Lesson 19. Swimming Plesiosaur

LECTURER:

Lesson Objective

Learning Objectives

1. Learn about plesiosaurs.
2. Learn about the crank rocker.

Possible Difficulties

1. Build the linkage structure of the plesiosaur.
2. Understand the usage of the crank rocker in the robot.



Background Information



Background Information



The Loch Ness Monster is a legendary creature in Loch Ness, Scotland. This mysterious water monster has also attracted the attention of many scientists and explorers. There have been countless hunts for water monsters over the centuries, but they all failed. At present, most people think that the Loch Ness monster is just a man-made prank, and its prototype is a marine reptile such as a plesiosaur.

Background Information



The plesiosaur is named for its large size and slender neck. It belongs to the same ocean overlord as the ichthyosaurs, and they ruled the Mesozoic Ocean together. The body length of plesiosaurs is generally 3 to 5 meters. Their appearance is characterized by a small head, a slender neck, a broad body like a turtle, a short tail, and two pairs of large and long flippers.

Background Information

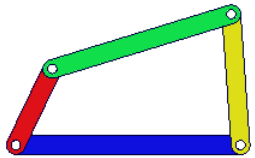


In fact, the plesiosaur's neck was too long, accounting for about half of its body, and it was too heavy to lift its head and neck above the water, so it could only bend like a swan's neck. Scientists have theorized that even if they could hold their necks high and bend, the center of gravity would have tipped their bodies forward and submerged their heavy necks in the water.



Knowledge Introduction

New Knowledge | Mechanical structure



Crank rocker: The red rod is the crank, the yellow rod is the rocker, and the green rod is the connecting rod. Using this structure can change the circular motion (trajectory of the red rod) into a planar reciprocating motion (trajectory of the yellow rod). We will use this structure to control the back-and-forth movement of the neck of the plesiosaur robot.

Programming Knowledge

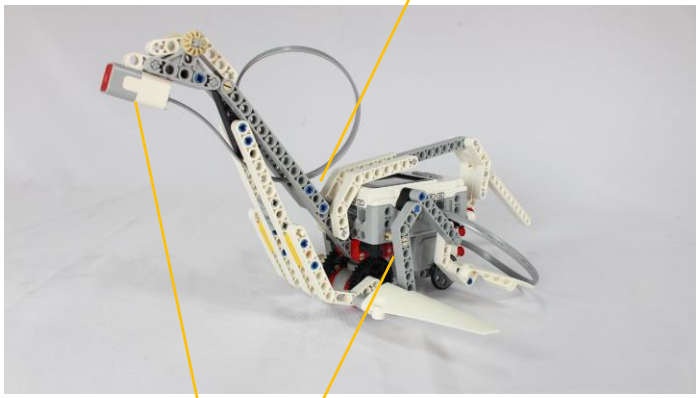


We need to use laser sensors to control the forward speed of the plesiosaur. Since the laser sensor returns 8888 when the measurement distance is exceeded, data limiting is required.



