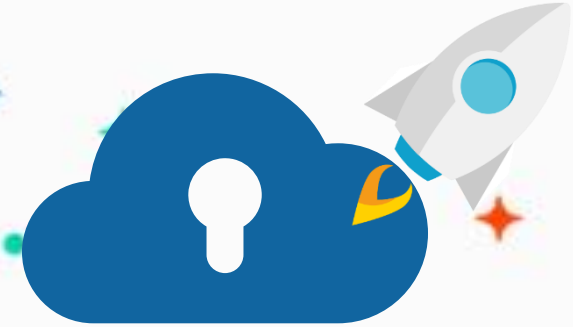

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Lesson 24. Automatic Seesaw

LECTURER:

Lesson Objective

Learning Objectives

1. Learn about the seesaw.
2. Learn about the lever principle of the seesaw.

Possible Difficulties

1. Build a seesaw.
2. The program of moving up and down on both sides of the seesaw.



Background Information



Background Information



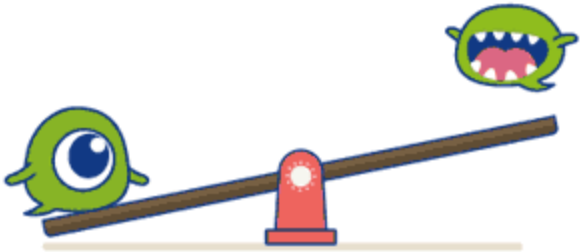
Seesaw is a simple game that requires two people to cooperate with each other to experience the fun. The seesaw can make people feel the weightlessness caused by rising and falling for a short time, and stimulate the human body to produce a pleasant feeling.

Background Information



Not everyone knows how to properly use a seesaw. Many believe it's meant for comparing weight, but in reality, it requires cooperation to bring joy to both users.

Background Information



For two people of similar weight, the person in the lower position needs to use his feet to lift himself to a higher position. In comparison, the person initially in a higher position has dropped to a lower place due to the effect of leverage. He needs to use his feet to push the ground again to return to a higher position. The better the two work together, the more they can go up and down.



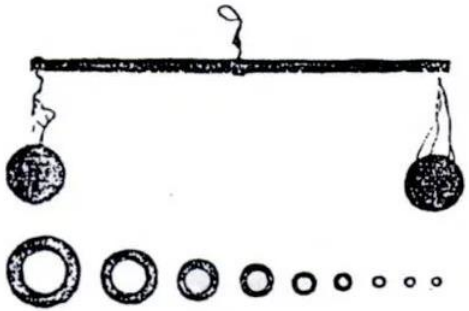
Knowledge Introduction

New Knowledge



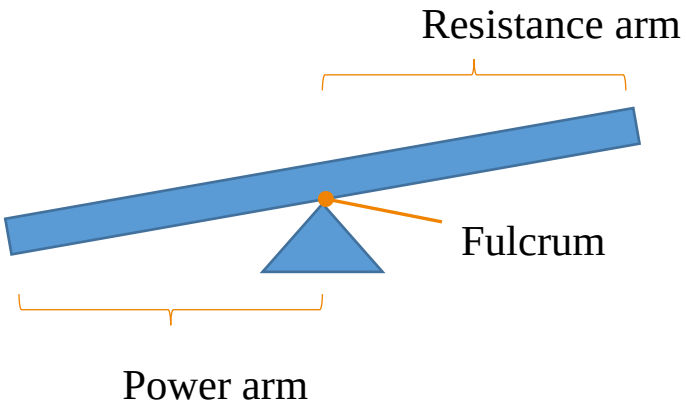
The seesaw is based on the principle of leverage. The principle of leverage was first proposed by Archimedes. Through the principle of leverage, people can move and transport heavy objects more easily.

New Knowledge

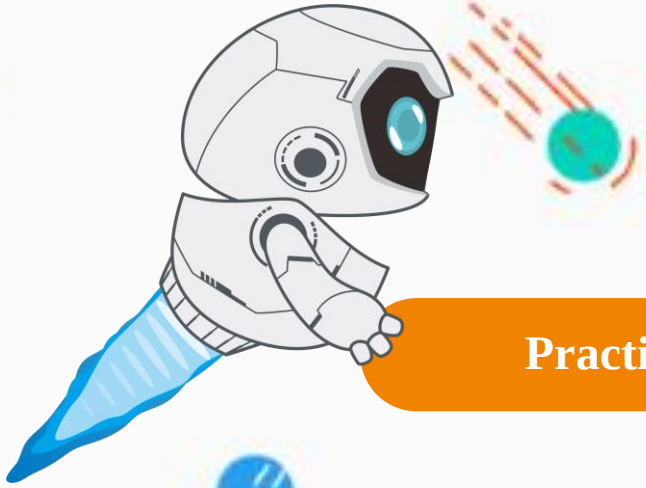


During the Warring States period, Mohism also summed up the law in this area. It is recorded in the "Mojing": "Hengmu: if it is heavier on its side, it must be hammered one by one." It means that if you want to keep the balance between the two sides of the wood, the weight of the placed objects should be consistent. Tools such as balances were also invented based on the principle of leverage.

New Knowledge

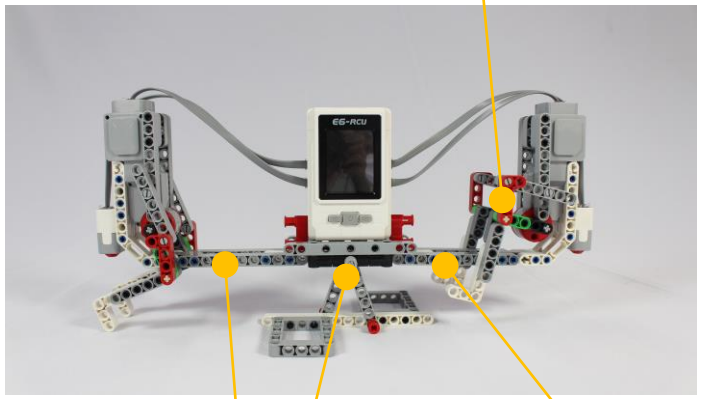


The lever consists of two parts, the fulcrum and the hard rod. In order to learn and understand better, it is generally divided into three parts: the fulcrum, the power arm, and the resistance arm. The power arm and resistance arm are divided from the hard rod. The seesaw we built today will use an equal-armed lever, that is, levers with the same length as the power arm and resistance arm.



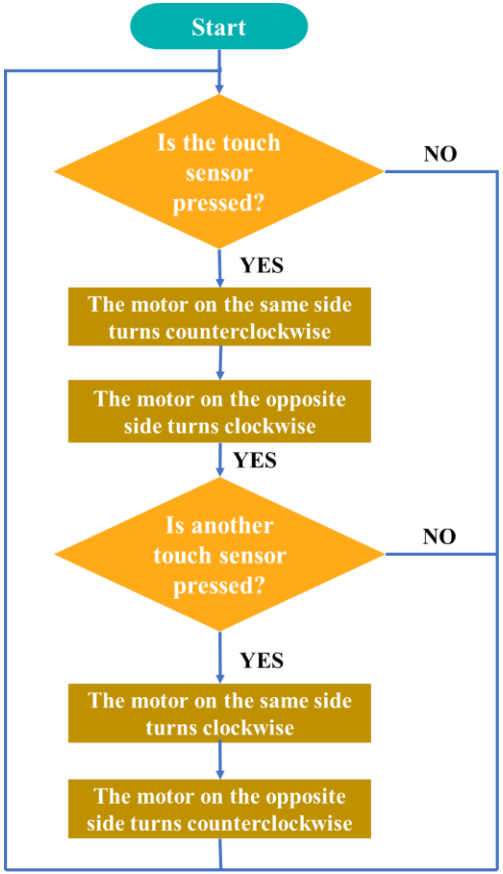
Practice

New Knowledge

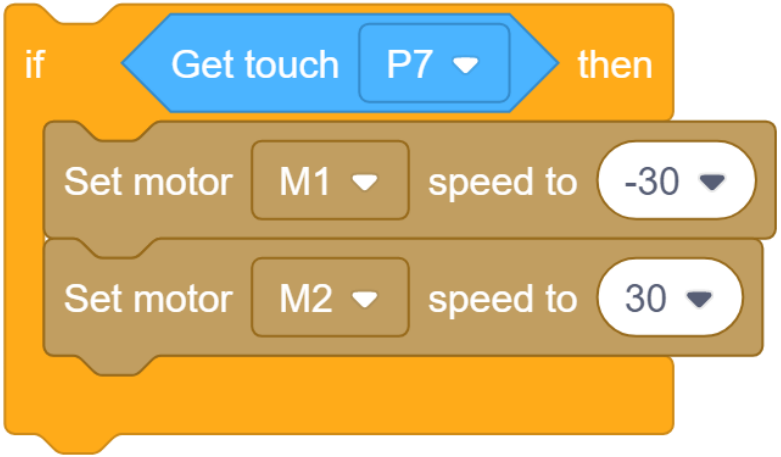


According to the building manual, build a seesaw to realize the function of "kicking" and lifting after the motor touches the ground, and the machine can move back and forth on both sides by itself.

Practice | Flow Chart

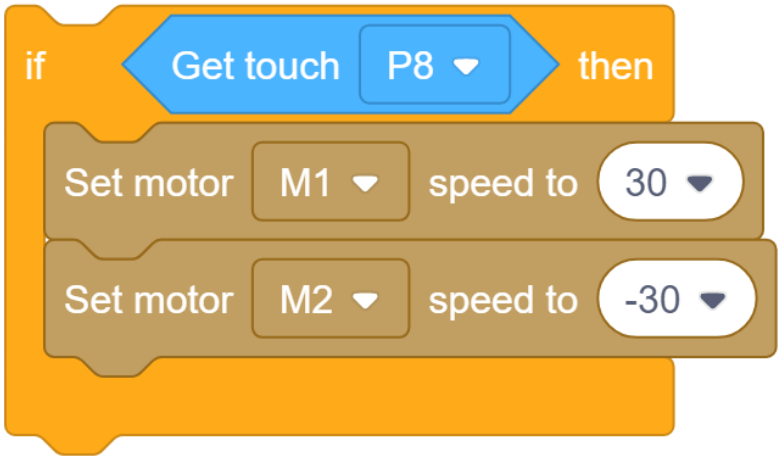


The motor rotation needs to be triggered by the touch sensor. After the touch sensor is triggered, the motor controls the connecting rod to rotate down, thereby realizing the leg-kicking action. The motor is combined with the touch sensor, and the touch sensor is triggered when the motor touches the table.



Judgment on whether to touch the ground

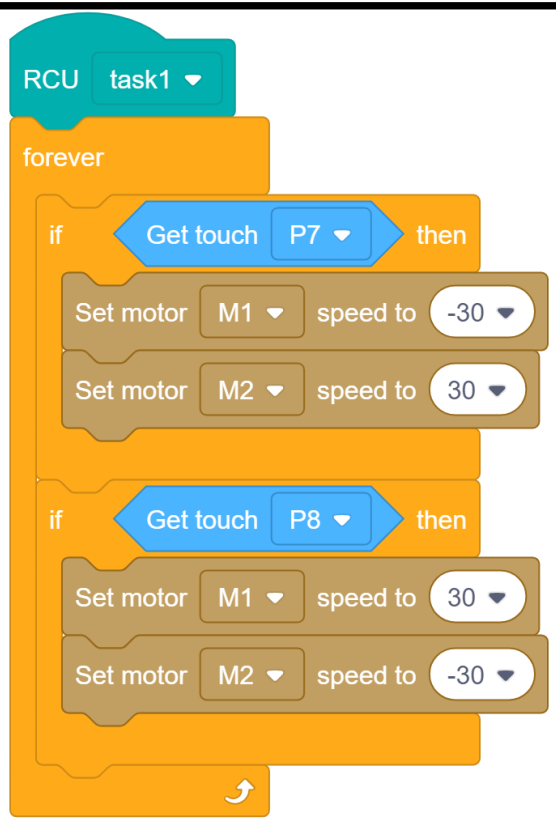
First, program the touch sensor on one side so that the speed of the motor is not too high, so that the robot can operate normally.



Judgment on whether to touch the ground

Change the direction of motor rotation, turn kicking into retraction, and turn retraction into kicking on the other side.

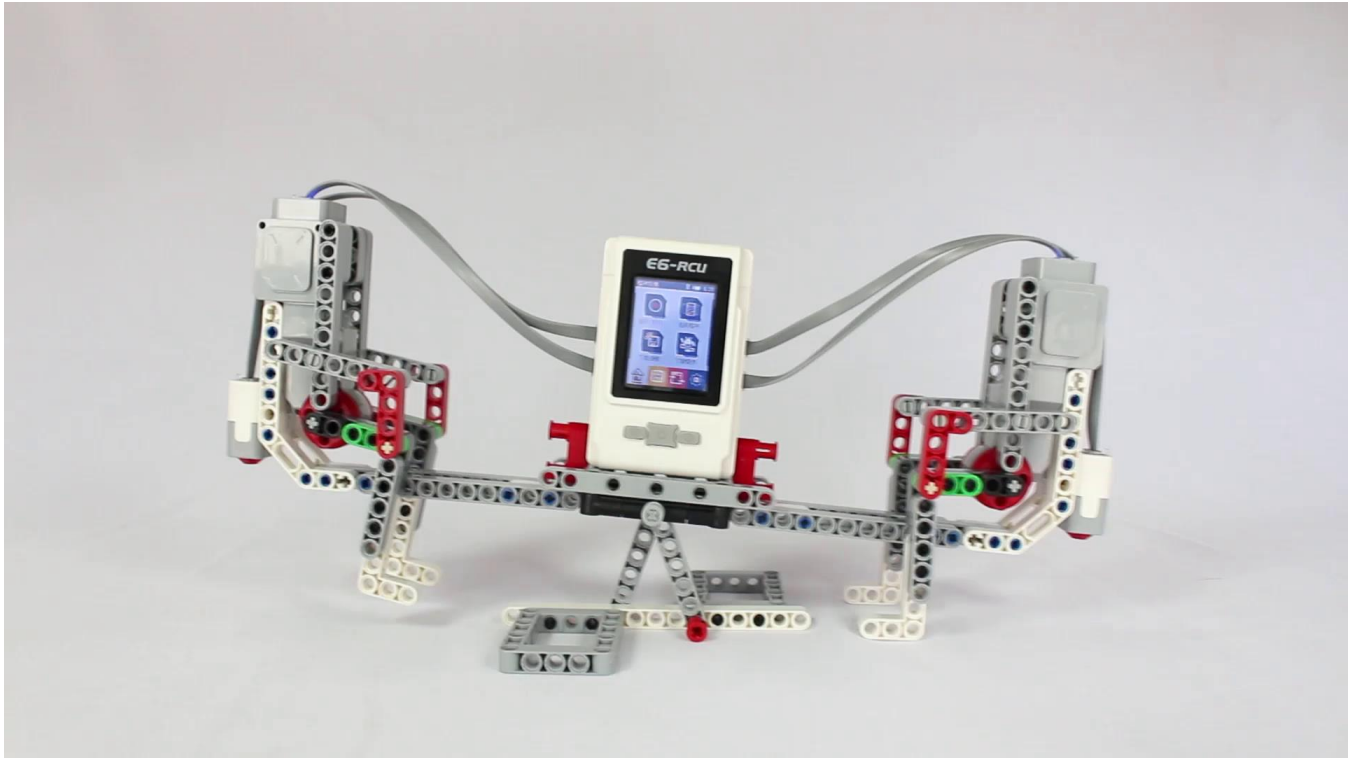
Practice | Programming

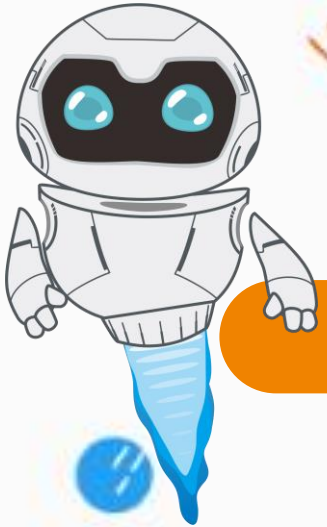


Integrate the program

Integrate the program according to the flowchart.

Practice | Programming





Results

Program Optimization

In this lesson, we implemented the function of moving up and down on the seesaw.

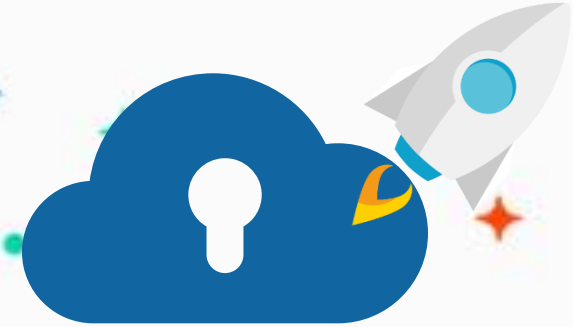
Next, modify the seesaw to change the way the robot switches the direction of motor rotation.

Requirements: Use other sensors or different program logic to achieve the same seesaw function.

Further Reading



Archimedes has such a famous saying that has been circulating for a long time: "Give me a fulcrum, and I can pry up the whole earth!" This sentence refers to the principle of leverage. Archimedes first regarded some empirical knowledge in the practical application of levers as "self-evident axioms", and then proceeded from these axioms, using geometry to pass rigorous logical demonstrations, and came up with the principle of leverage.



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Thanks!

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