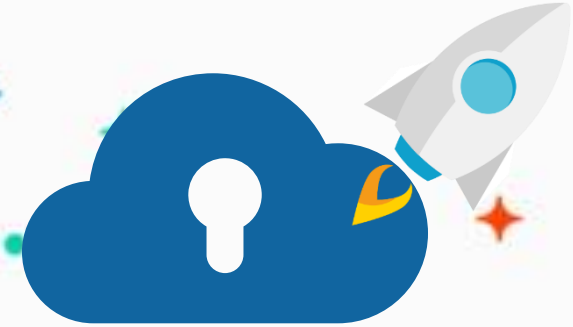

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Lesson 12. Elf in the Tree

Lecturer:

Lesson Objective

Learning Objectives

1. Get to know sloths and build a sloth robot
2. Use RoboCode to write a program to control the sloth to move forward and backward.
3. Allow the sloth to follow the movement of the object in front, and move during the day and sleep at night.

Possible Difficulties

1. Construction and reinforcement of parallel linkage climbing structure.
2. Application of multiple sensors and programming.



Background



Background Knowledge | Sloth



Sloths have a slightly monkey-like appearance and slow movements. They often hang their claws upside down on branches for hours without moving.

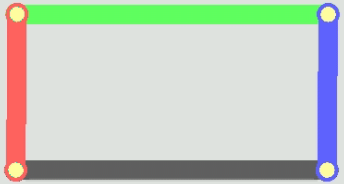
Sloths have become highly specialized for an arboreal life and have lost the ability to move on the ground. Although they have legs, they cannot walk and rely on their forelimbs to drag their bodies forward.

Sloths live in trees all year round, hooking their claws to branches to hang upside down and move around the trees. They move so slowly that algae, lichens and other plants may even grow on their bodies.



Introduction

Introduction | Parallel Four-bar Mechanism



A four-bar mechanism in which all kinematic pairs are rotating pairs is called a four-bar hinged mechanism, which is the basic form of a planar four-bar mechanism.

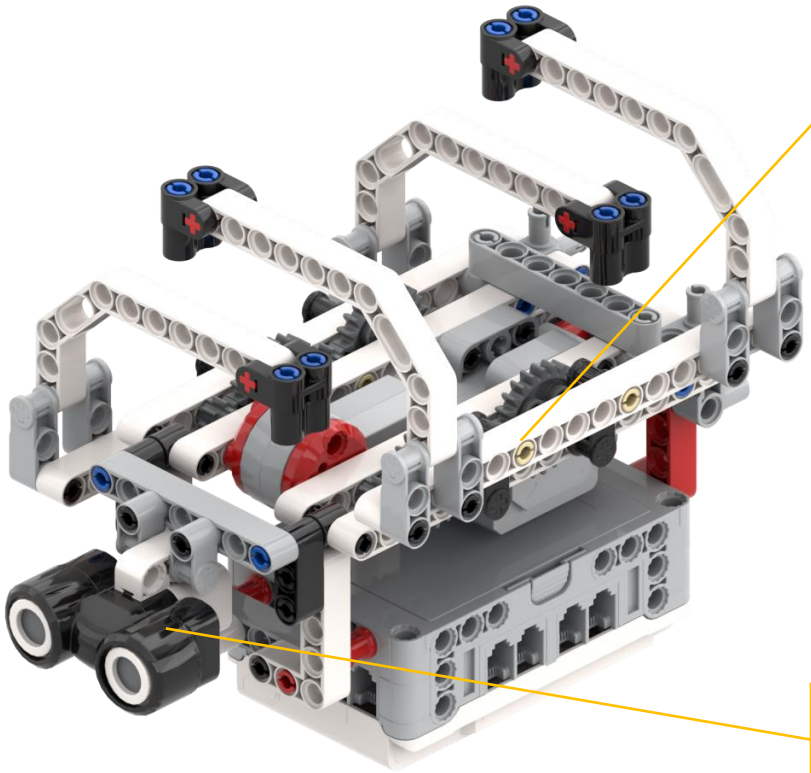
When four bars form a parallelogram, it is a parallel four-rod structure. The parallel four-bar mechanism can transmit rotation or swing to other connecting rods in parallel.



