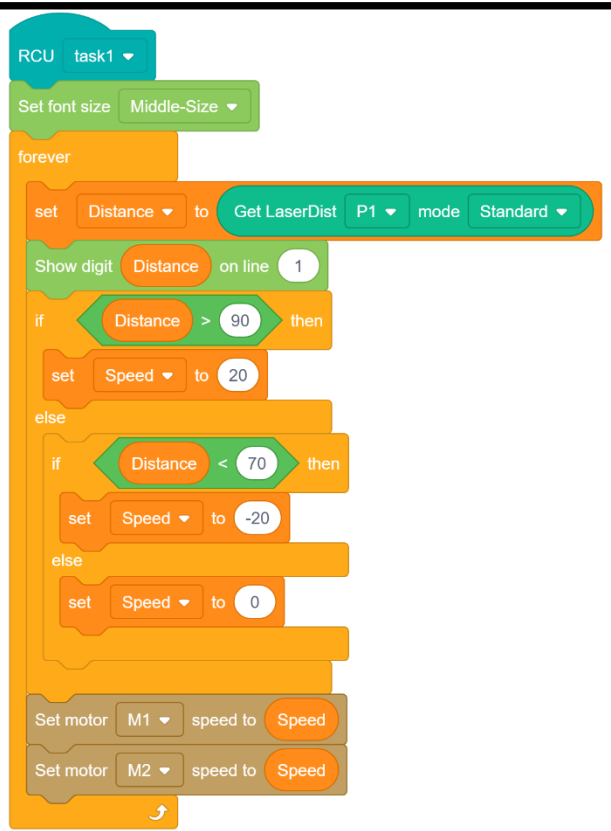
Practice | Programming



The judgment of range

Combining the previous two logical judgments, when they are not met, the robot will be located at a distance that is not far or near, and remain still.

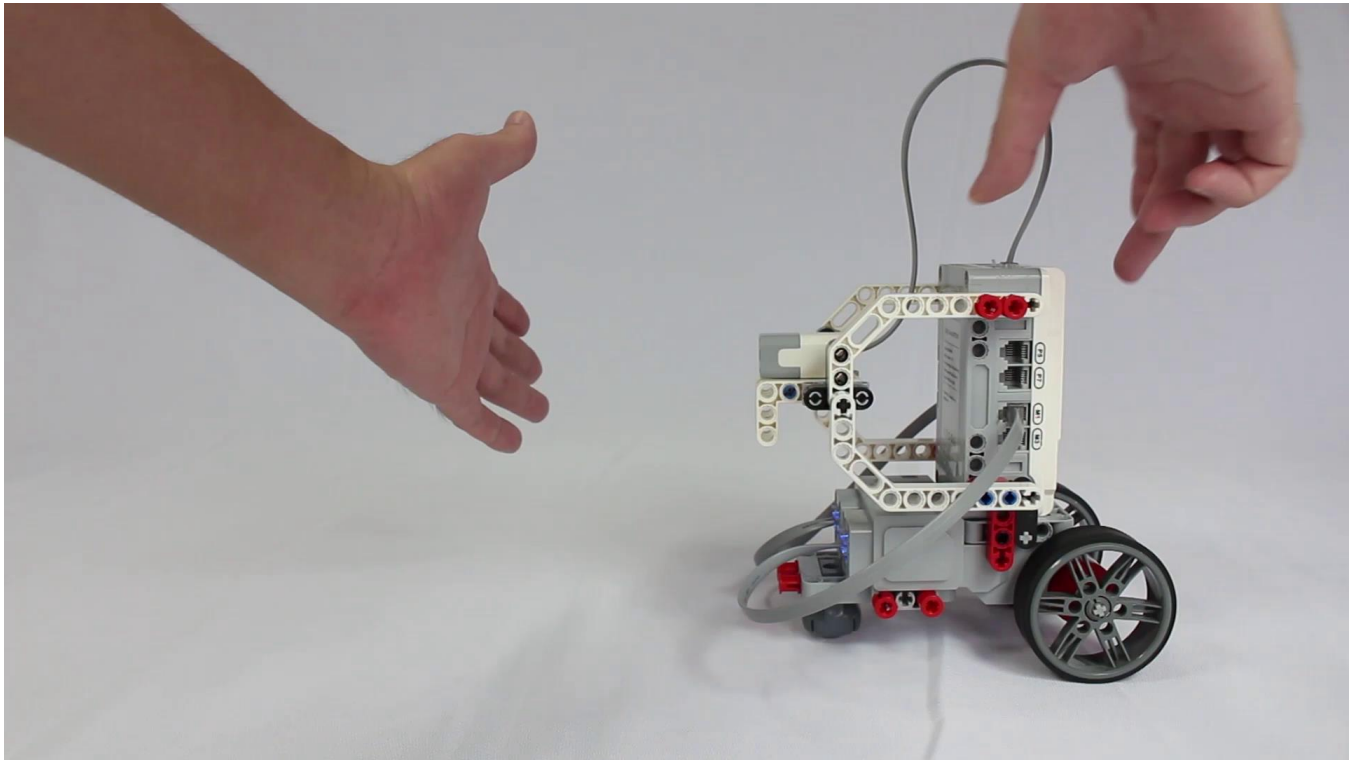
Practice | Programming

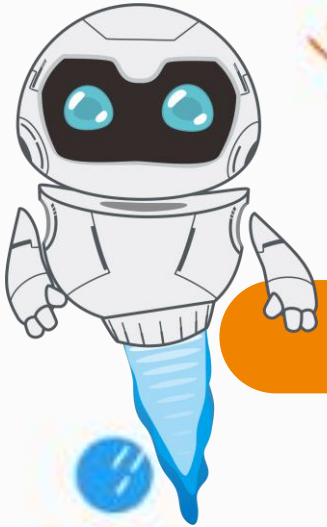


Integrate the program

Based on the flowchart and the previous program, the entire logic flow is integrated to control the rotation of the motor using the speed variable.

Practice | Programming





Results

Reflect | Program Optimization

This lesson implements the robot's ability to move back and forth or stop depending on the distance from the sensor to the object.

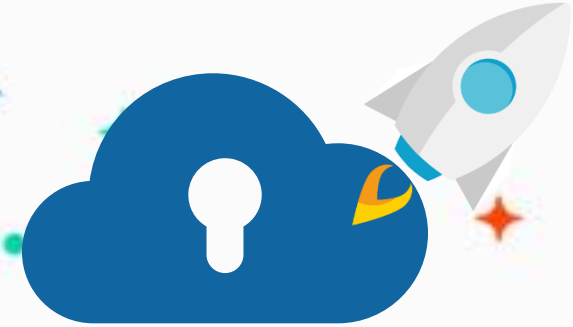
Next, modify the program so that the robot is able to approach at a faster speed when the distance is farther away.

Requirement: The robot moves forward at a faster speed when the robot measures a distance of more than 400mm.

Reflect | Further Reading



The reality of following is more complex. To achieve the following function, not only the distance between front and back direction, but also the angular direction, so commercial-type robots will choose more advanced rotation tracking module, so that the robot can also play the following effect in the complex environment.



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Thanks!

LECTURER: XXX