7. Face Tracking

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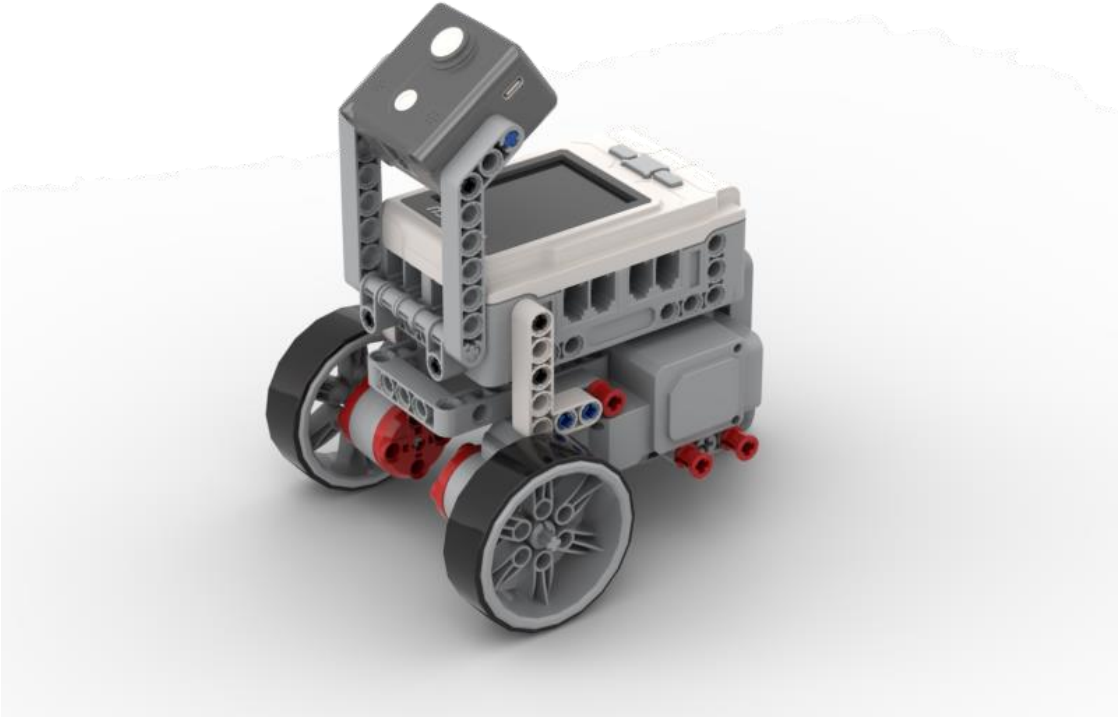
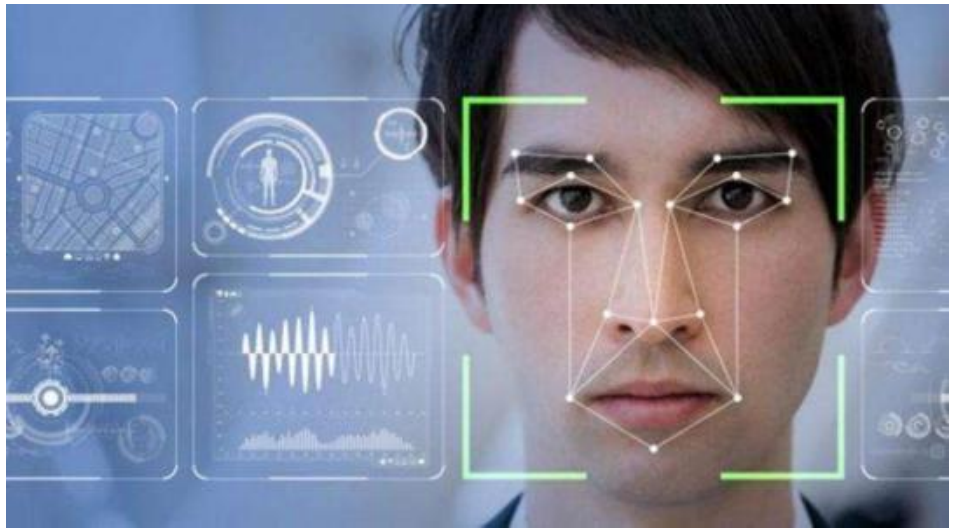


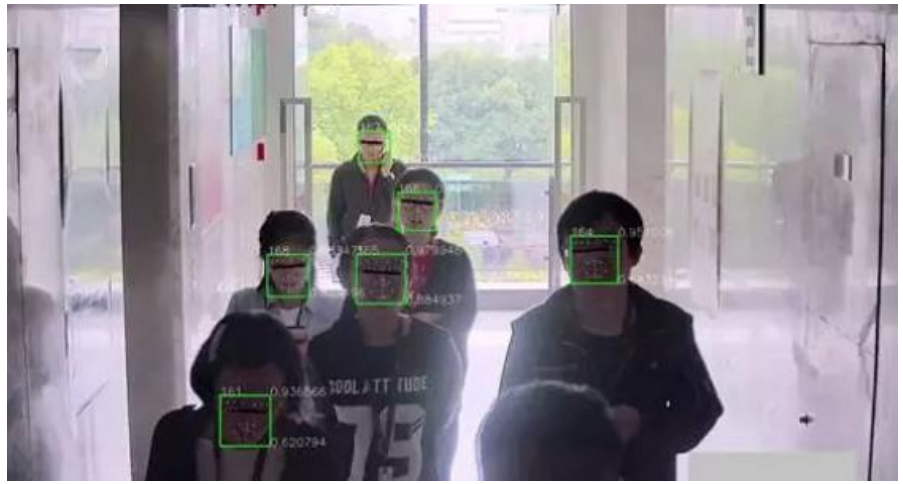
Theme Introduction



With the development of smart technology, cameras are becoming more and more functional.

In addition to being able to perform area surveillance, they are also able to detect faces and track a person in real time within a certain area, also known as face tracking.

Theme Introduction



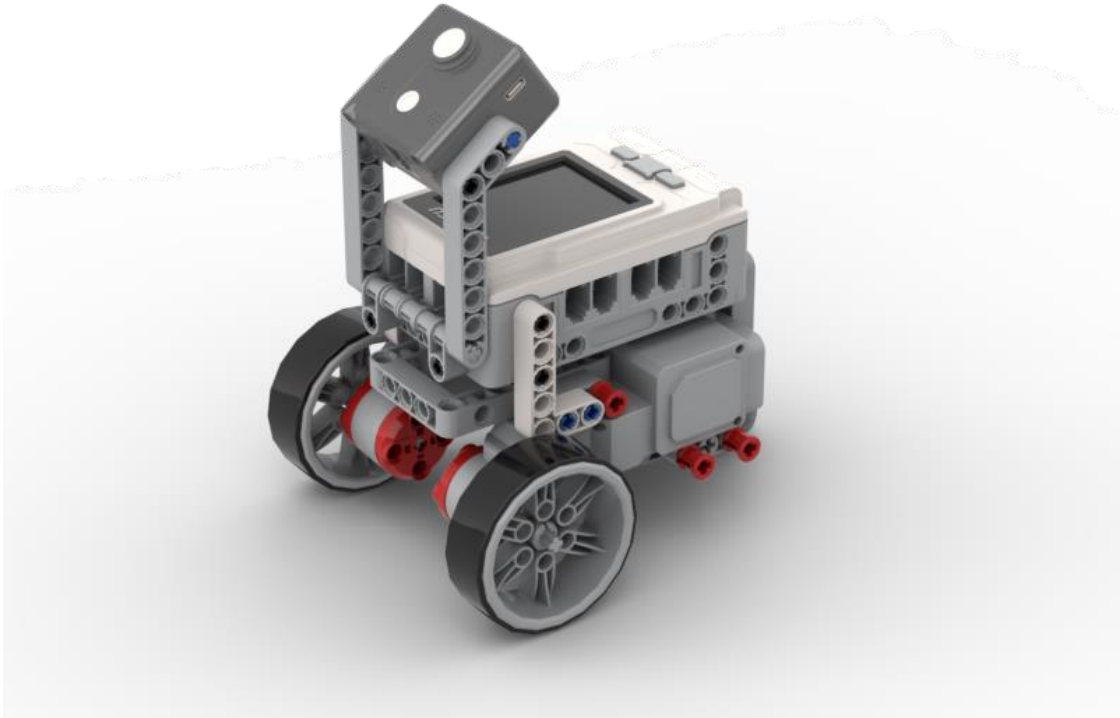
These cameras with high intelligence, when detecting a face, will judge the position of the face based on the coordinates.

Based on the location, the camera will track the face, so as to realize the function of face tracking. We can also use the face detection function of AI audio-visual module to make a face tracking robot and feel the value of face recognition application.

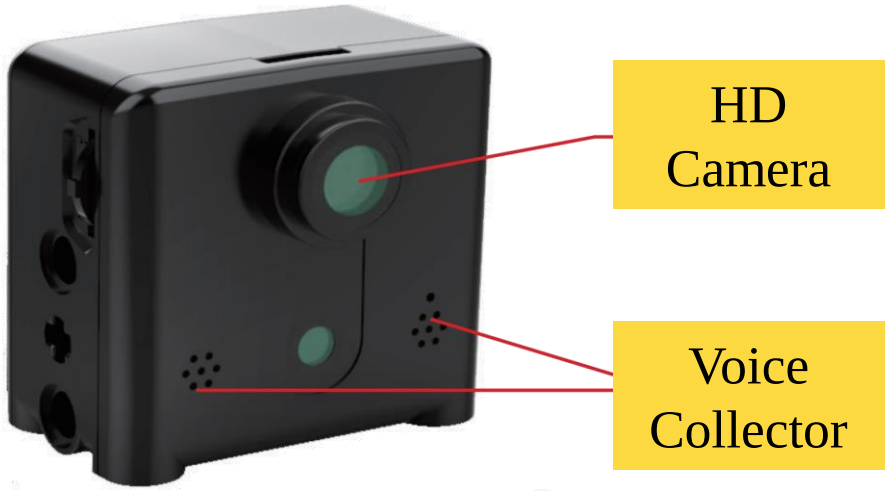
Learning Objectives

1. Understand the principle of face detection.

2. Learn to use the face detection mode of the AI audio-visual module.



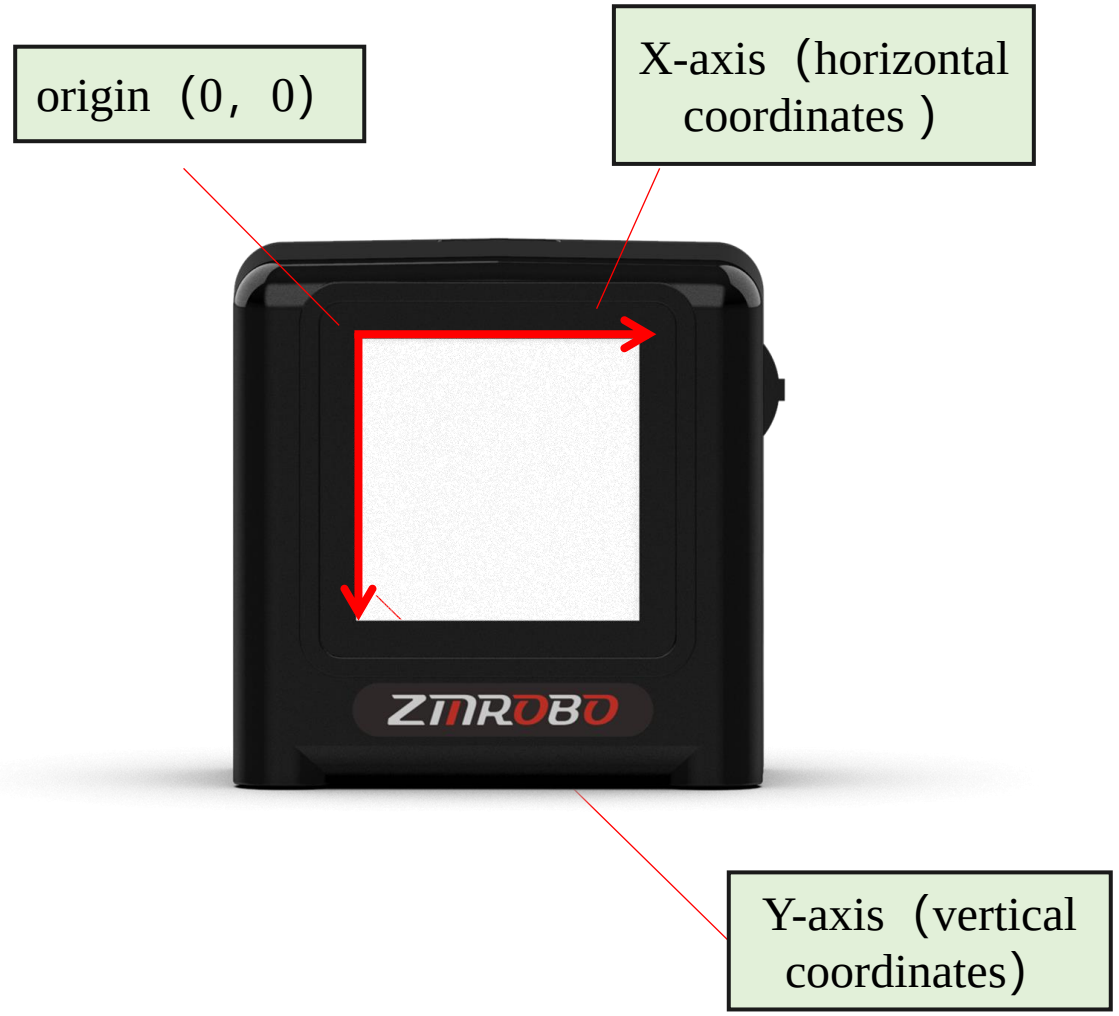
New knowledge



Face Detection

Face tracking is to continue to capture the position and size of the face in subsequent frames under the premise of detecting the face, including face recognition and face tracking technology. The AI audiovisual module has the function of face detection. When the AI audiovisual module uses the camera to detect the face, it will return the X and Y coordinate values of the face to the controller, and use the XY coordinates to determine the position of the face.

New knowledge

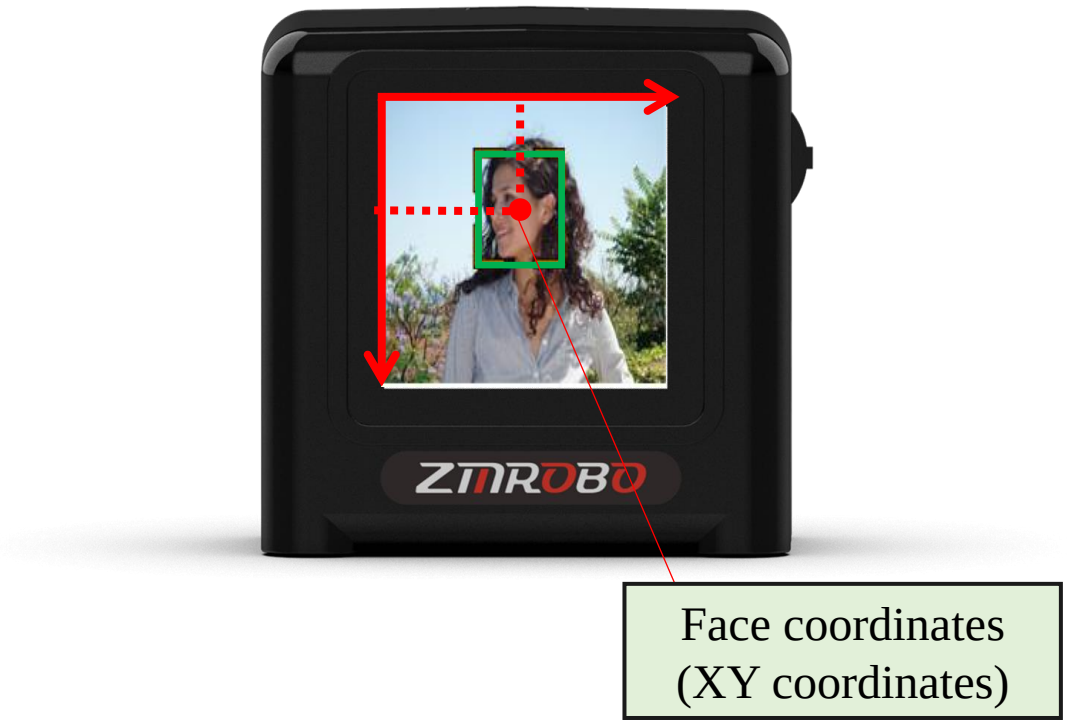


Face Detection

AI audio-visual module in face recognition mode, X coordinate (i.e. horizontal coordinate) range is 0-240, Y coordinate (i.e. vertical coordinate) range is 0-180. the XY coordinate in the upper left corner of the camera screen is the origin, and the coordinate is (0, 0).

When the camera screen captures a face, the coordinates are (X, Y), i.e., the horizontal coordinates combined with the vertical coordinates, which is the position of the face captured by the camera.

New knowledge



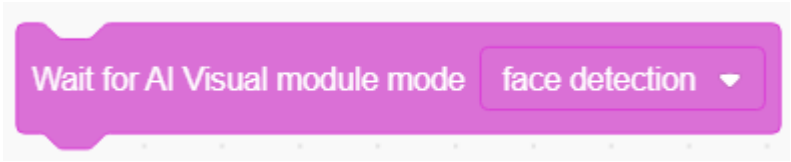
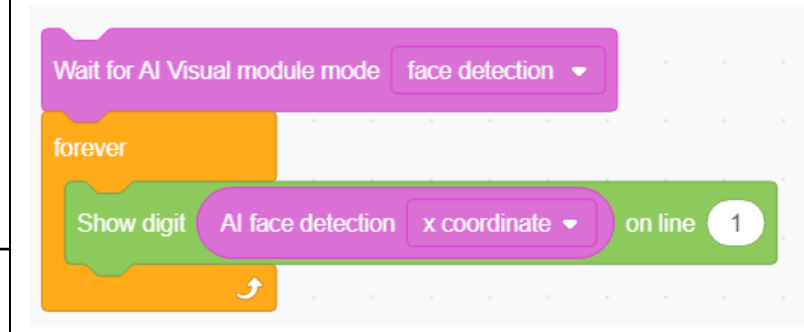
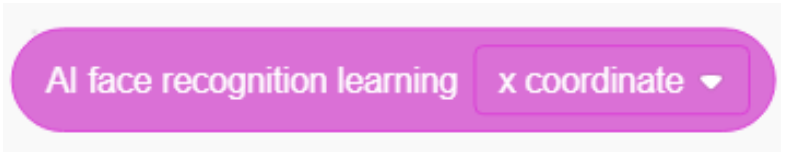
Face Detection

When entering face detection mode, the AI audiovisual module starts to detect faces and identify coordinates.

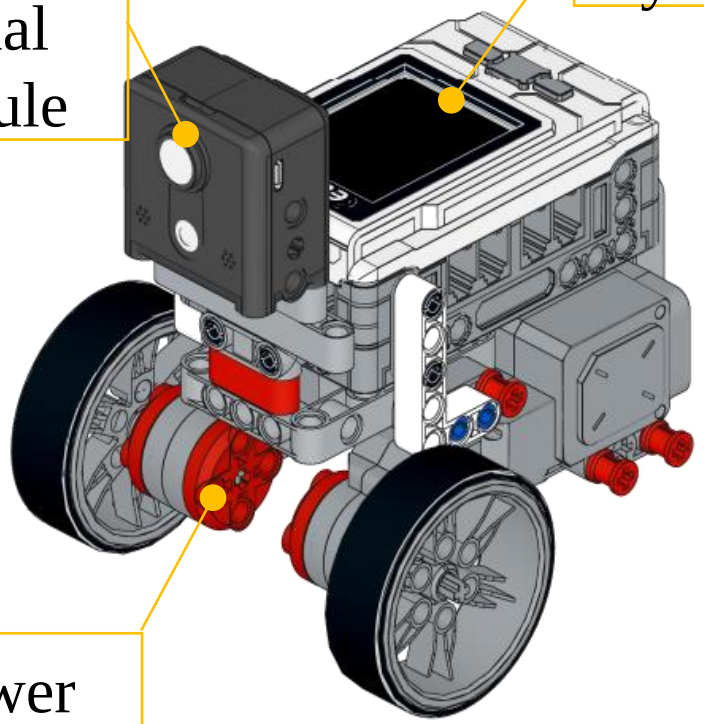
When face recognition is identified, a green box will appear on the screen for capturing the face. The center point inside the box is the XY coordinates of the face.

New knowledge

Software Modules

Module	Description	Application examples
	Set the AI audio-visual module mode to face detection mode. Click "▼" to select face detection.	
	It is able to detect the XY coordinates and the size of the face and return the data to the controller.	

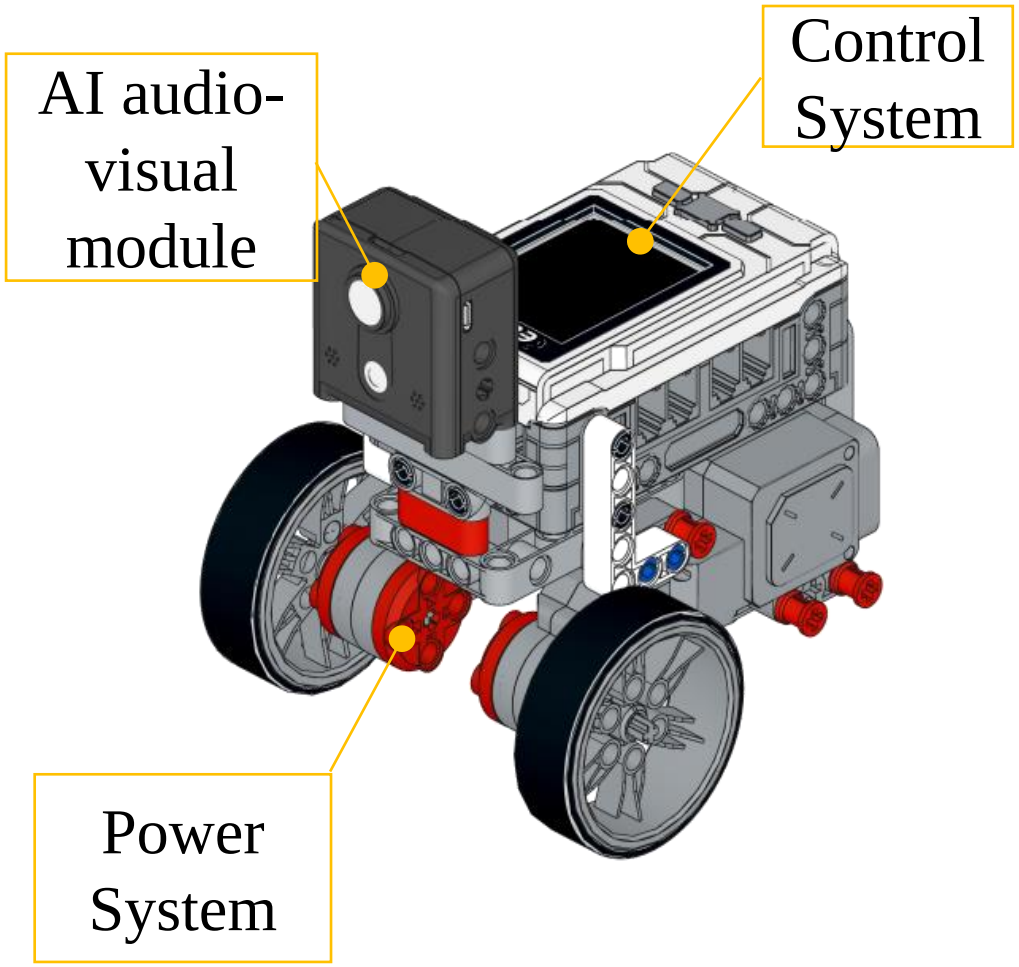
Design and Assemble



Build a model

Assemble the face tracking robot according to the build manual to implement the face tracking function.

Design and Assemble



Build a model

In this lesson, we need to use two motors for the power system, a controller for the control system and an AI audio-visual module. The motors are connected to M1 and M2 ports of the controller, and the AI audio-visual module is connected to P8 port of the controller.

Requirement: Install the AI audio-visual module on the side of the face tracking robot.

Programming

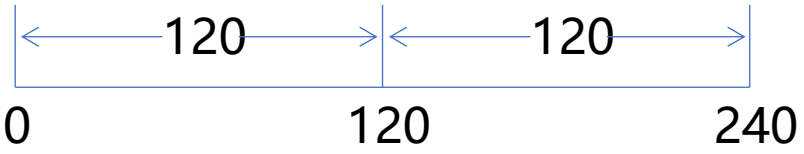
Programming idea：

When the program starts, switch to face detection mode.

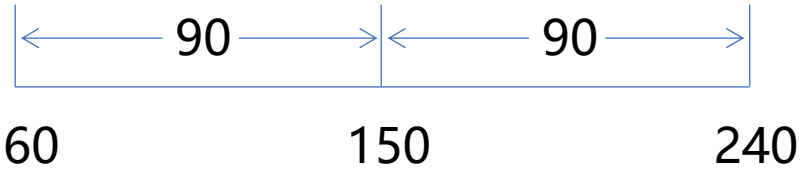
Specific idea: use the AI audiovisual module as the camera for face detection, and use the X coordinate of the face to make the robot rotate to the left and right. Next, use the controller as the control system of the face-tracking robot; finally, use the motor as the power system of the face-tracking robot.

Programming

Theoretical coordinates



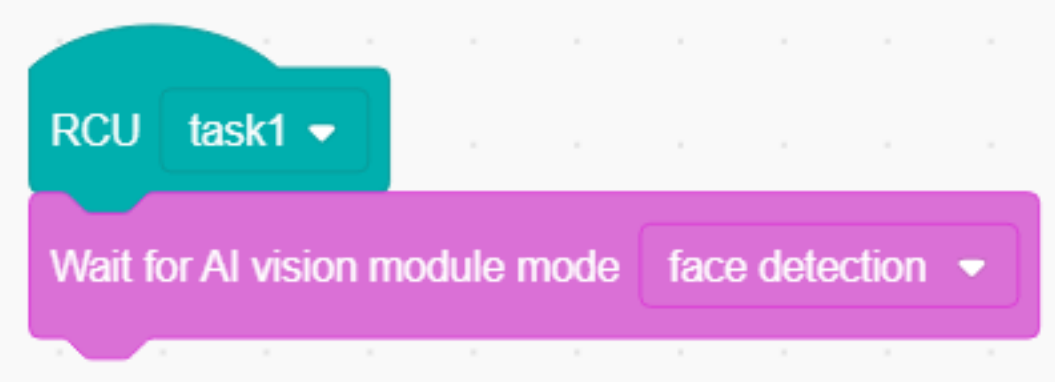
Actual Coordinates



Theoretically, the X coordinate range in the AI audio-visual module is 0-240, but in practice, when the audio-visual module recognizes a face, the X coordinate is usually about 60.

Then the range of face recognition in the audio-visual module is between 60-240, and the middle value is 150. when the X coordinate is 150, it means the face is in the middle. Face recognition range can be detected according to the actual.

Programming



Let's start writing the program for the face tracking robot.

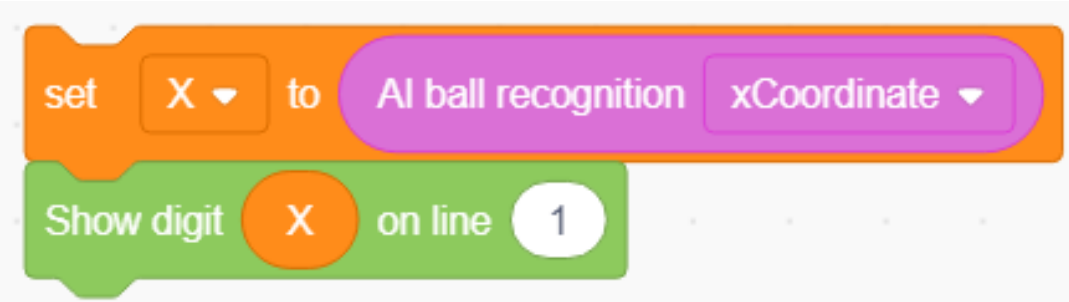
Set the AI audio-visual module to "face detection" mode.

Programming



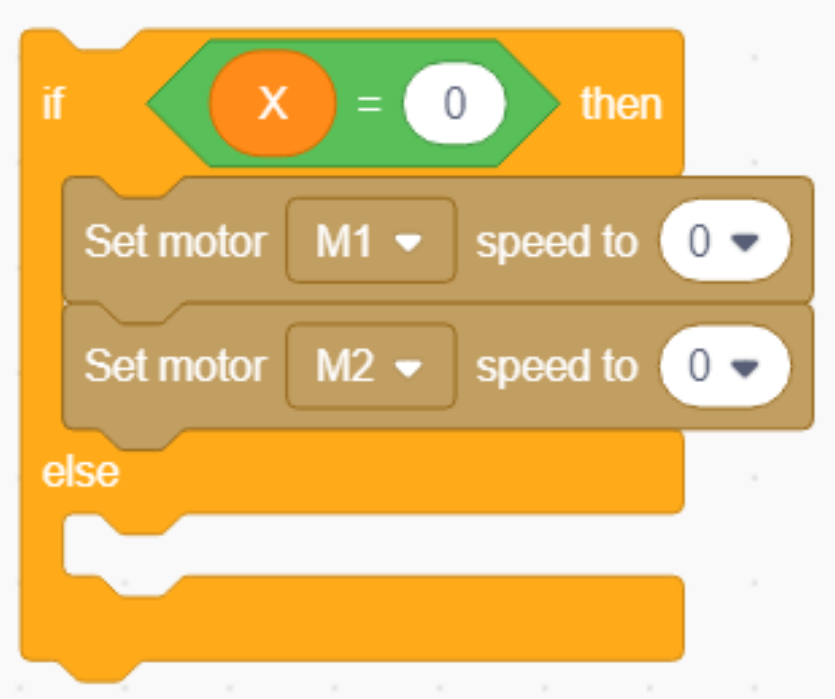
Then create two new variables named "K1" and "turn", with K1 set to 0.3 and turn set to 0.

Programming



Create a new variable named "X" to record the recognition result of the X coordinate of the face. And display the coordinate value on the controller screen.

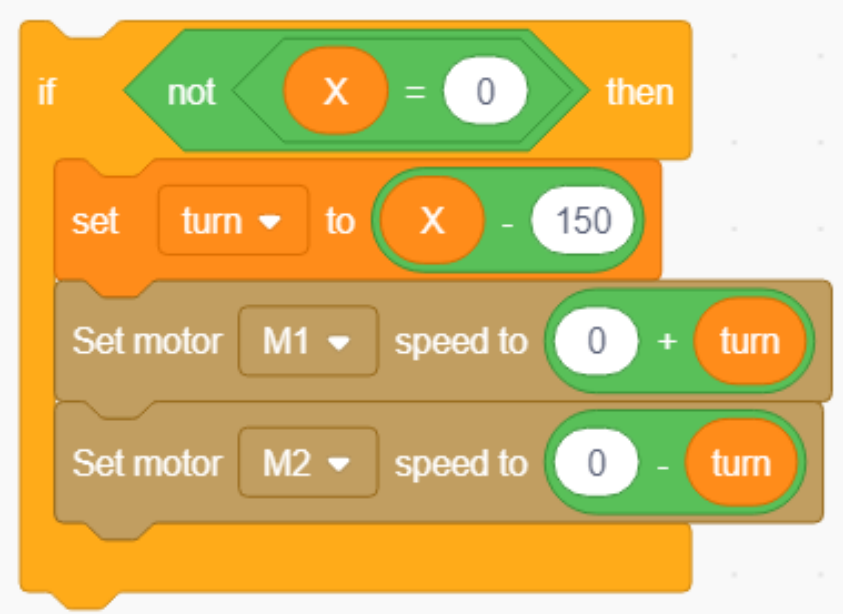
Programming



If X=0,which means no face is detected,

then M1 and M2 motors stop.

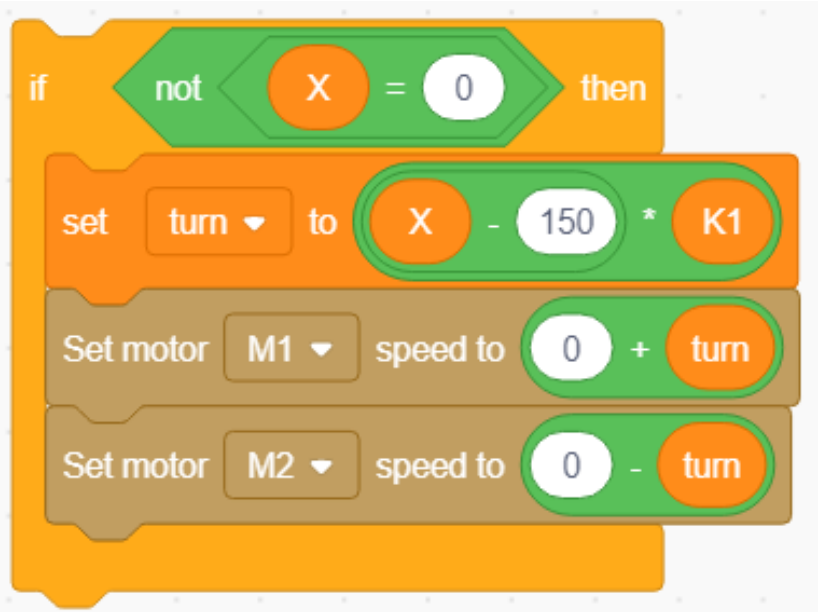
Programming



When X=0 does not hold, i.e., when the face coordinates are detected, turn is set to X-150. motors M1 and M2 are set to rotate at 0+turn and 0-turn, respectively.

This setting allows the face tracking robot to be able to rotate according to the change of face position. For example, if X=120, turn=120-150=-30. then motor M1 and M2 rotate at -30 and 30 respectively. when X=150, i.e. when the face is recognized to be in the middle, turn=0 and the motor stops, and the face tracking robot is facing the face at this time.

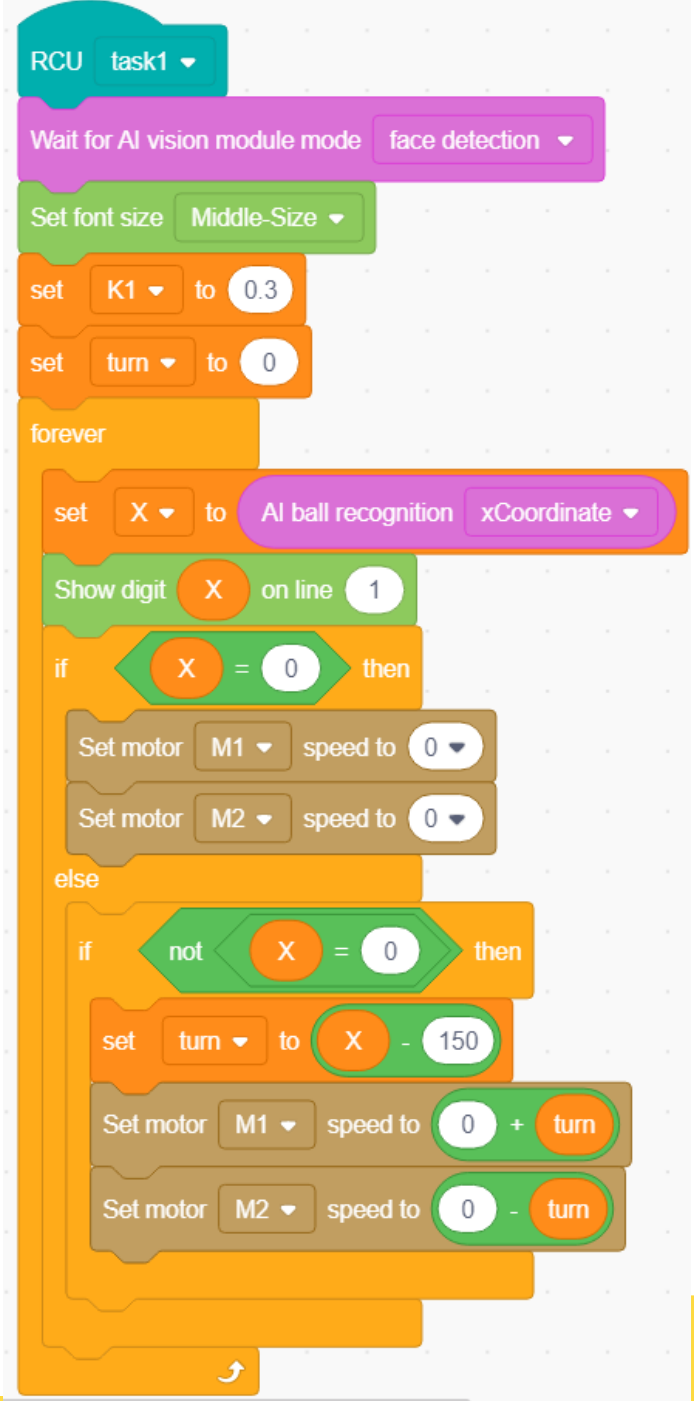
Programming



However, in the actual application process, when the position of the face is too far to the left or right, the face tracking robot turns too fast to track the face, so X-150 needs to be multiplied by K1, i.e., turn=(X-150)*K1. used to slow down the speed.

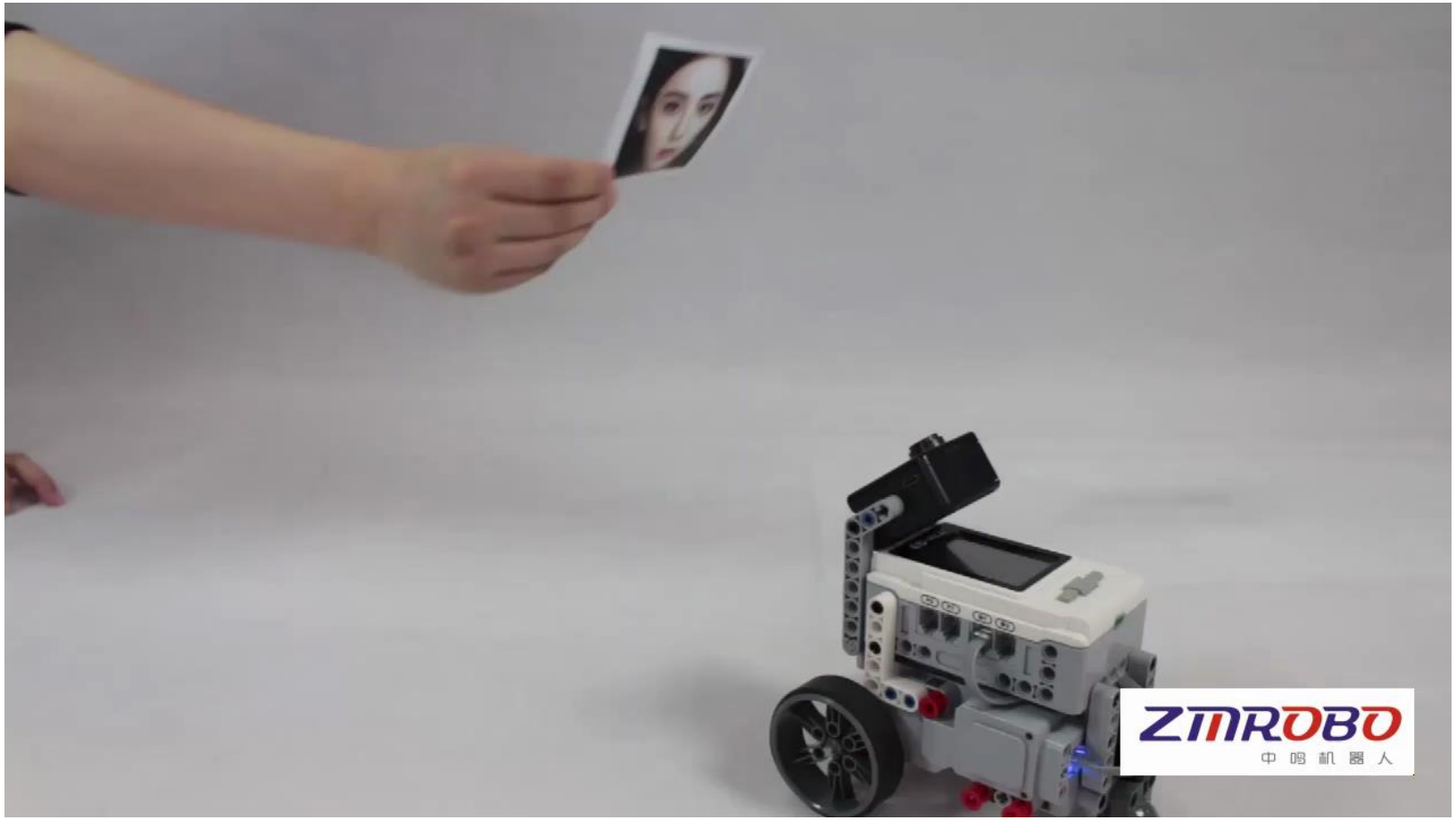
Programming

The complete programming of the face-tracking robot is completed by integrating the programs together and adding a "repeat execution" programming module to keep the programs executing.



Programming

Sample Demonstration



Course Extension



Face Detection

Face detection is the process of searching any given image using a certain strategy to determine whether it contains a face, and if so, return the position and size of a face. Face detection has important applications in content-based retrieval, digital video processing, video detection, etc.

Take the image processing software, in your phone as an example, when you open the software, the software comes with its own algorithm to start detecting faces. When a face is detected, the software automatically adds a beauty effect to the face.

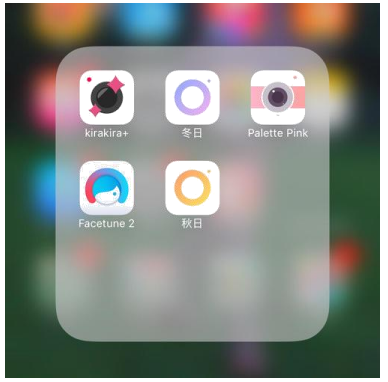


Image processing software