Practice



Practice | Robot Building

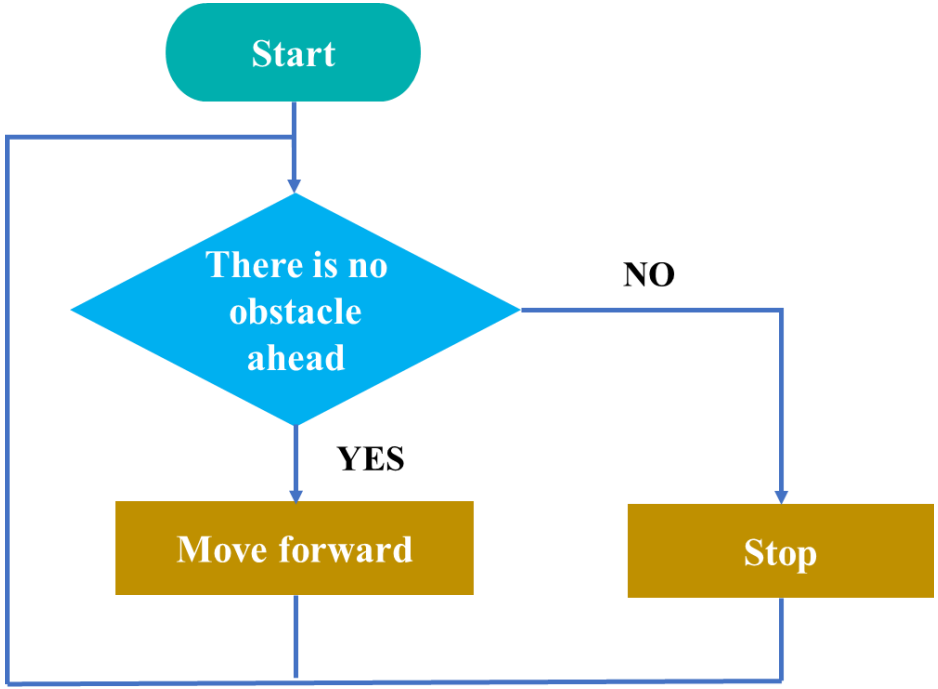


Parallel link structure drives the sloth's limbs

Measuring distance with the ultrasonic sensor

Build the sloth robot according to the building manual and choose the port yourself.

Practice | Flowchart



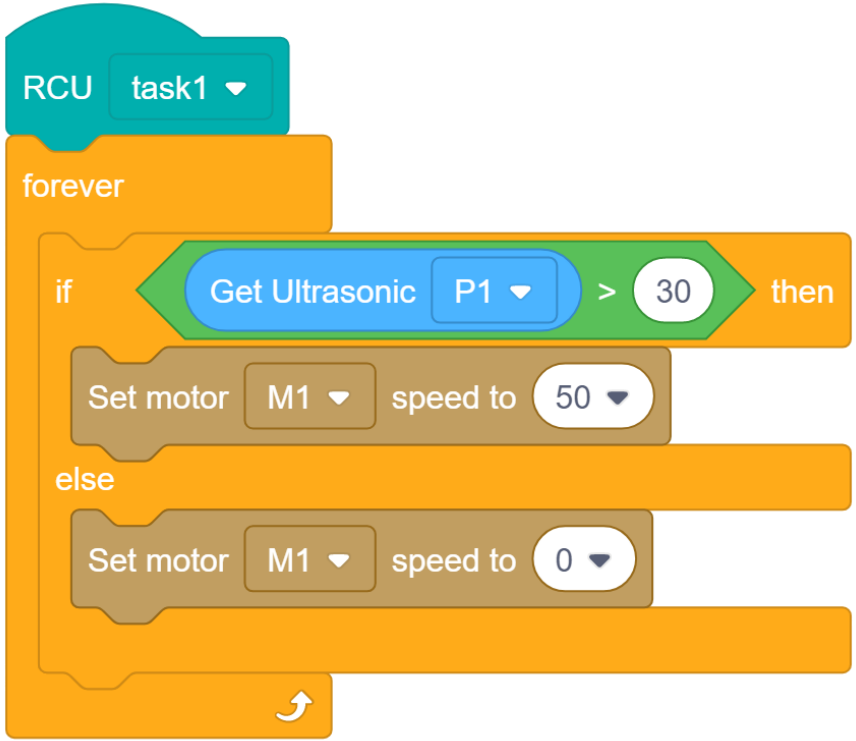
The program flow of the sloth robot:

① If there are no obstacles ahead, move forward.

② Stop moving if there is an obstacle.

③ Repeat this cycle.

Practice | Programming



The program flow of the sloth robot:

① If there are no obstacles ahead, move forward.

② Stop moving if there is an obstacle.

③ Repeat this cycle.

Exploration





Exploration | Discussion

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

Is the sloth crawling unsteadily?

Isn’t the action rich enough?

Add more effects?

Exploration | Discussion

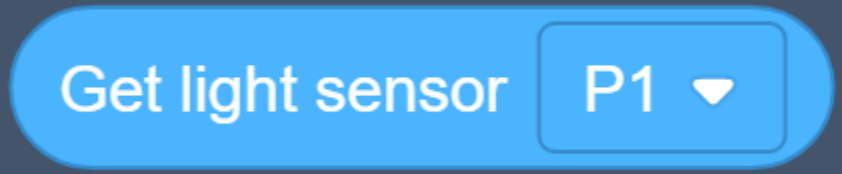
So, how to solve these problems and make improvements?

Exploration | Photoelectric Sensor



A light sensor, also known as a photoelectric sensor, is an electronic component that can distinguish between different shades of color. It can also be used to detect the size of ambient light.

Exploration | Programming Module



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.

Exploration | Programming Module

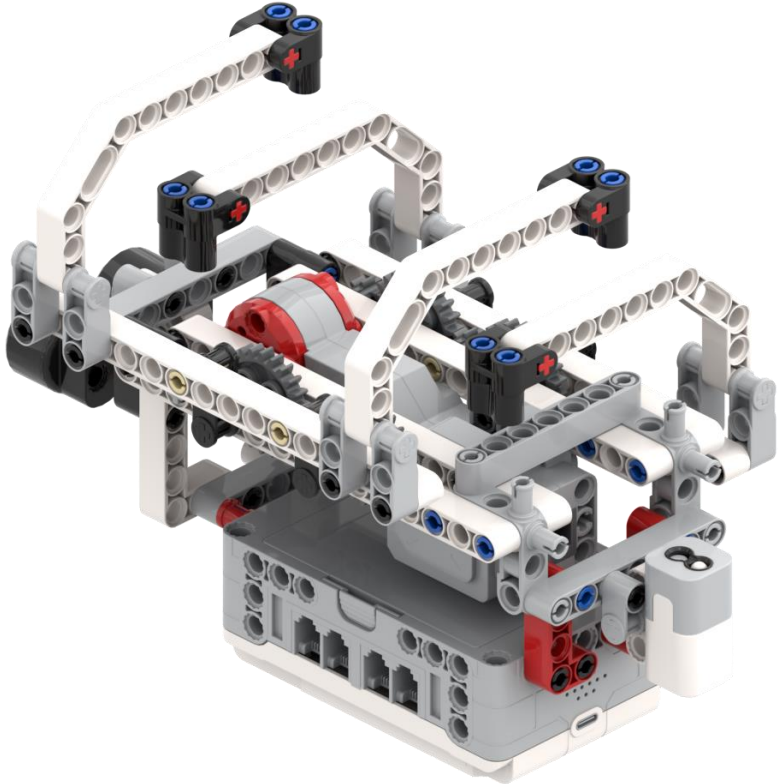


To detect ambient light instead of reflected light, we can use this module to turn off the photoelectric sensor's LED light.



Optimization

Optimization | Analysis



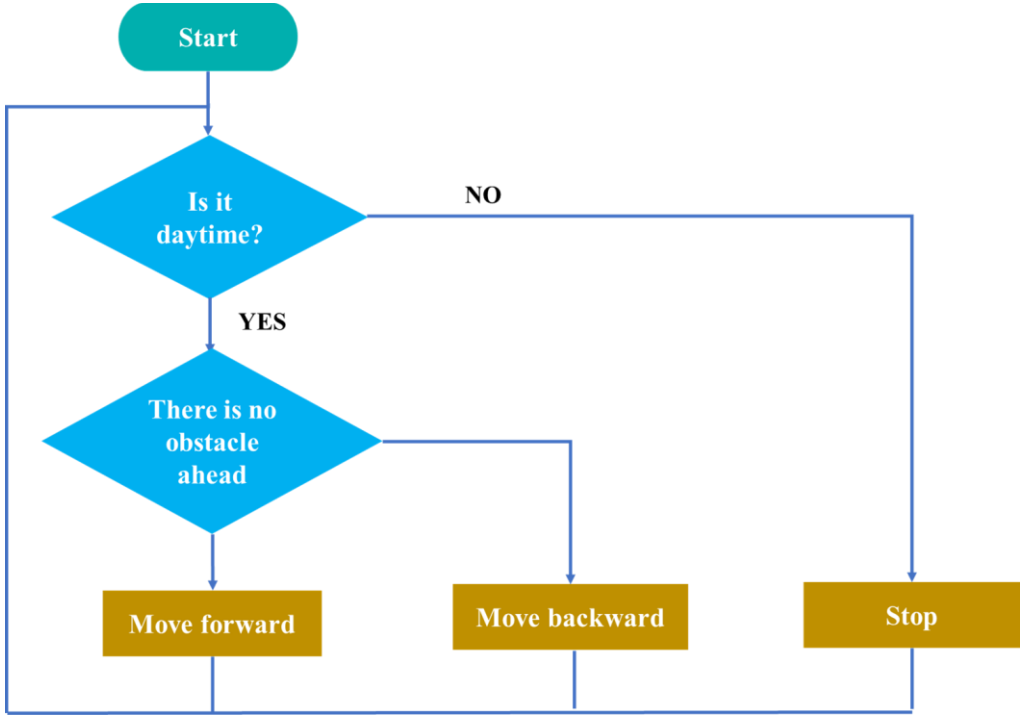
Test, observe and think

1. Which places need reinforcement?

2. Where to add a photoelectric sensor?

Please modify your robot to make the model more interesting and play freely based on this.

