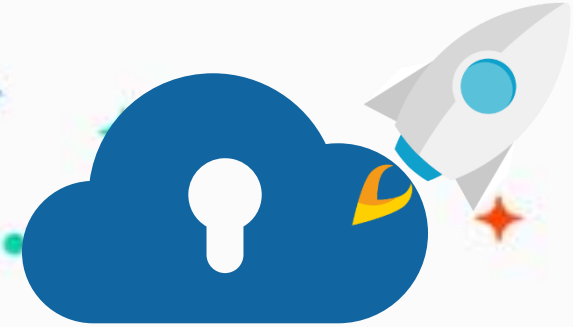

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Lesson 6. Magnetically controlled door

LECTURER:

Lesson Objective

Learning Objectives

1. In-depth understanding of the magnetic field and the direction of the magnetic field, knowing that the magnetic field has a north and a south pole.

2. The opening and closing of the door is controlled by a magnet.

Possible Difficulties

1. There are individual differences in the magnetic field strength of magnets and measurement data is required.

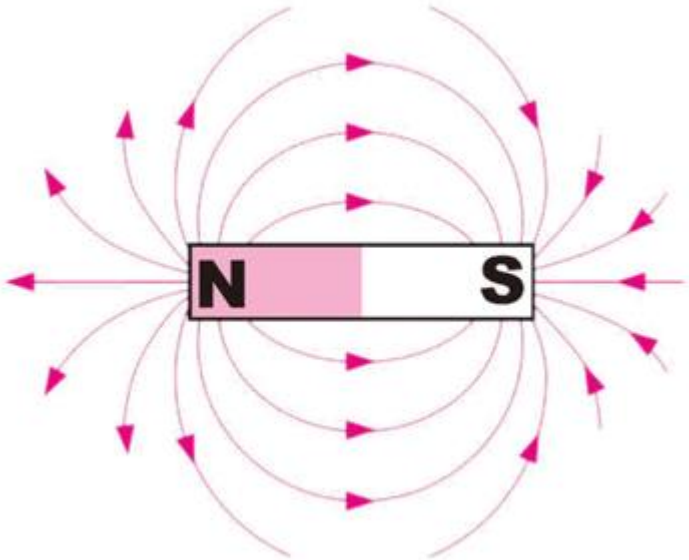
2. The range that the magnetic strength can affect is very small, and it needs to be measured many times during the experiment.



Background Information

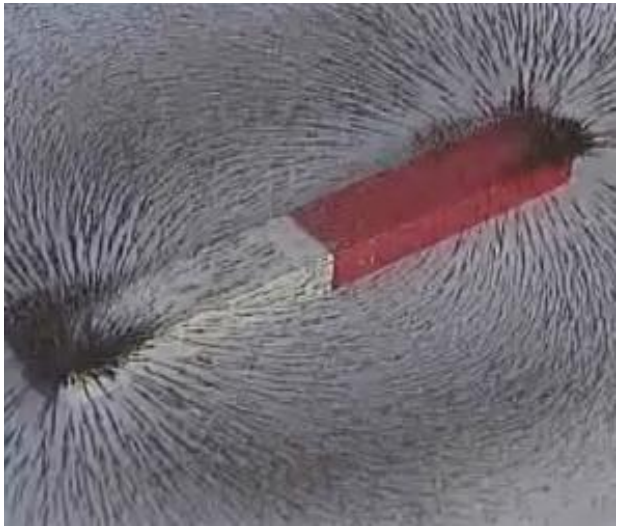


Context Import



There is an invisible and intangible substance around the magnet, which is called the magnetic field. The earth is a huge magnetic field. And the magnetic field has a direction. Magnetic field lines are usually used to express the direction of the magnetic field. Outside the magnet, the lines of magnetic field travel from the north pole N to the south pole S. Magnetic fields are strong. When the area is constant, the denser the lines of magnetic field are, the stronger the magnetic field will be.