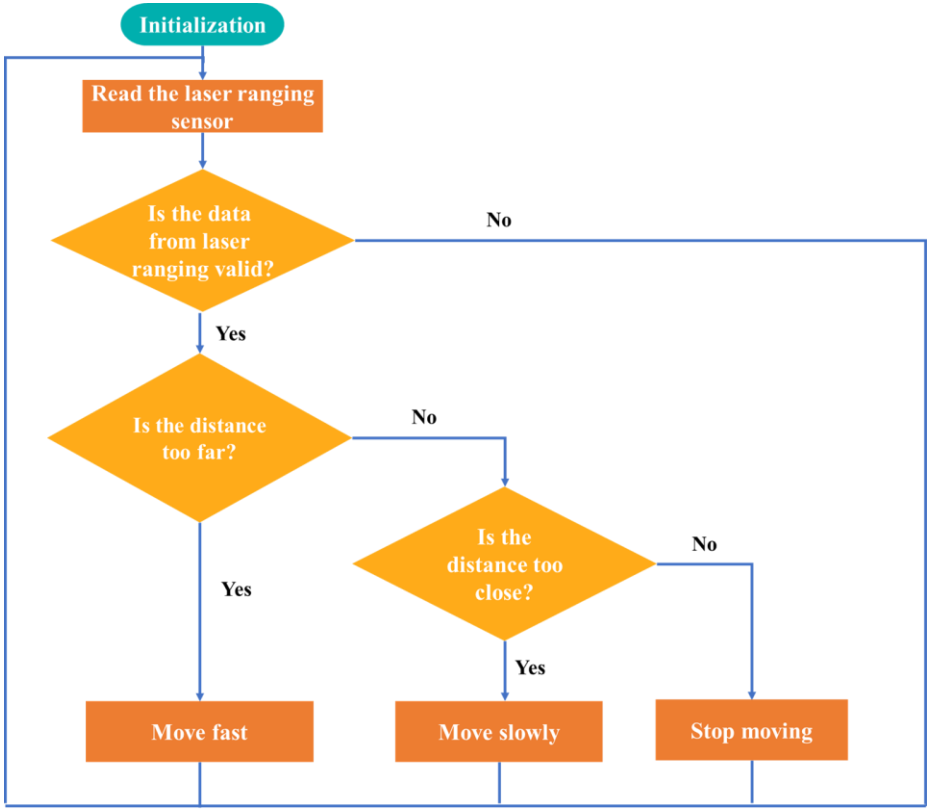
Practice

New Knowledge



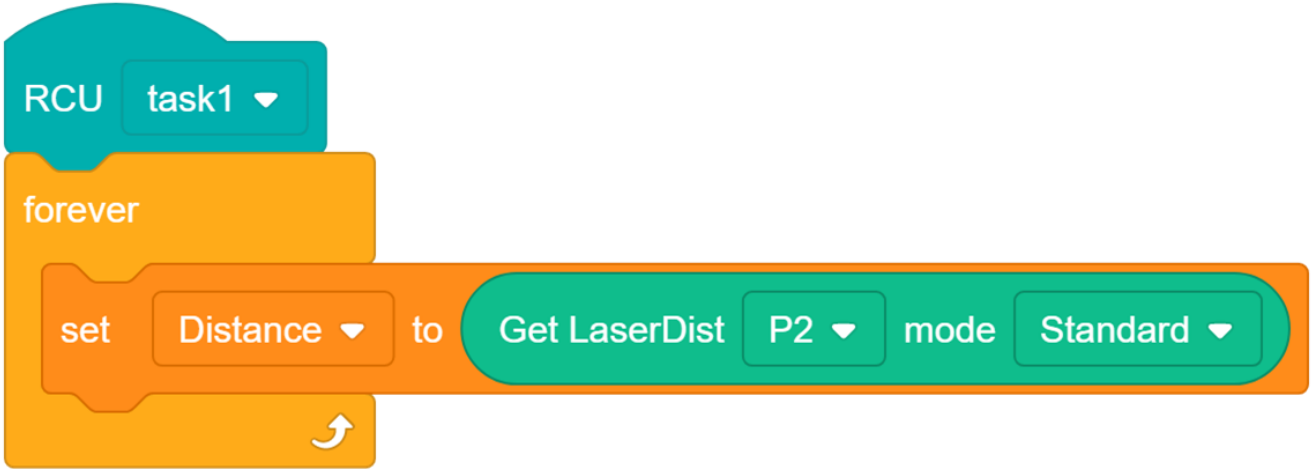
According to the building manual, build the plesiosaur robot. The plesiosaur robot can control its forward speed according to the distance speed until it stops.

Practice | Flow Chart



Use the laser sensor to control the forward speed of the plesiosaur. When the distance is far away, the speed is faster, and the closer the distance is, the slower the speed is. Stop moving when the distance is too close.

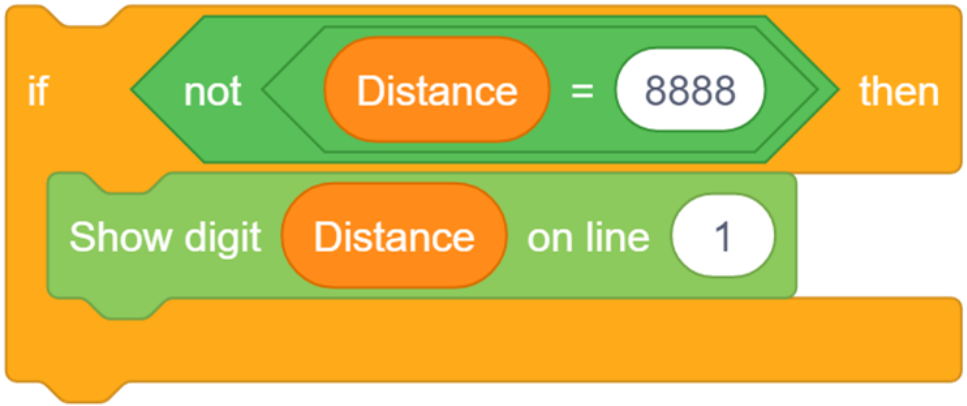
There are three speed gears, the farther the distance, the faster the speed.



Read the data

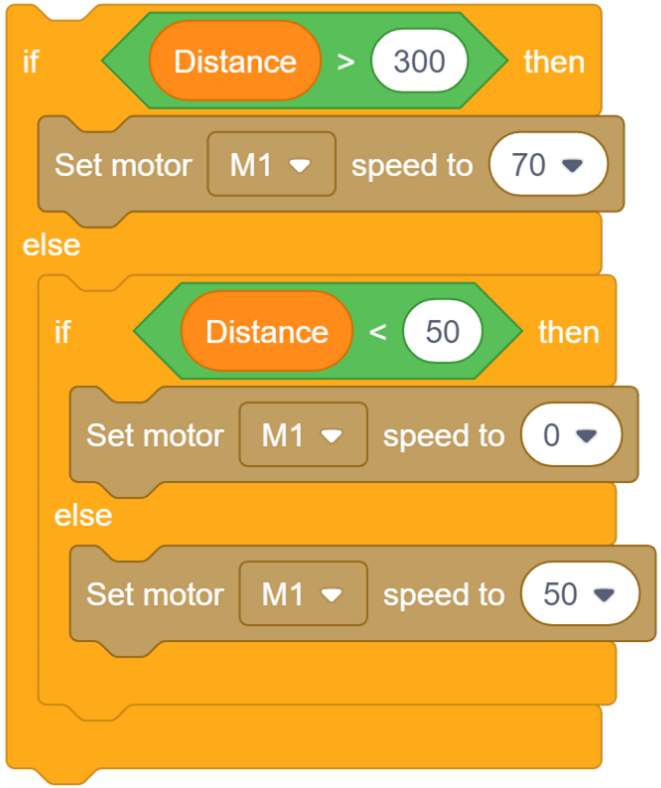
Read the value of the laser distance sensor.

Practice | Programming



Judge data

Filter valid data. Data is re-read when the data is invalid.



Judge the distance

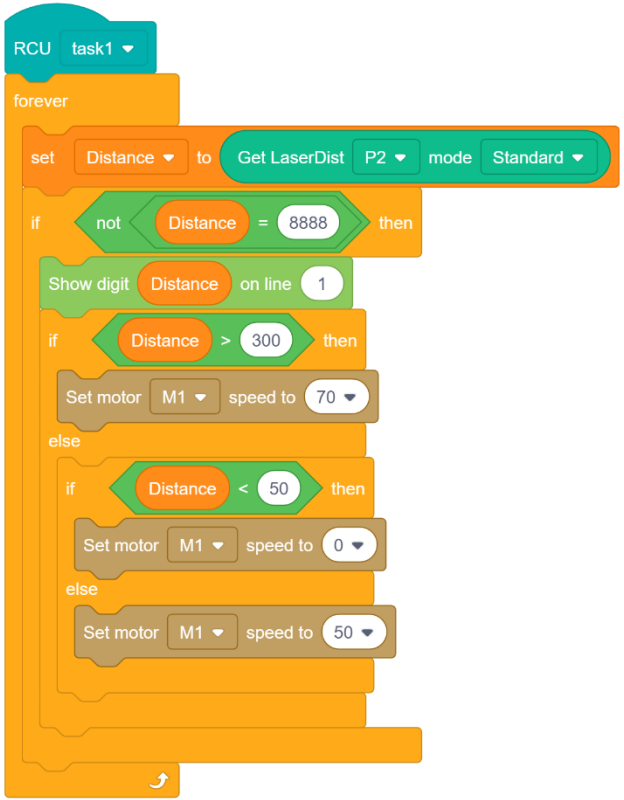
Different distances apply different speeds.

The distance is greater than 300, and the speed is set to 70;

If the distance is less than 50, the speed is set to 0;

The distance is between 50 and 300, and the speed is 50.

Practice | Programming

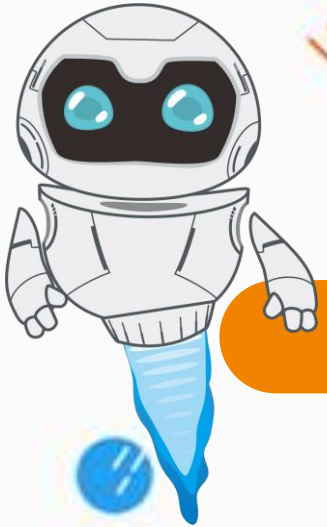


Integrate the program

Integrate the program according to the flowchart.

Practice | Programming





Results



Program Optimization

In this lesson, we implemented the plesiosaur robot to move forward and swing its neck to move the flippers.

Modify the program so that the plesiosaur robot can move backwards.

Requirements: Plesiosaurs can move backwards under certain conditions.

Further Reading



A hinged four-bar linkage with one crank and one rocker is called a crank-rocker linkage. Usually, the crank is the active part and rotates at a constant speed, while the rocker is the driven part that swings back and forth at variable speeds, and the connecting rod performs plane compound motion. In the crank-rocker mechanism, a rocker is also used as an active component, and the reciprocating swing of the rocker is converted into the rotation of the crank. The crank-rocker mechanism is the most basic form of the four-bar mechanism. The figure is a schematic diagram of a pedal sewing machine using a crank rocker mechanism.

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Thanks!

LECTURER: