01 - Mechanical Gripper

Mechanical Gripper

Basic Teaching Information					
Teaching facility	AI Module 1s	Teaching mode	Project-based learning	Class duration	90 minutes

Teaching Objectives:

1. Learn to design bionic structures;

2. Review the design and function of the worm gear;

3. Automatic opening and closing of mechanical gripper by program control.

Focus

With the development of science and technology, the application of industrial robots is becoming more and more popular. Especially when carrying out picking and conveying in a factory, a mechanical gripper is usually used for picking items. The mechanical gripper, as the final execution part of the robot's work, is both an actuator and a perceptron, covering scientific knowledge in multiple fields.

Exploration

We will design a mechanical arm that is similar to human hands, and can increase its power.

By observing the hand movements, the mechanical arm is abstracted and decomposed into three parts: thumb, four fingers and arm.

We can slow down the speed and make the output force larger by the deceleration device.

Expansion: the mechanical power formula is p =fv, where p is the power, f is the traction force, and the v is the speed, so if we want to make the traction force larger under the same power, we need to reduce the speed, so we use the worm gear and worm mechanism as the deceleration device.

Finally, we need to design the shape structure of the mechanical gripper similar to human hand.

Mechanical Gripper

Creation

To build the mechanical gripper, we need the following

1. Closed-loop motor as the power of mechanical arm

2. 24 straight tooth combined with worm to build worm gear and worm mechanism

3. 70 beams, 90 degree 3x5 beams and 50 beams to build the arm peripheral structure

4. 110 beams to build mechanical arms

5. The controller as brain

Programming

Through flow control, fingers will grab and release.

This lesson is the application of actuator precise control, students need to master the actuator control, sequence structure and loop structure.

Through APP programming, mechanical gripper should grab and release.

Try to grab objects by adding wait module.

Extension: touch sensor.
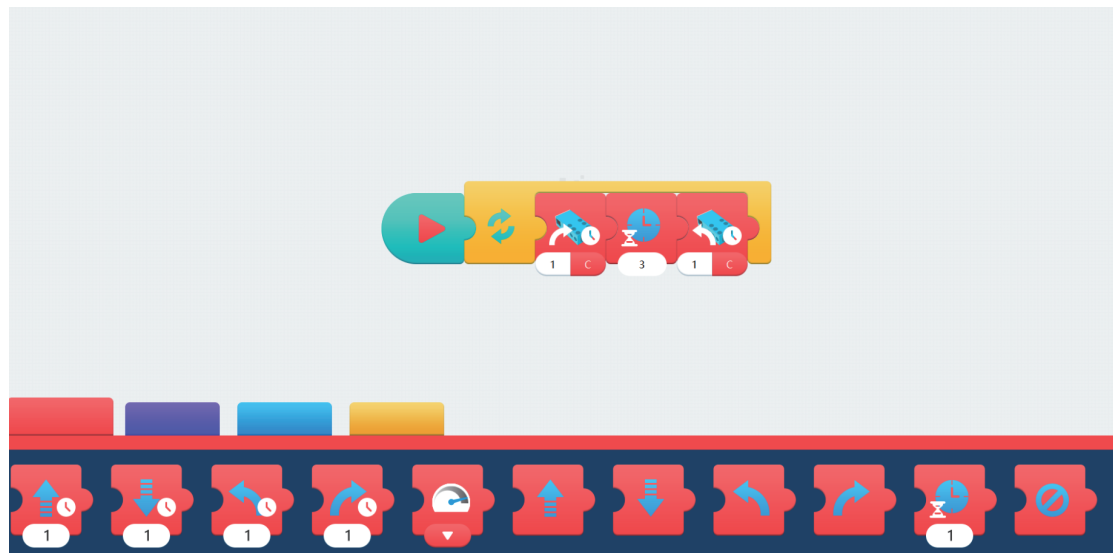
Mechanical Gripper

Evaluation

Q: What is the role of worm gear?

A: The worm gear have the function of self-locking, decelerating, increasing torque.

Q: Analyze the grasping movements of the hands, the hands can be divided into three parts, what are they?

A: The three parts are thumb, four fingers and arm.

Show

Demonstrate the working effect of mechanical arm and explain the core knowledge.

Key point 1: Describe the working characteristics of worm gear. How each part works.

Key point 2: Explain the programming and the actuator control mode.