Optimization | Analysis



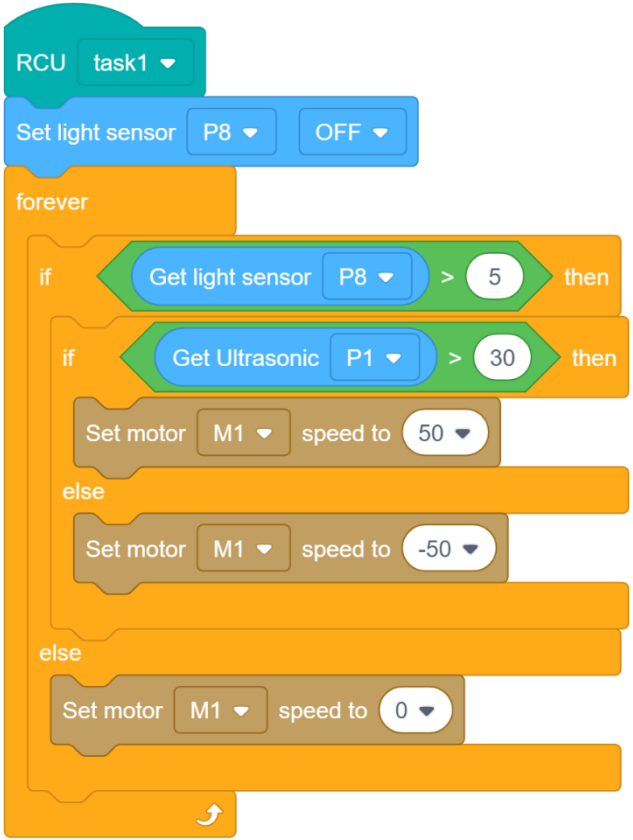
Test, observe and think

1. How do sloths distinguish between day and night?

2. How to make the sloth follow the object in front of it to move forward or backward?

Please design movements for the robot and complete the programming, and then play freely based on this.

Optimization | Analysis



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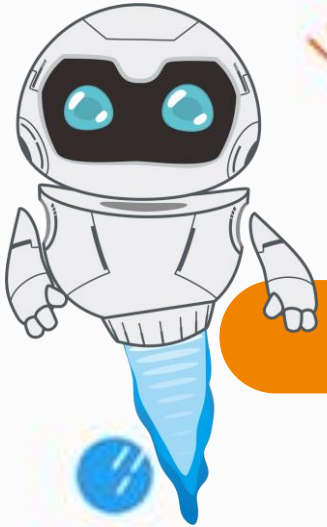


Result

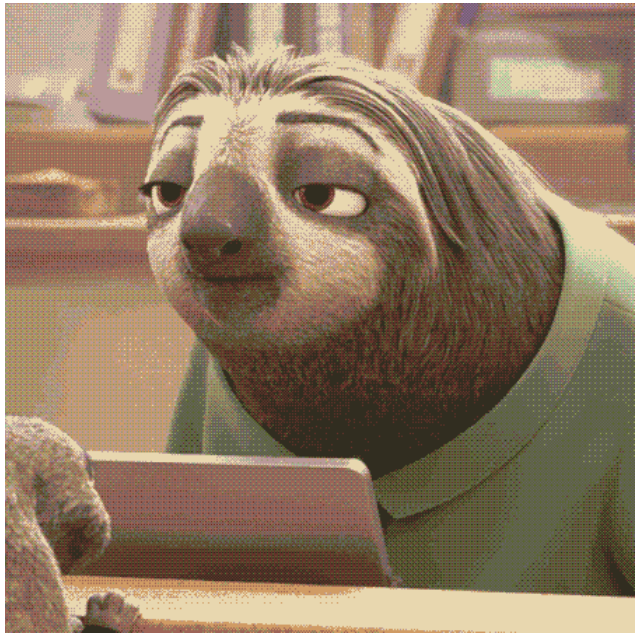


Result | Display Your Robots

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)

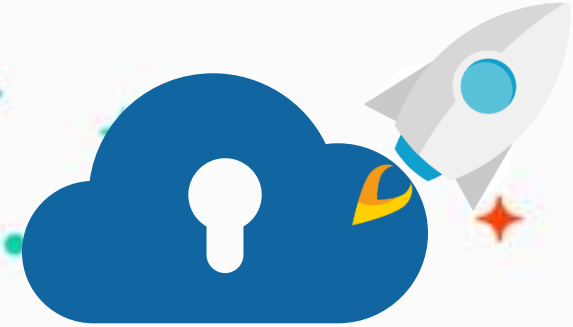
Result | Further Reading



With the popularity of "Zootopia", a sloth named "Flash" has gained people's favor. If you still don't know what "Flash" looks like and why it can win the favor of everyone, you need to "make up for it" with some knowledge.

This sloth named "Flash" is the most outstanding supporting character in "Zootopia". There is a huge contrast between his actions and his name. When speaking a sentence, the interval between each word is as long as ten seconds, and it is even slower to coordinate the movements. Such a cute appearance, and super slow speaking speed and movements bring constant laughter to the audience.

In nature, the sloth is also truly the laziest animal. It takes one month to move a distance of 2 kilometers. Therefore, when a child is slow to do something, parents can say: "Hey, your actions are slower than Flash!"



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Thanks!

LECTURER: