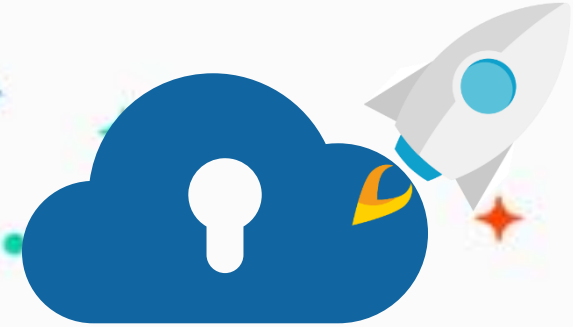

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Lesson 13. Warrior With Claws

Lecturer:

Lesson Objective

Learning Objectives

1. Get to know crabs and build a crab robot.
2. Use RoboCode to write programs to control crab movement and attack.
3. Let the crab move or attack randomly after discovering the enemy.

Possible Difficulties

1. Building of linkage structure and gear structure of claws.
2. Application of the random number and the custom block modules.



Background

Background Knowledge | Crab



Crabs are crustaceans of the order Decapoda and are protected by a hard shell. They breathe through gills. In terms of biological taxonomy, it is the same animal as shrimp, lobster, and hermit crab. Most types of crabs live in the sea or offshore areas, and some live in freshwater or land. Common crabs include swimming crabs, sea swimming crabs, blue crabs and Chinese mitten crabs (river crabs, hairy crabs, clear water crabs), etc.

Background Knowledge | Crab



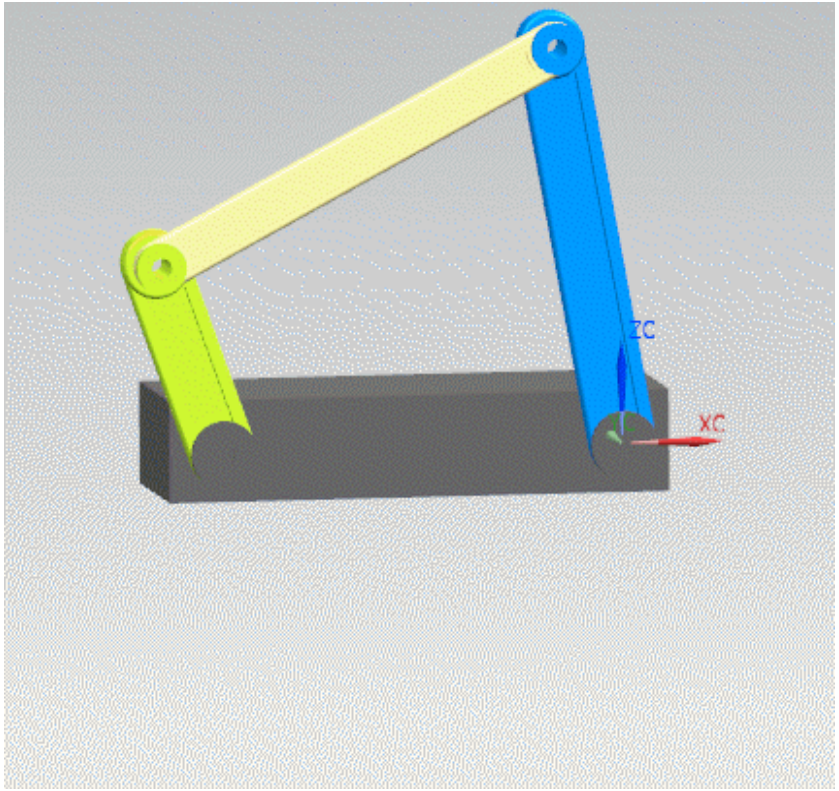
Crabs are very familiar animals found in rivers, oceans, and beaches. Crabs have a very special pair of eyes called stalk eyes. There are movable joints at the base of the stalk eyes, so the eyes can stretch up and down. When stretched out, they resemble two lookout posts. The crab's most powerful self-defense weapon is a pair of large claws, which are also used to attract the opposite sex during the courtship season.

When animals generally move, they always move forward or backward with their head as the center. Crabs walk on four pairs of legs, and the joints of the legs can only bend downwards, not forward and backward. Therefore, when crawling, they must first grasp the ground with the tips of one side of the toes, and then use the other side of the legs to rise straight up. Push the body over so it can only crawl sideways.



Introduction

Introduction | Linkage Mechanism



Remember what the most basic form of linkage mechanism is?

Yes, it’s the parallel four-bar mechanism.

Introduction | Random Number Module



The random number module can pick random numbers within the specified interval and set the value range reasonably.

Note: If the two values before and after are integers, then the random number output is also an integer.

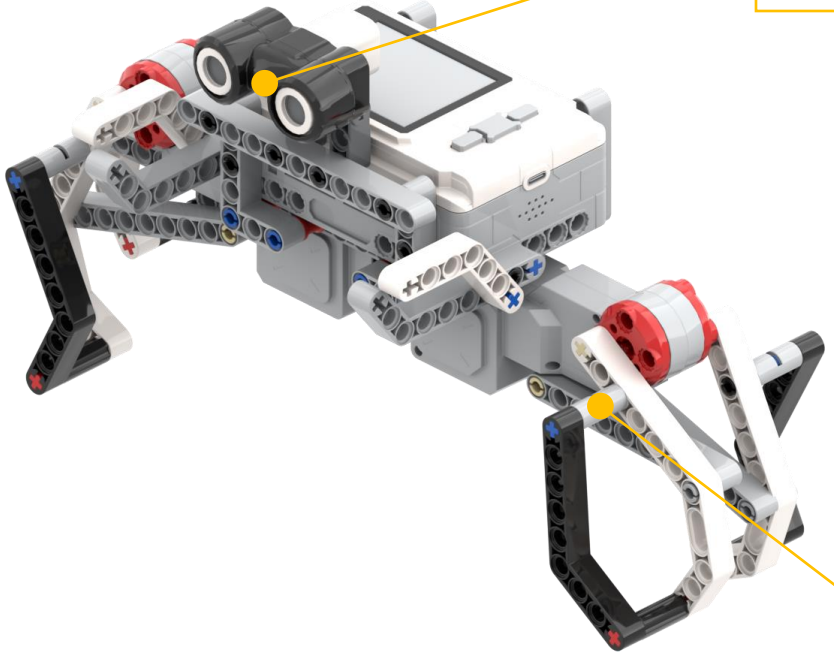


Practice



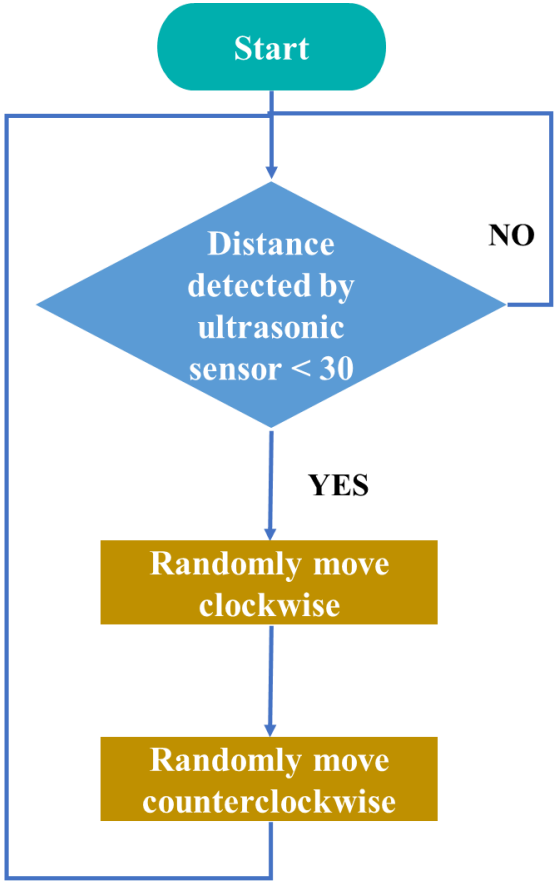


Practice | Robot Building



Build the crab robot according to the building manual, and connect the large motor to the M1/M2 port.

Practice | Flowchart



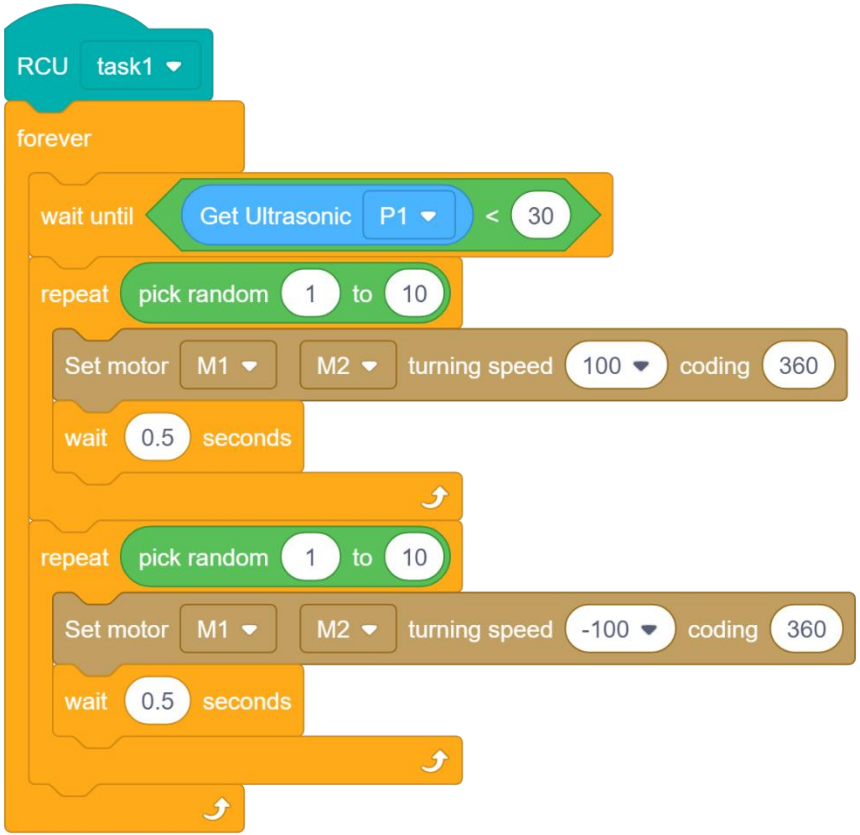
The program flow of the crab robot:

①If the ultrasonic sensor detects an object, it moves.

②The robot first moves clockwise randomly and then moves counterclockwise randomly.

③ Repeat this cycle.

Practice | Programming



The program flow of the crab robot:

①If the ultrasonic sensor detects an object, it moves.

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③ Repeat this cycle.



Exploration



Exploration | Discussion

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

Add pincers to the crab?

Is the center of gravity unstable?

Add some random effects?

Not enough action?

Exploration | Discussion

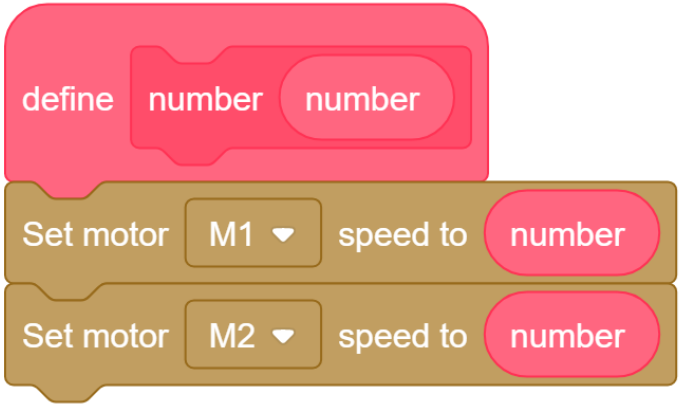
So, how to solve these problems and make improvements?

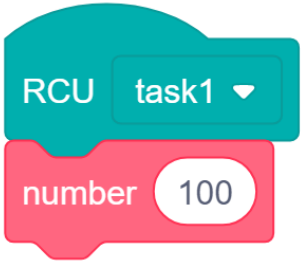
Exploration | Fiddler Crab



The biggest feature of the fiddler crab is a pair of claws of very different sizes. The large claws placed on the chest resemble a warrior's shield. Fiddler crabs are known as fiddler crabs because they dance with their claws. The purpose of this "tidal" action is to use its large pincers to intimidate enemies or to court a mate.

Exploration | Custom Block Module





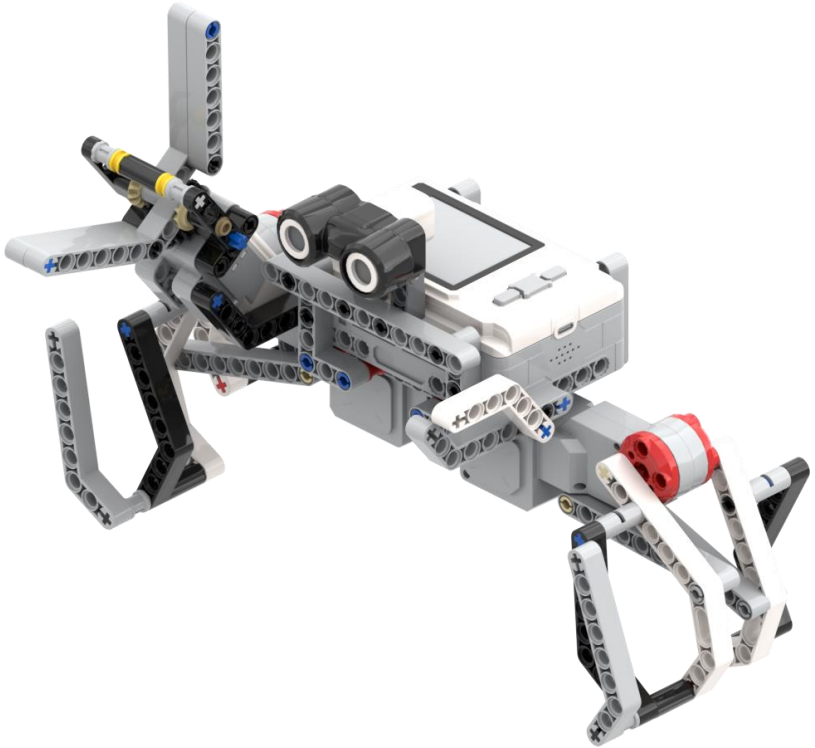
If there are many repetitive parts in the program, we can create custom blocks to fix some programs into a function and then call it.

In this way, the main program can be more concise and easy to modify.



Optimization

Optimization | Analysis



Test, observe and think

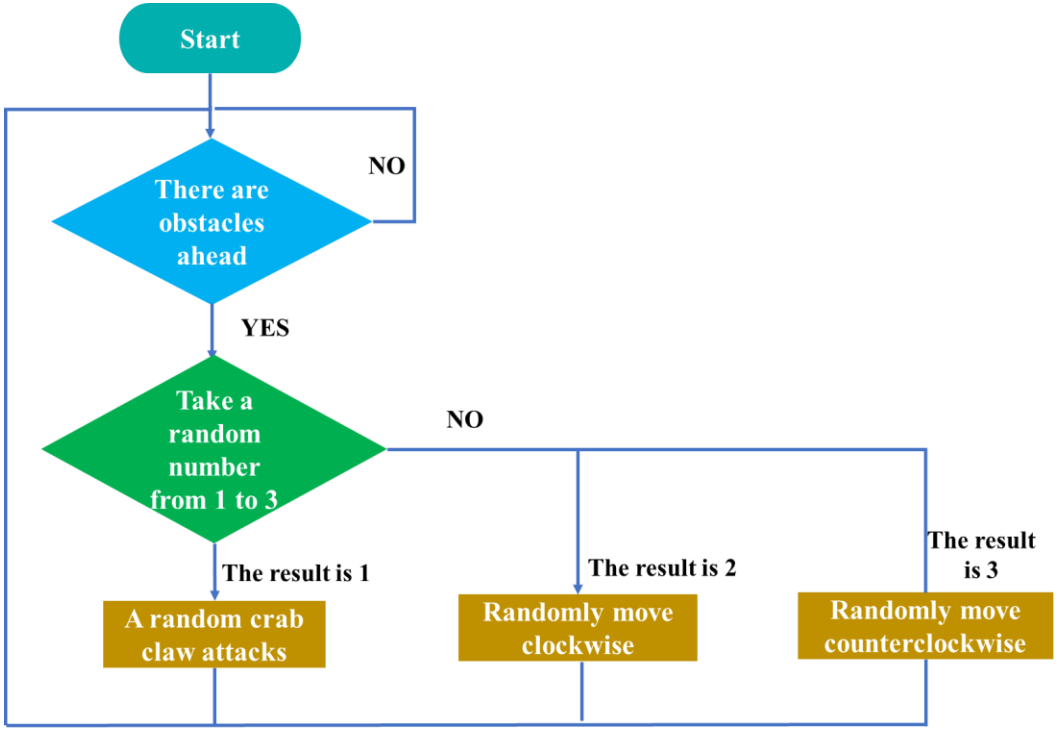
1. Which places need reinforcement?

2. How do you build a crab claw?

3. How to add structure so that the robot can crawl without falling?

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

Optimization | Analysis



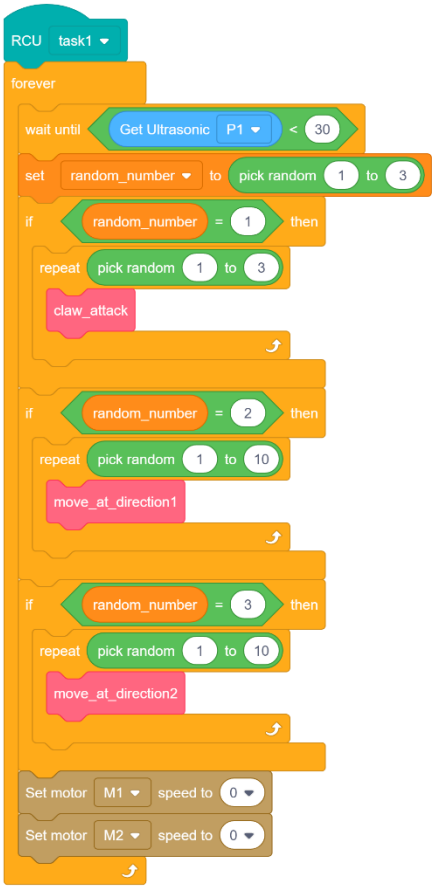
Test, observe and think

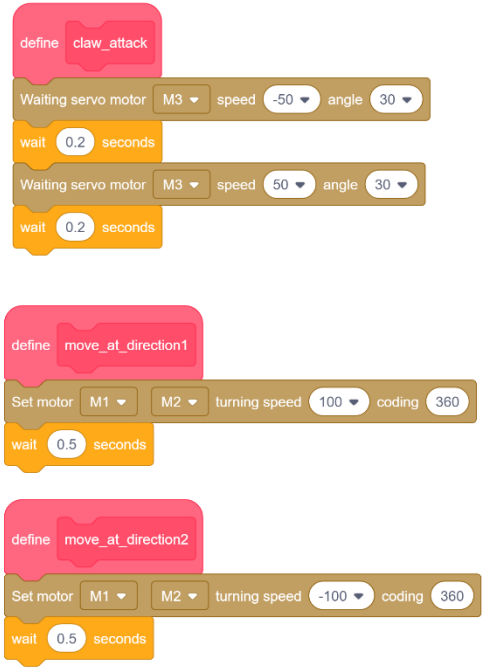
1. How do you use random numbers to select corresponding actions?

2. What is the rotation angle of the middle motor?

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

Optimization | Analysis





Test, observe and think

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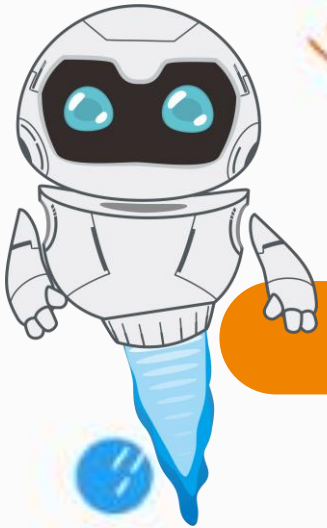


Result



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: Crab's Story

It is said that thousands of years ago, human ancestors had settled on the land in the south of the Yangtze River in China, engaged in fishing and farming, and worked hard from generation to generation to create a land of plenty. Due to the low-lying terrain and abundant rainfall in the south of the Yangtze River, floods are often common.

Sometimes, although a good harvest is in sight, many beetles that love to crawl toward the light appear in the rivers and lakes. They have two pincers and eight legs. They are vicious in appearance and can break into the rice fields to steal grains and even hurt people with their sharp pincers. The ancestors of the Yangtze River area were frightened like tigers and wolves. They called this insect a mangling insect and closed the door early before the sun went down.

Later, Dayu went to the south of the Yangtze River to open rivers to control floods. He sent the warrior Ba Jie to supervise the work in the lake area where water and land intersected and led migrant workers to excavate the Haikou River channel. At nightfall, a fire was just lit at the entrance of the work shed. Unexpectedly, the fire attracted a large black mass of mangling insects, each spitting foam and surging like a lake.

Everyone came out to resist, and a human-insect war broke out on the construction site. After a while, the foam from the mangling bugs extinguished the fire. The two sides fought in the darkness until the east turned white, and the mangling bugs had already retreated into the water. However, many migrant workers were injured or crushed to death. Their blood and flesh were dripping from their bodies, and it was too horrible to see.

Result | Further Reading: Crab's Story

The infestation of mangling pests has seriously hindered the river opening project. Ba Jie thought for a long time and came up with a plan. He asked migrant workers to build an earthen city and dig a deep ditch beside the city. At night, a fire would be lit on the city and boiling water would be poured into the ditch. The mangling insects swept over them, and they fell into the ditch of boiling water and were scalded to death. As more and more corpses of worms accumulated in the ditch, they were picked up with long scratching hooks and continued to fight with boiling water.

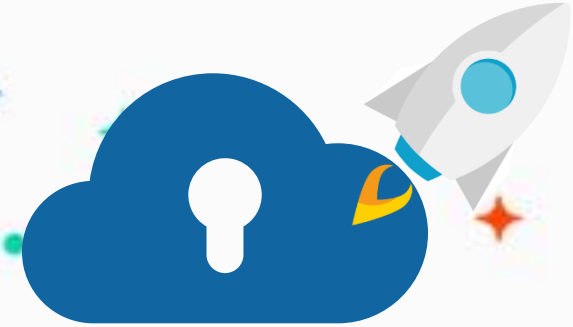
The scalded mangling insects were all red and piled up like a mountain, emitting an appetizing and delicious aroma. After Ba Jie smelled it, he took one out of curiosity and took a closer look. He opened the carapace and smelled the scent. He thought: The smell is fragrant. I wonder if the meat can be eaten? He took a bold bite. Unexpectedly, the teeth chewed gently, and the taste in the mouth was fresh and delicious, more delicious than anything else.

The more Ba Jie ate, the more delicious it became. He chewed one mangling insect into his stomach at once, and then ate another one in succession. Everyone saw that he was eating with gusto, and the brave migrant workers also started eating. They all said with great joy, "Come and eat the mangling insects, everyone, they taste so delicious! “

Result | Further Reading: Crab's Story

As a result, the migrant workers picked them up and ate them all. After the local people learned about it, they began to catch the mangling insects and eat them, and soon the news spread in all directions.From then on, the ancestors were no longer afraid of mangling insects, and the pests, which were feared like ferocious beasts, suddenly became a well-known delicacy.

In order to thank Ba Jie for daring to be the first in the world, everyone respected him as a warrior. They added the word "worm" under the word "jie" and called the mangling insect "crab", which means that Ba Jie conquered the mangling insect and became the best crab-eater in the world. Ba City is named in memory of Ba Jie. The hairy crabs produced in Bacheng have become famous all over the world and have long enjoyed a high reputation.



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Thanks!

LECTURER: