Experiment 3： Smart Shopping Assistant

一、Scene Description

With the development of artificial intelligence, more and more positions may be replaced by artificial intelligence, such as supermarket salesman. Compared with traditional salesman, smart shopping assistant can significantly reduce labor costs, complete sales more efficiently, and settle accounts more accurately. In this experiment, a smart shopping assistant system was built to simulate the process of voice order, intelligent settlement and face payment.

二、Experiment Principle

This experiment used speech recognition and face recognition. Customers can control the robot to grab the corresponding goods through voice commands to complete the order, and then the smart shopping assistant system will automatically calculate the bill according to the goods grabbed by the robot, and finally the customer completes the payment through face recognition.

Speech recognition, also known as automatic speech recognition, has the goal of converting vocabulary content in human speech into computer content, such as text information, binary

encoding, or character sequences. The process of speech recognition is as follows:

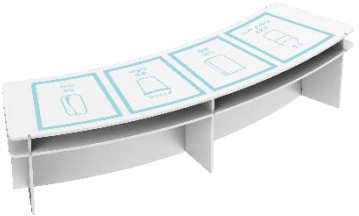
1. Collect speech data;
2. Extract speech features;
3. Identify initials and finals;
4. Identify vocabulary or a single word
5. Output a sentence;

Face recognition is a kind of biometrics recognition technology based on human facial feature. A series of related technologies that use cameras to collect images or video streams containing human faces, and automatically detect and track human faces in the images, and then perform face recognition on the detected faces, usually also called portrait recognition and facial recognition . Face recognition needs to complete the following process:

1. Collect face data;
2. Create a face model;
3. Train the face model;
4. Test the face model;
5. Apply the face model;

一、Experiment Equipment

Equipment Image	Name	Number
	Dobot Magician Lite	1

	Gripper	1
	Camera	1
	Power adapter	1
	Tape-C cable	1
	Goods models	4
	Map	1
	Shelves	1

二、Experiment Steps

1. Scene Create

（1）According to the map of the smart shopping system, place the experimental equipment, as shown in Figure 3.1.

Figure 3.1 The map of smart shopping assistant system

（2）Physical map of smart shopping assistant system is shown in figure 3.2.

Figure 3.2 The physical map of smart shopping assistant system

2. Program Design

Step 1: Read the flow diagram of smart shopping assistant system, as shown in Figure 3.3.

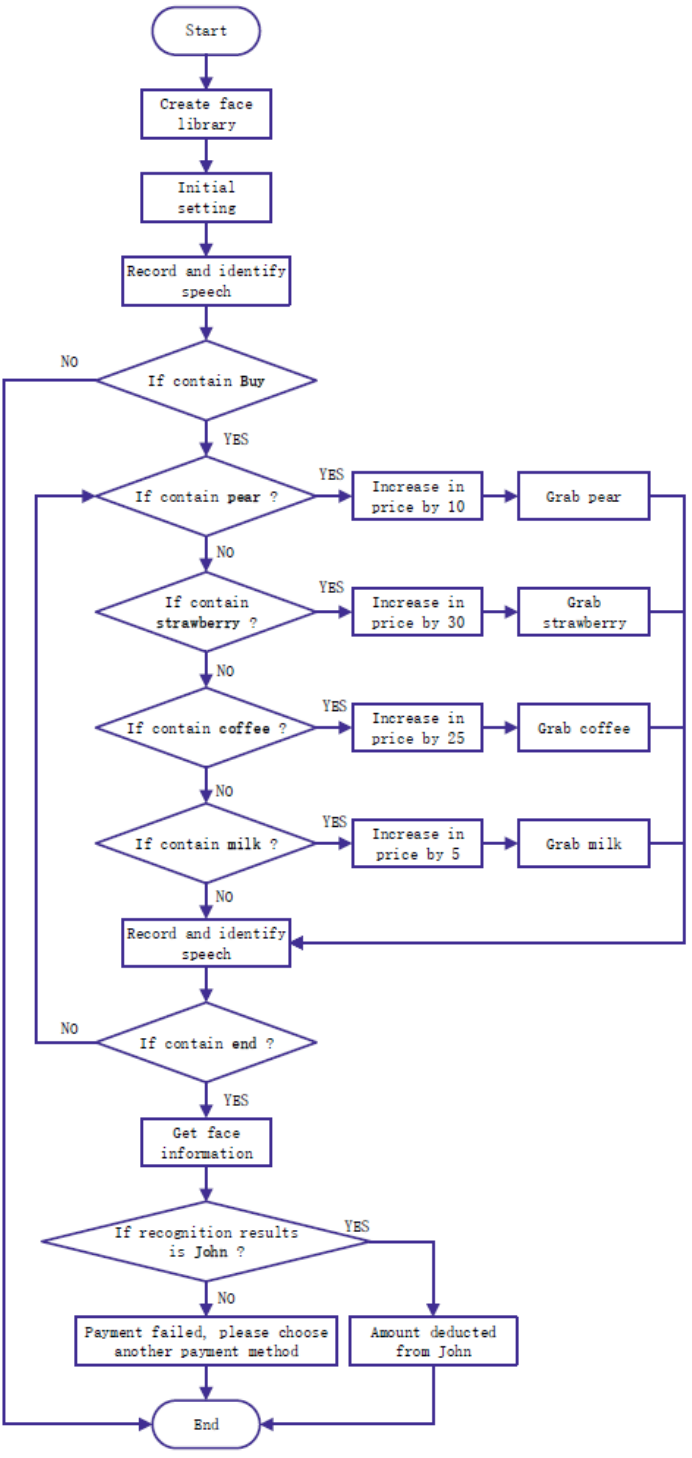


Figure 3.3 The flow diagram of smart shopping assistant system

Step 2: Create face set

1) Connect Magician Lite, add AI expansion module, select the **AI,** tab and click the New Face

Data, as shown in Figure 3.4.

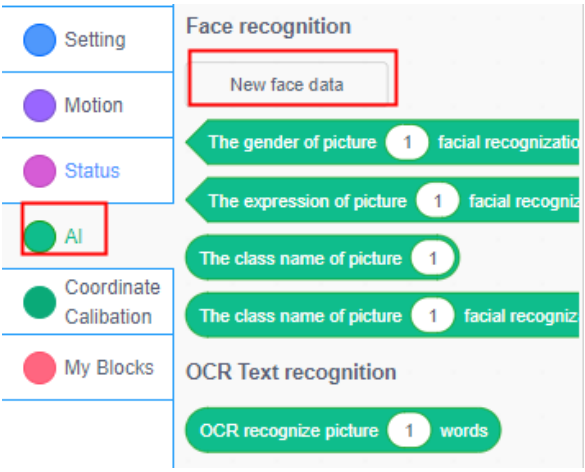


Figure 3.4 create face data

2) Create a face set label. Face photos can use face pictures or actual faces, as shown in Figure 3.5.

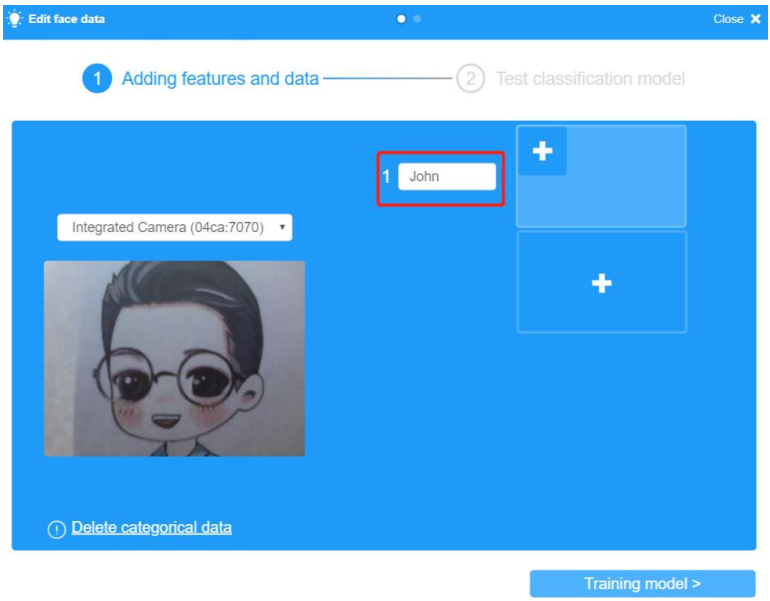
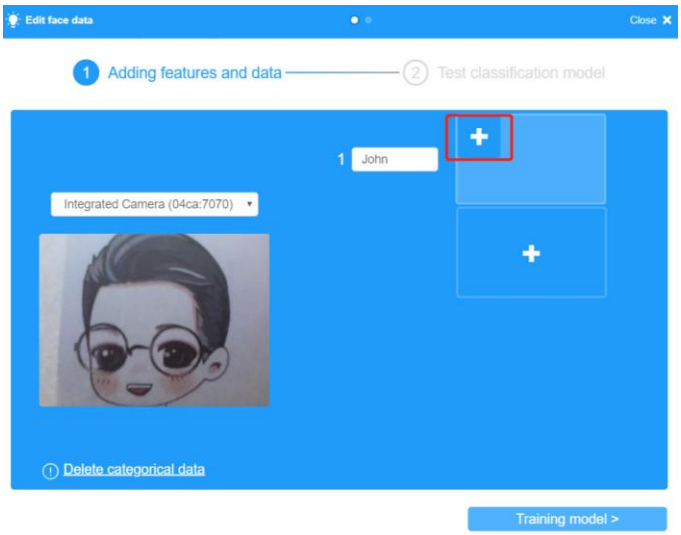


Figure 3.5 create face label

3) Collect face data. Put the face at the camera, click the + in the data set frame to add image data, as shown in Figure 3.6.



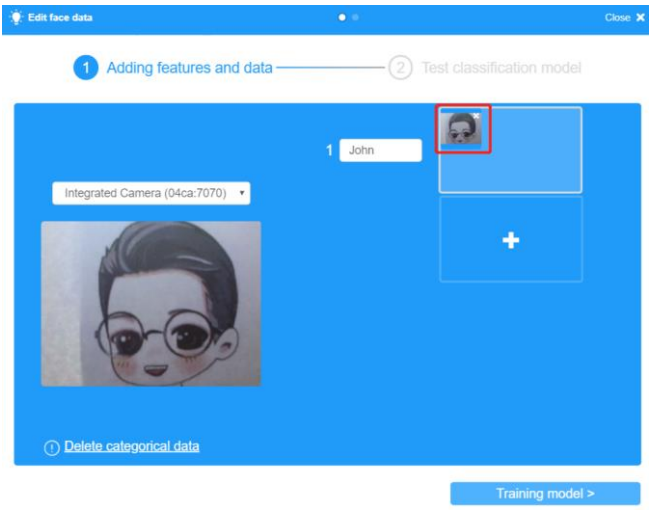


Figure 3.6 Collect face data

Step 3: Train and test face model

1) Train face model as shown in figure 3.7.

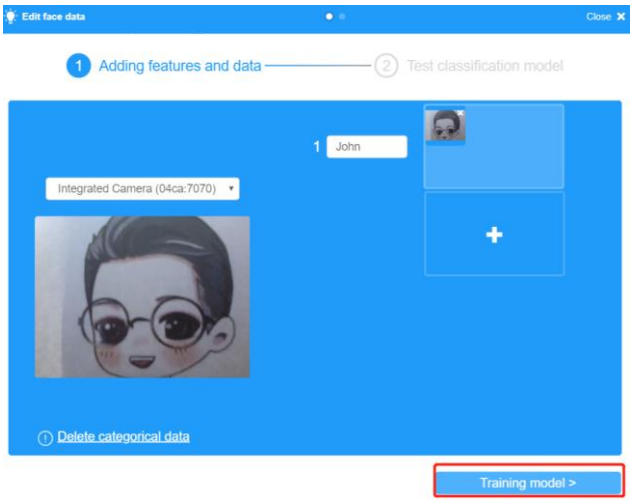


Figure 3.7 Train face model

2) Test face model. Place the face of John in front of the camera and click **Test**. If the probability value after the test is greater than 90%, click **Finish**, otherwise return to the previous step and collect the face data, as shown in Figure 3.8.

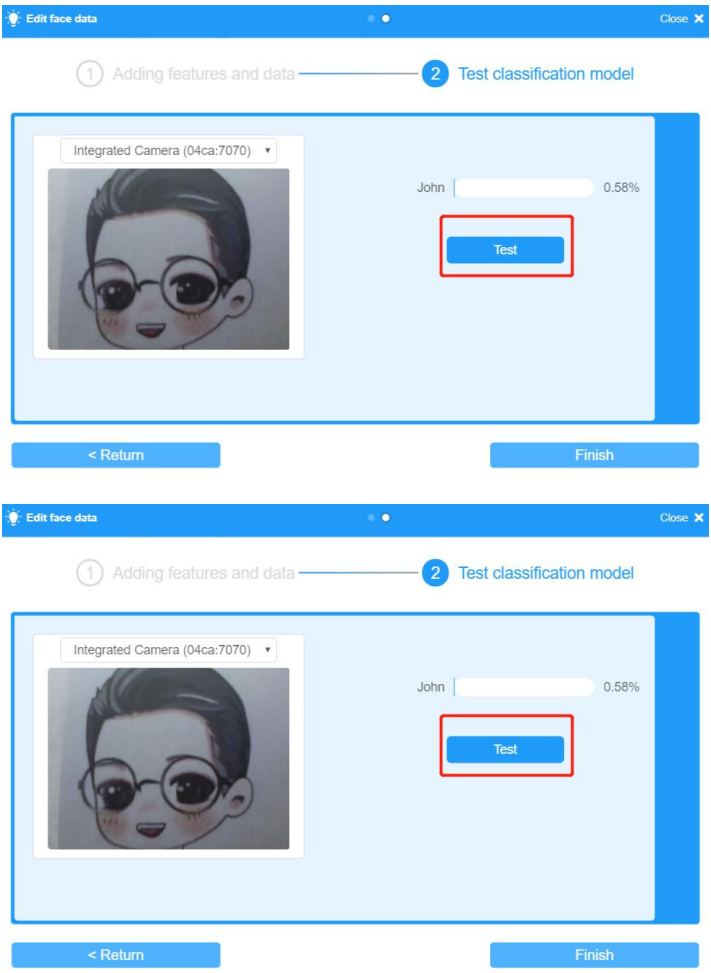


Figure 3.8 test face model

Initialize the smart shopping assistant system. Set the initial position of the robot, create a variable **price** to store the customer's bill, and then make a voice prompt, as shown in Figure 3.9.

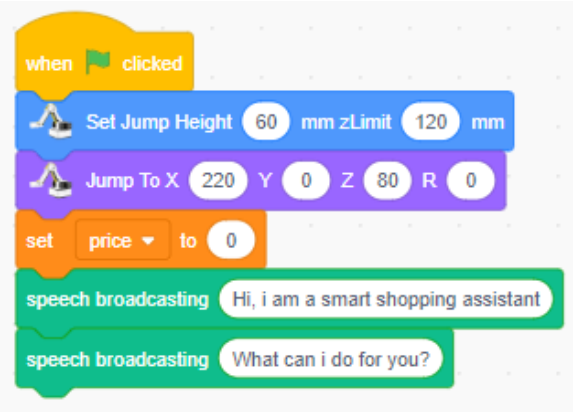


Figure 3.9 Initial smart shopping assistant

Step 4: Record speech, as shown in Figure 3.10.

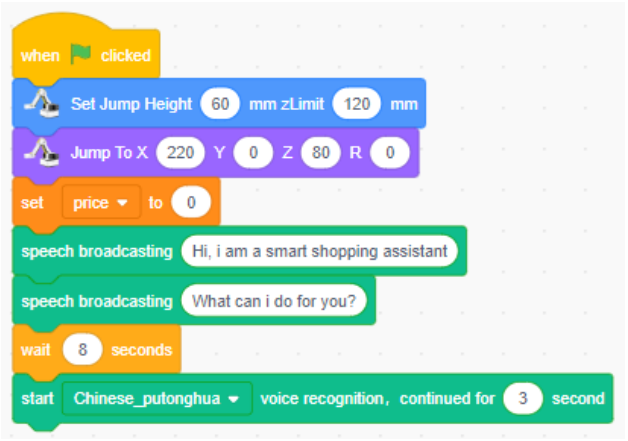


Figure 3.10 record speech

Step 5: Recognize voice and determine whether the text of the voice recognition contains "buy" text. If it contains "buy", continue to judge whether the voice recognition result contains the text of "pear". If it contains, the robot will grab the pear. The bill is increased by 10, as shown in Figure 3.11.

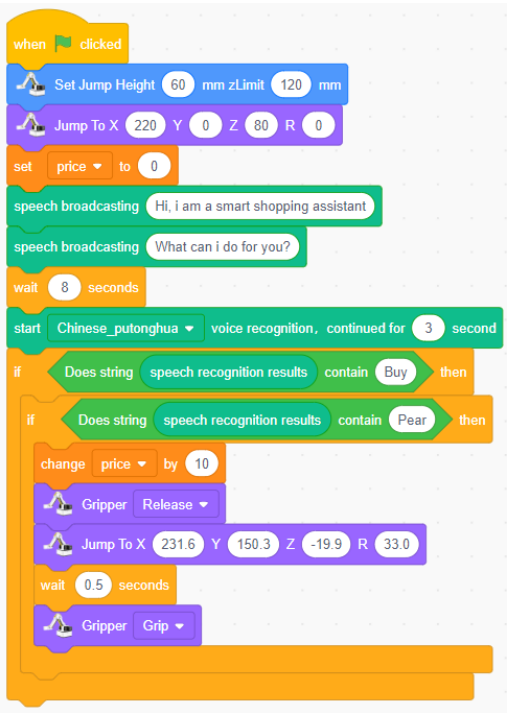


Figure 3.11 Whether recognize pear

Step 6: Determine whether the instruction to buy other goods is recognized, if it is recognized, grab the corresponding goods, as shown in Figure 3.12.

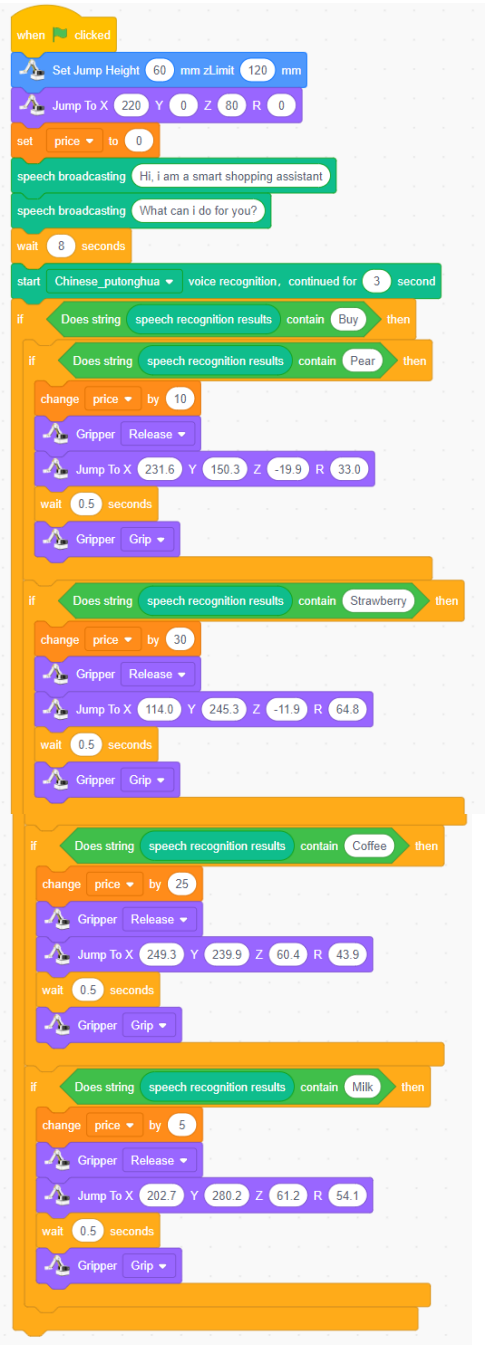


Figure 3.12 Speech order goods

Step 7: Place the goods in the goods settlement area to facilitate customers to take the goods, as shown in Figure 3.13.

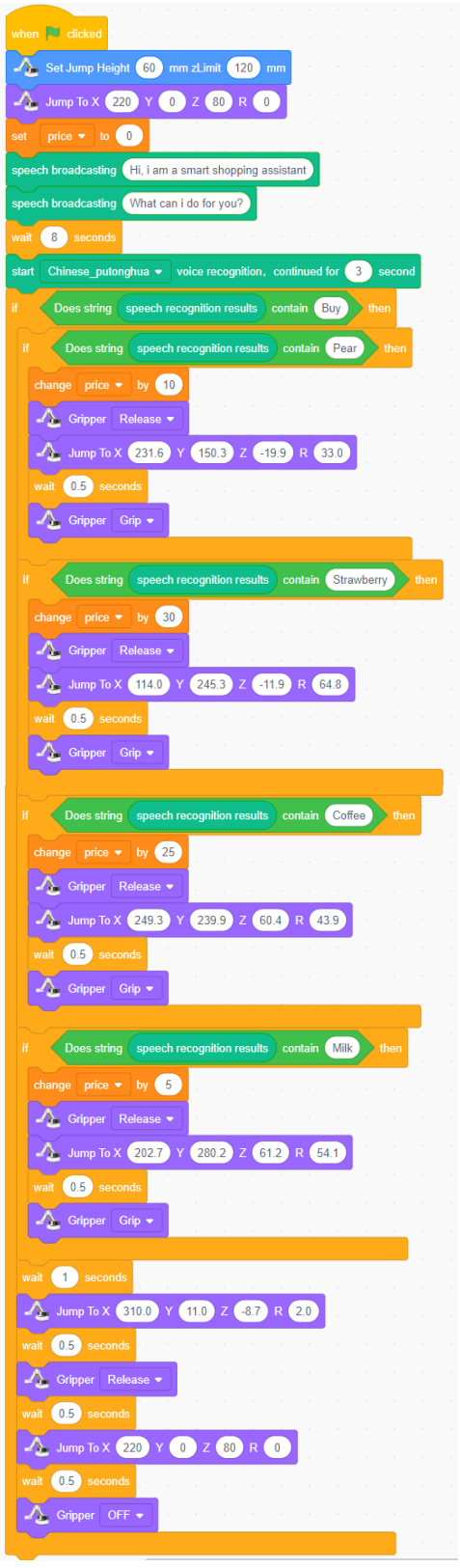


Figure 3.13 Grab goods to settlement area

Step 8: After ordering a product by voice, the smart shopping assistant system continues to

wait for the customer's voice instruction. If the voice recognized the "end" instruction, the order is finished, otherwise the order is continued, as shown in Figure 3.14.

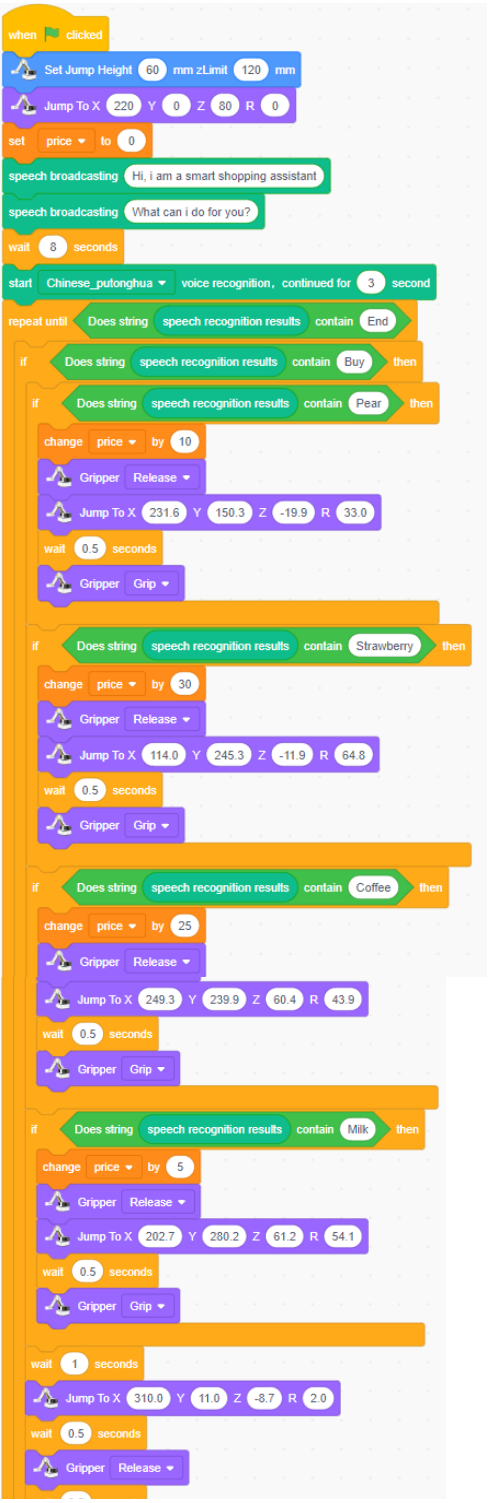
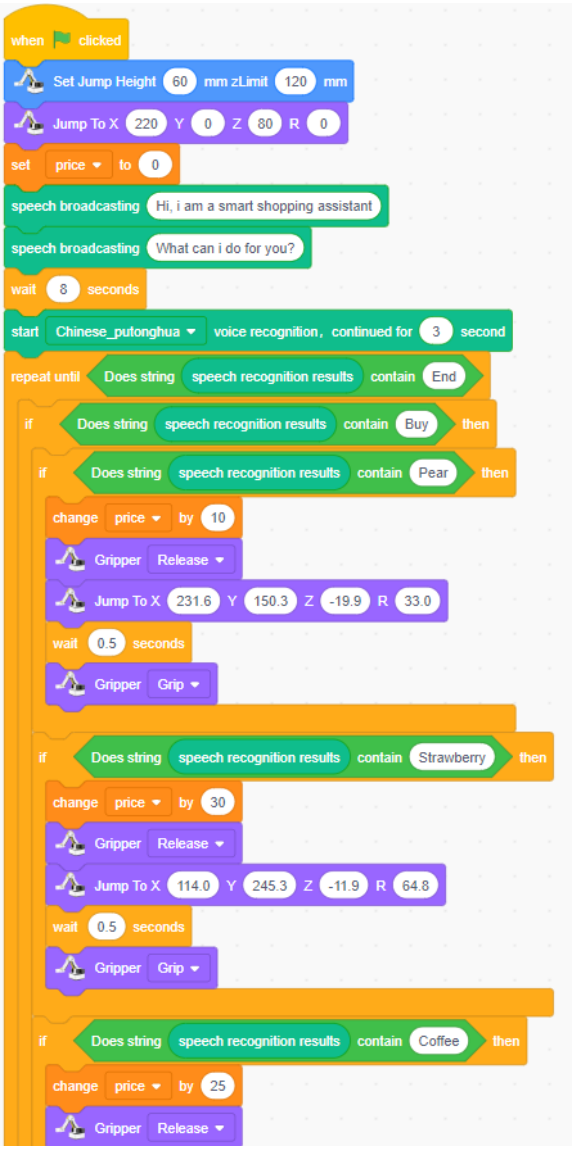


Figure 3.14 Recognize end instruction

Step 9: Face payment. The smart shopping assistant system will settle the bill and costumers pay the bill through face recognition.



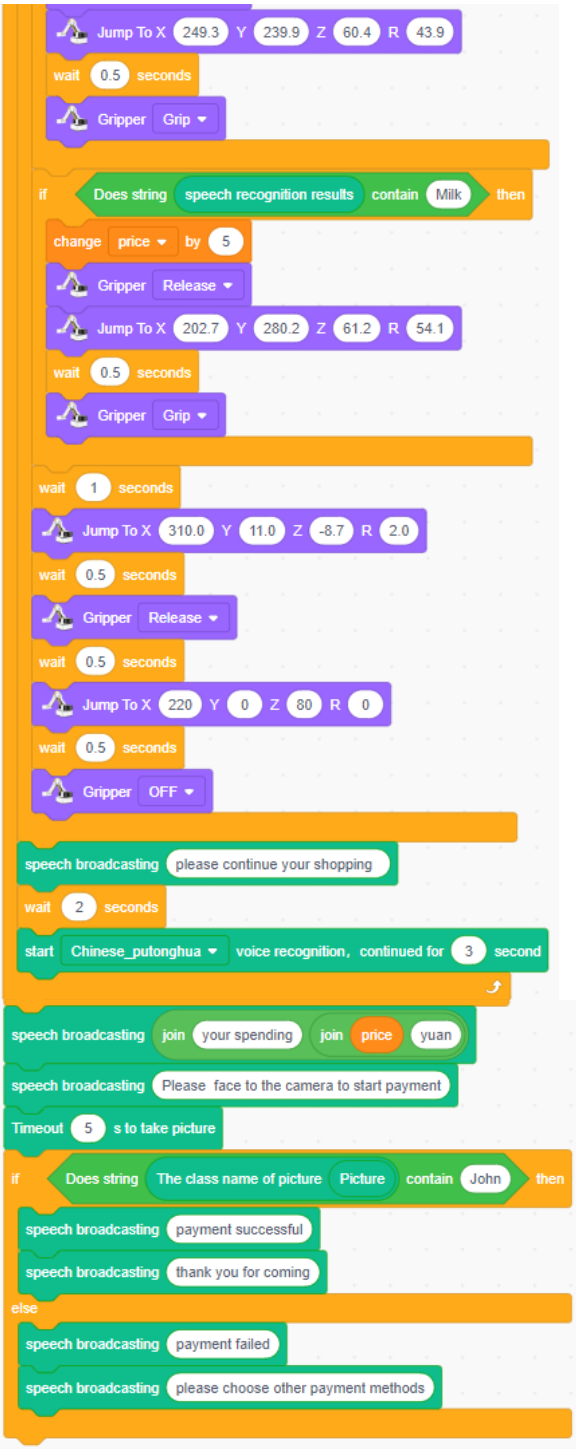


Figure 3.15 Figure 3.15 Face payment