Context Import



In order to accurately detect the data of magnets, a series of magnetic sensors have emerged to detect the magnetic field strength and polarity of magnetic objects. Among them, the most widely used are Magnetic Sensors. We can use the magnetic sensor to make a magnetic switch door and experience the magic of the magnetic sensor.



Knowledge Introduction

New Knowledge



The door of the refrigerator has a magnetic force. Through the magnet itself, it can help us to firmly attract the door to the door, so as to achieve a better effect of freshness preservation and heat preservation. In addition to the suction force, the magnetic force can also show repulsion, such as maglev trains, The train is suspended in the air through repulsion, reducing friction and obtaining faster speed.

New Knowledge



According to this characteristic of the magnet, people invented the magnetic suction door, which controls the closing of the door through the on and off of the power supply. Similarly, the magnetic principle is used to attract the opened door so that it cannot be closed by itself, commonly known as "Door Suction" or "Door Stopper".

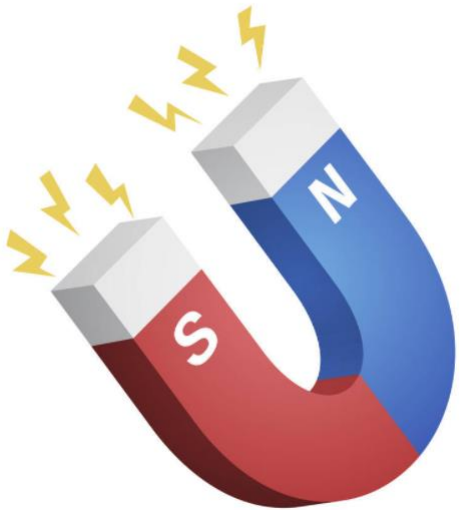
New Knowledge



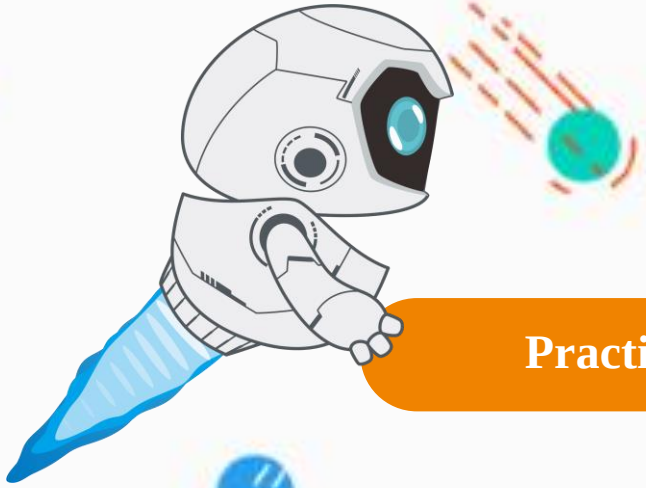
The design of the electromagnetic lock (or magnetic lock) is the same as that of the electromagnet, which uses the principle of electromagnetism. When the current passes through the silicon steel sheet, the electromagnetic lock will generate a strong suction force and tightly absorb the adsorption iron plate to achieve the effect of locking the door.

As long as there is some current, the electromagnetic lock will generate a huge magnetic force. When the power is disconnected, the electromagnetic lock loses its suction and the door can be opened. Make a magnetic switch door. The door will automatically open when a magnet is detected approaching, and it will automatically close after waiting for a period of time.

New Knowledge



According to the characteristics of the magnet, a magnetic switch door is made by simulating the electric suction door. The door will automatically open when a magnet is detected approaching, and it will automatically close after waiting for a period of time.

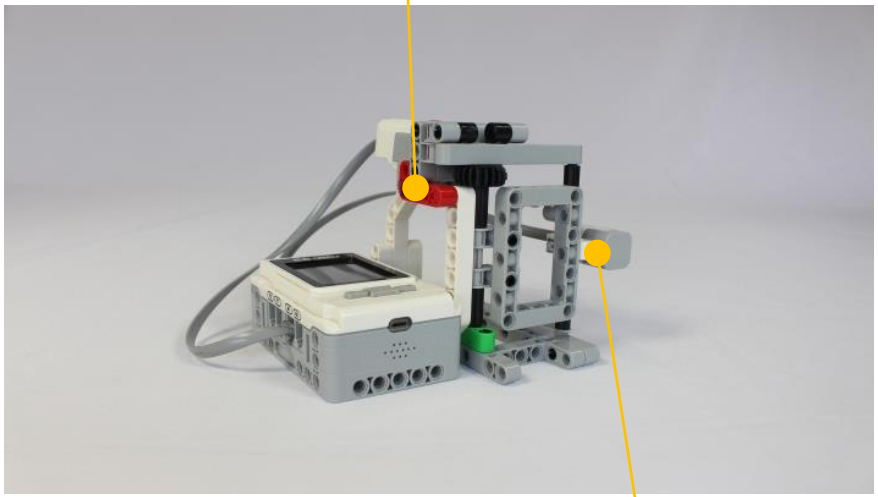


Practice



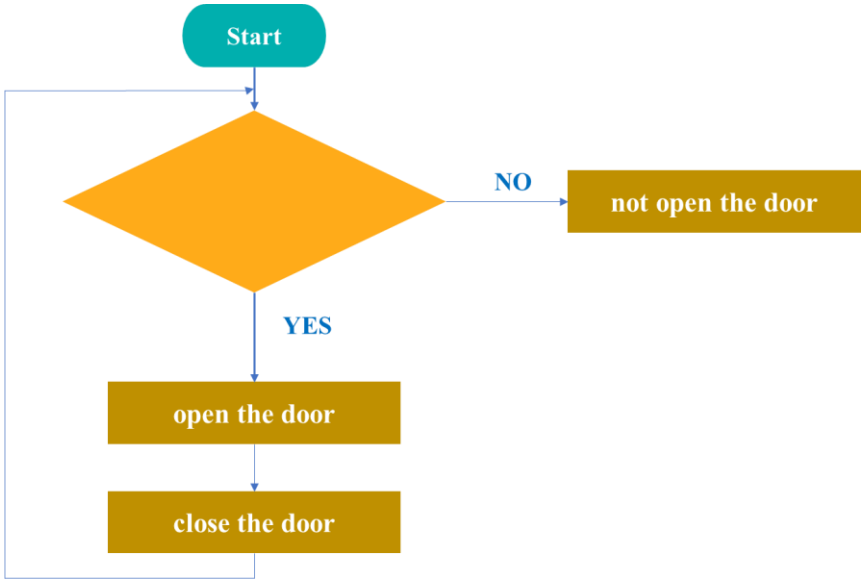


New Knowledge



Build the magnetic switch door according to the building manual and open the door according to the magnitude of the magnetic force.

Practice | Programming



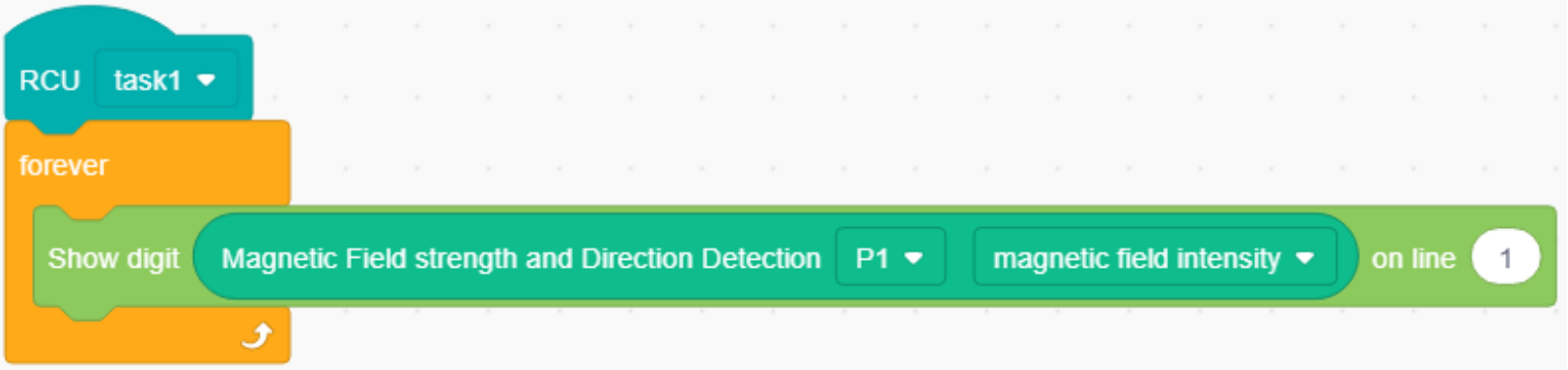
Use magnetic field strength to control the opening and closing of the door

When the conditions are met, the door is opened and closed after a period of time; if the conditions are not met, the door is not opened.

Here is a key, the value of the magnetic field intensity needs to be tested.

Before designing the program, specify the value of the magnetic field intensity.

Practice | Programming



Test settings

Displays the value of the magnetic sensor

on the first line.

Practice | Programming

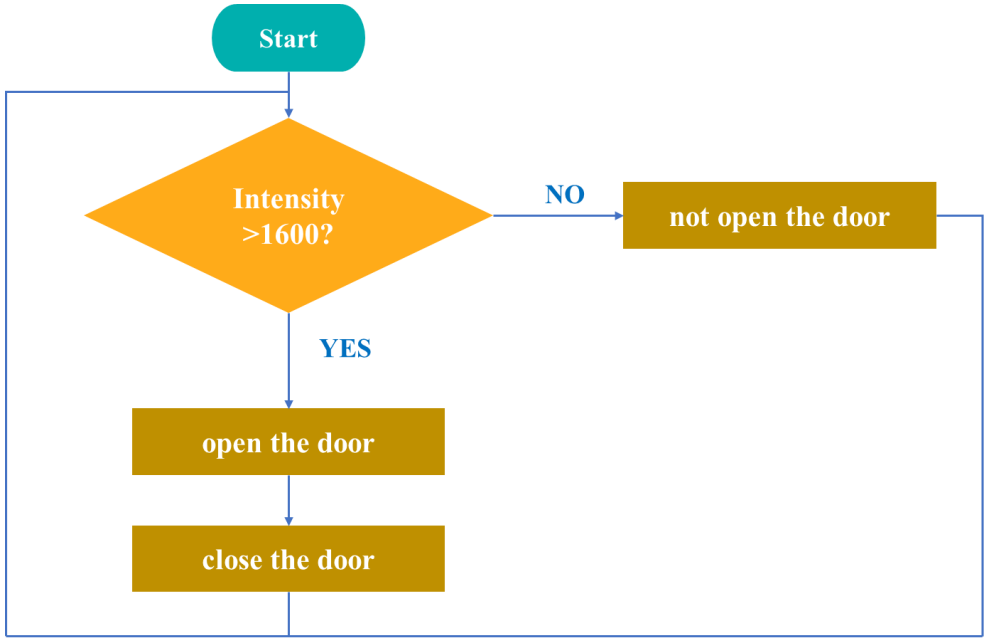
Round	Value
1	
2	
3	

Run the program and record the magnetic intensity data.

Detects what the value of the magnetic field strength is when one end of the magnet touches the magnetic sensor. The magnetic field strength will be different for different magnets.

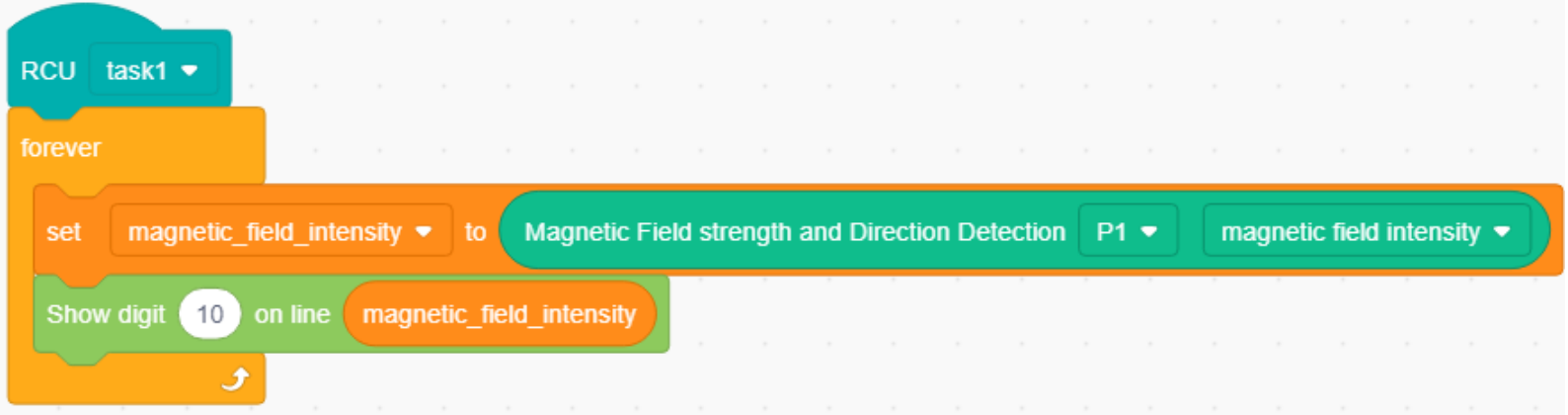
The magnetic field strength needs to be detected before the next programming step can be performed. Once the specific value is detected, a slightly smaller value can be set to control the opening and closing of the door when the magnet is close to the magnetic sensitive sensor. If a value of 1800 is detected on contact, then 1600 can be set to ensure that the magnetic door will operate properly.

Practice | Flow Chart



When the program starts, judge whether the current magnetic field intensity is greater than 1600. If it is greater than 1600, the door will be opened and then closed. If it is less than 1600, the door will not be opened.

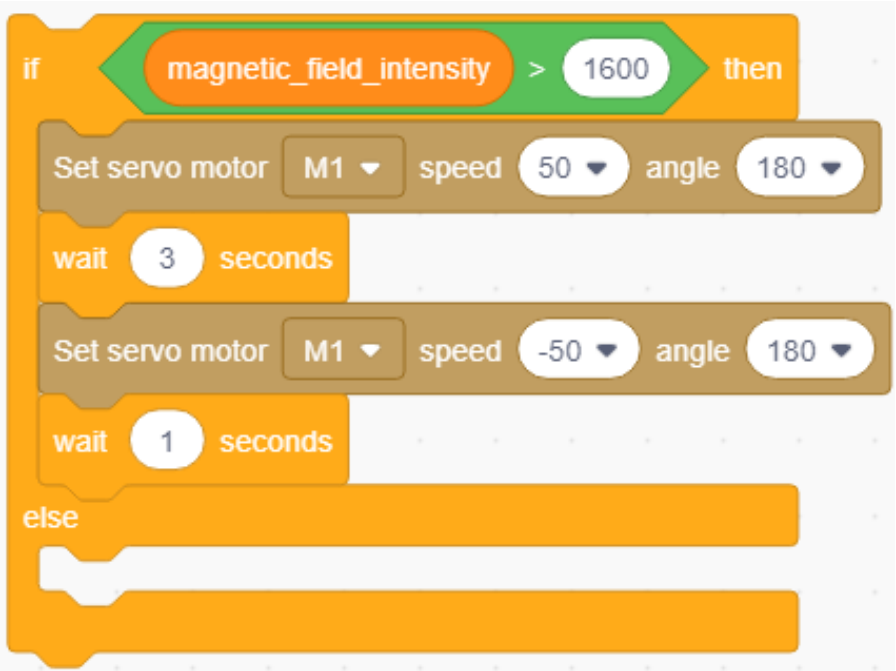
Practice | Programming



Display settings

Store the data of the magnetic sensor into a variable and display it on the first line.

Practice | Programming

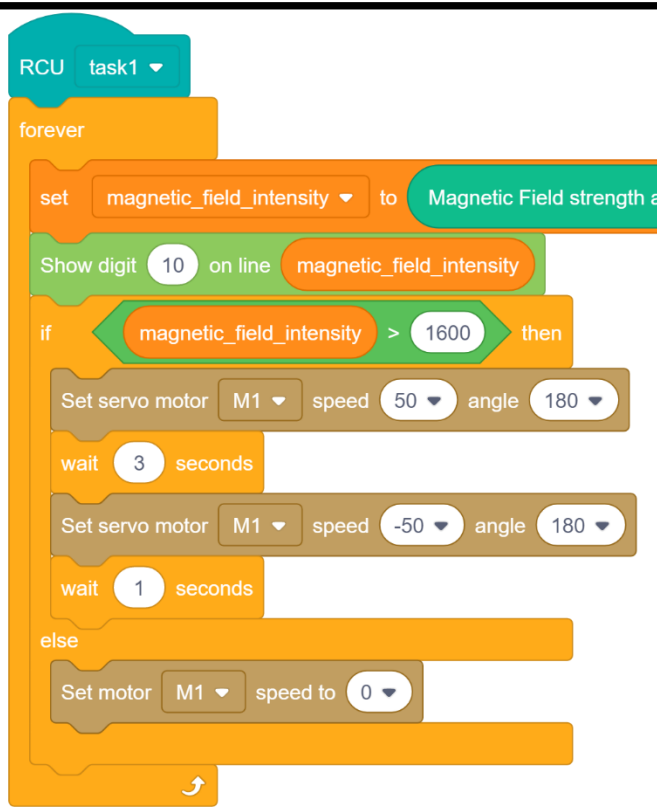


Open the magnetic door

After the magnetic field intensity is greater than the set value of 1600, open the door for 3 seconds then close it and wait for one second.

Waiting for one second is to avoid still detecting large magnetic intensity causing the door to keep opening and closing.

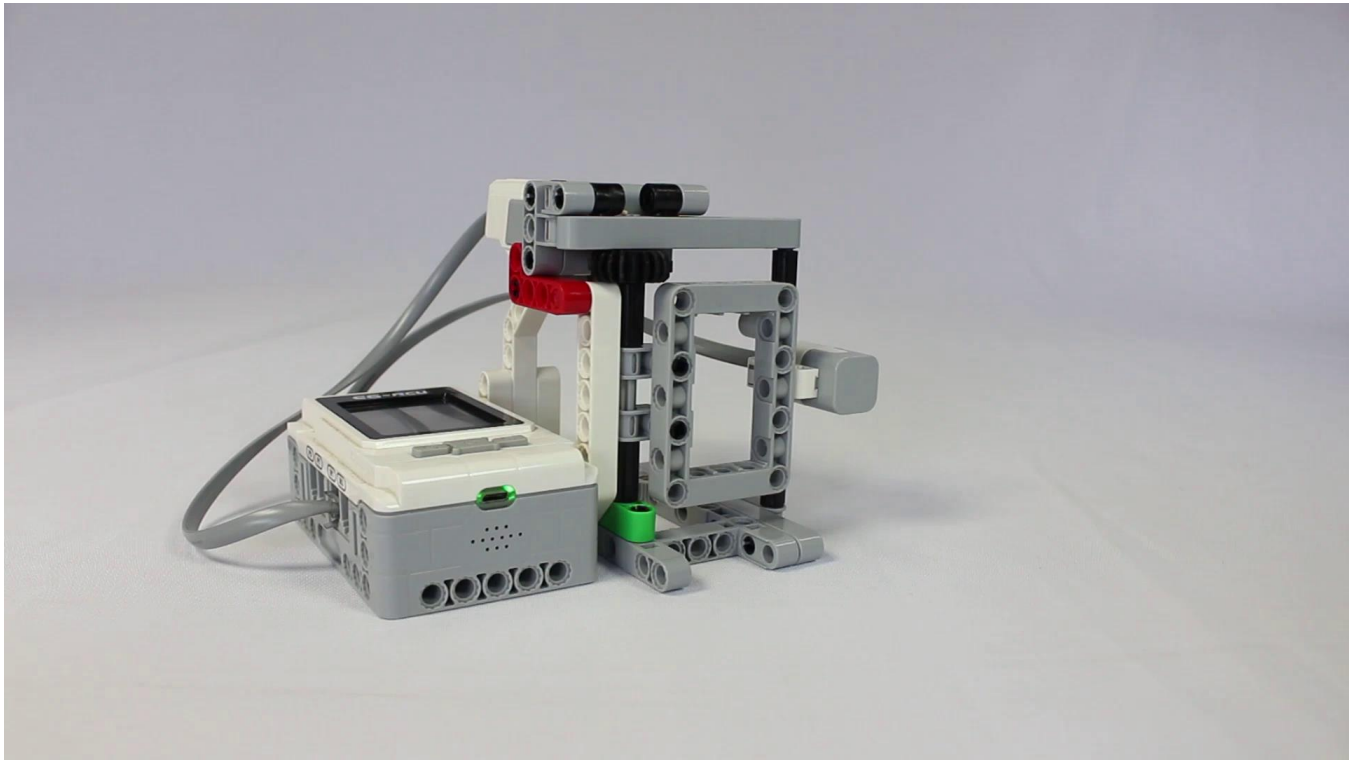
Practice | Programming

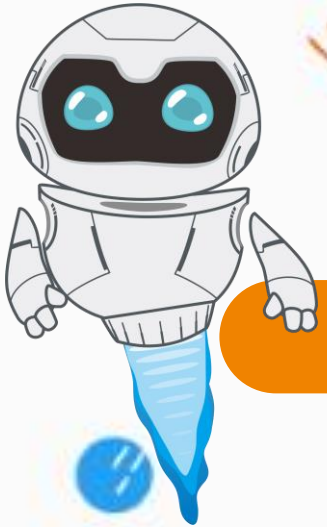


Integrate the program

Integrate each segment of the program according to the flowchart. When the value of the magnetic sensor does not exceed 1600, the motor does not rotate.

Practice | Programming





Results

Reflect | Program Optimization

This lesson implements that the door opens when a magnet is near the magnetic sensor and closes after waiting for a period of time; it stays closed if no magnet is sensed.

Next, modify the program to reverse the form of opening and closing the door.

Requirement: Modify the program logic to close the door when a magnet is detected to be close, otherwise open the door.

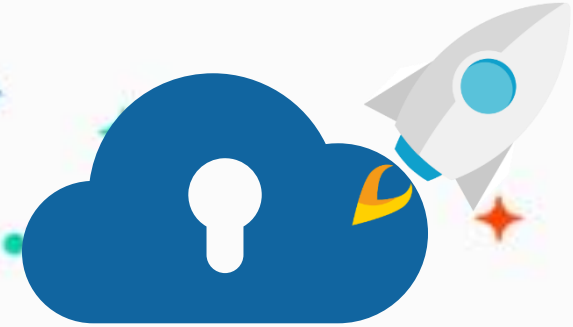
Reflect | Further Reading



Magnetic sensors can be used in brushless DC motors (Hall motors), which are used in tape recorders, video recorders, XY recorders, printers, record players, and ventilation fans in instruments.

In addition, the Hall element and Hall sensor in the magnetic sensor are also used to measure the speed, flow, and flow rate, and use it to make Gauss meters, ammeters, power meters and other instruments.





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Thanks!

LECTURER: