Test Project (Offline)

BRICS-FS-08_System Integration and Application for Robots with Artificial Intelligence

2022 BRICS Skills Competition

2022 BRICS Skills Competition

Competition of System Integration and Application for Robots with Artificial Intelligence

Test Project

Total competition task time: 6 hours

Catalogue

1. Form of participation

(1) The competition is a team competition, and each team consists of 2 players and 1-2 experts.

(2) Teachers and students from vocational colleges (including technical colleges) aged 16-35 can participate as contestants.

(3) According to the requirements of the competition tasks, the 2 contestants will cooperate with each other to complete the competition tasks, and cooperate in the installation, deployment, programming and other work.

2. Content of the competition

The competition consists of two tasks (Task 1 and Task 2). Each task lasts 3 hours, with a total of 6 hours, and the contestants complete it in order. After the start of the competition, participants will be provided with task description, circuit diagram, equipment layout, equipment operation instructions, and data sources or other technical basis conditions required to ensure the independence and fairness of each task (sub-task). The competition includes the following skilled requirements based on the application development of the AI robot integrated system training platform. After the participants complete the specified tasks (Task 1 and Task 2), the referee will score the results respectively:

Figure 1: Competition platform renderings

1）System software and hardware installation and debugging

2）Artificial intelligence architecture construction and deployment

3）The PLC control system programming

4）Intelligent robot programming

5）Visual system programming

6）Interactive system programming

3. Project module introduction

3.1 Project module introduction and schedule

There are 2 task modules of Competition of System Integration and Application for Robots with Artificial Intelligence(offline), requiring contestants to complete within 6 hours. The name of specific project task

module and sub-task modules and time requirements refer to Table 1.

Table 1: List of project modules and time requirements

order number	Task module	Sub-task modules name	Competition content time
1	Task 1	Module A: Software and hardware installation and debugging of the training platform	180 mins
2		Module B: Face / voice / image recognition	
3		Module C: Machine vision system identification, detection and measurement	
4		Module D: Task 1 function joint adjustment	
5	Task 2	Module E: Design and programming of the interactive control system	180 mins
6		Module F: Task 2 function connection adjustment	

The competition schedule is shown in Table 2.

Table 2: Competition schedule

date	time	content
On November 3	08:00-14:00	Registration, hotel check-in, event-related information collection
	15:00-16:00	1. Pre-race presentation meeting (experts must attend) 2. Group teams and draw lots
	16:00-17:00	The referee meeting
On November 4	08:30-08:45	Pre-race preparation (Group 1 team review)
	08:45-09:00	The participating teams will check the competition equipment
	09:00-12:00	Morning competition time; scored by experts and judges
	12:00-13:30	Lunch, break time
	13:30-13:45	Pre-race preparation (Group 2 team review)
	13:45-14:00	The participating teams will check the competition equipment
	14:00-17:00	Afternoon competition time; rated by experts and judges
	19:00-20:30	Opening ceremony
On November 5	08:30-08:45	Pre-race preparation (Group 1 team review)
	08:45-09:90	The participating teams will check the competition

		equipment
	09:00-12:00	Morning competition time; scored by experts and judges
	12:00-13:30	Lunch, break time
	13:30-13:45	Pre-race preparation (Group 2 team review)
	13:45-14:00	The participating teams will check the competition equipment
	14:00-17:00	Afternoon competition time; rated by experts and judges
	17:00-18:00	Return to accommodation
On November 6	19:00-21:00	Closing ceremony

3.2 Introduction of the task scenario

The competition lasts for a total of 6 hours. This competition focuses on the application of artificial intelligence and intelligent robot integrated system technology in industry, life, consumption and other fields. The competition reflects the intelligent mechanical arm technology, speech recognition and processing technology, machine vision technology, electrical control technology, sensor technology, automation control technology, software technology, communication technology, configuration technology and so on in the intelligent environment. The assessment content is closely combined with the teaching content of the relevant courses, which fully examines the professional skills and qualities involved in the complete integration cycle of the AI project. The assessment content includes the requirements for the core technical skills and the core knowledge of the automation and electronic information majors in the field of artificial intelligence.

Focus on assessing the contestants' comprehensive application ability of ai open platform deployment, data annotation, model construction, intelligent vision training, speech recognition training, intelligent robot system, and path optimization, combined with more mature artificial intelligence technology, to improve their engineering practice ability and innovation ability.

3.3 Introduction of the competition platform

1. Composition of the competition platform

The competition platform has a four-axis robot as the core, and also integrates the PLC control unit, HMI unit, vision unit, material storage unit, chute storage unit, color and material detection unit, feeding unit and transmission unit, in addition to the wiring unit, gas supply system and power supply unit. Combined with the cloud platform speech recognition and local data set training, it can realize the future intelligent application scenarios based on the integration of face recognition, speech recognition, machine vision, deep learning, robot control and other technologies, and can be used as an artificial intelligence solution in daily life, business, industry and other fields.

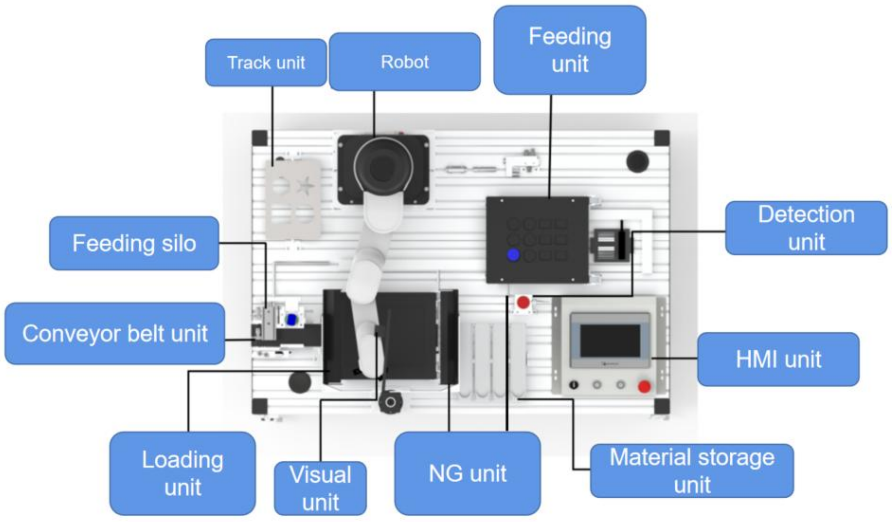

Figure 2: Layout diagram of the competition platform

2. System framework of the competition platform

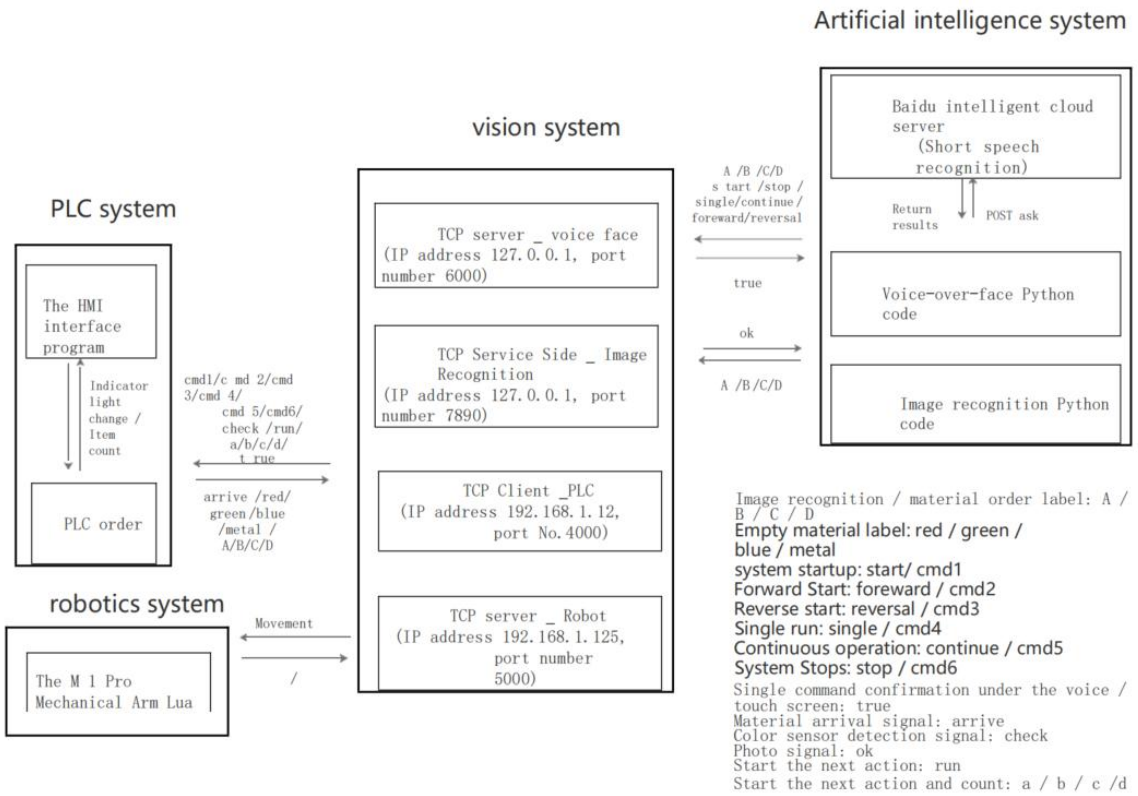

Figure 3: System framework of artificial intelligence and robot application training platform

3.4 Content of the task book

Competition materials

(1) Image material

The size specification of the image material is a Φ 30mm 10mm cylinder, as shown in the figure. The upper surface is the material image. The image is divided into four categories: fruit / vegetable, food, drink and clothing. During the competition, the image material needs to be sorted from the conveying unit into the specified chute according to the work task.

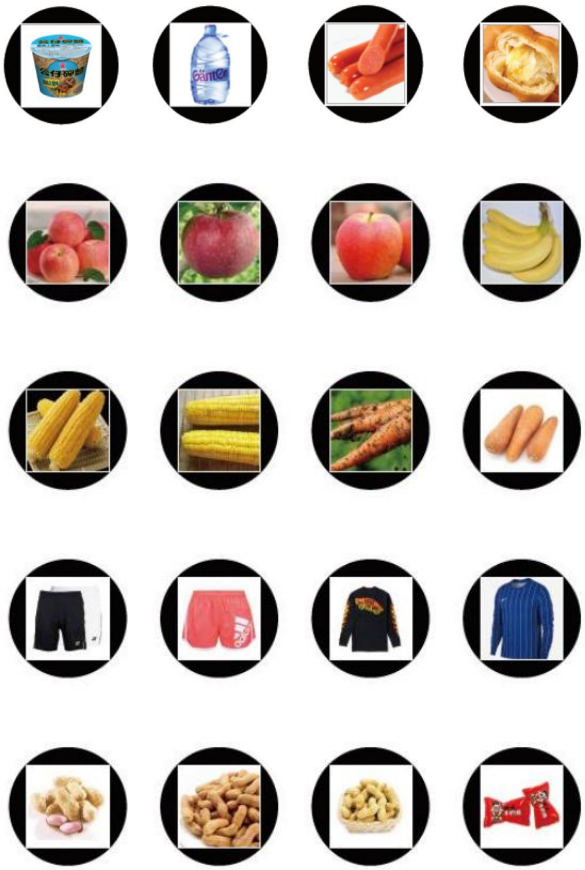

Figure 4: Image material

(2) Blank material

The size specification of the blank material is a Φ, 30mm, 10mm cylinder, with no image on the upper and lower surfaces, as shown in Fig. Items need to be sorted by identifying the color and materials to the specified location.

Figure 5: Blank material

(3) QR code materials

The qr code materials are a cuboid, as shown in the figure below, and the above surface is the qr code image. During the competition, the qr code content needs to be identified, and the materials are sorted to the designated position according to the information of the qr code and the task book requirements.

Figure 6: QR code materials

Task Module 1

Task A: the software and hardware system installation and debugging

Participants shall complete the installation and debugging of the software and hardware of the artificial intelligence and robot application training platform system according to the task requirements. The tasks shall include the following contents:

1）robot

2）Visual kit

3）PLC

Installation process requirements:

1) The cable and the trachea are bound separately, the first binding belt is 60 ± 5mm away from the joint, the distance between the other two binding bands should not exceed 50 ± 5mm, the binding belt cutting can not be left too long, must be less than 1mm, beautiful and safe. The air path bundling does not affect the normal operation of the robot, and will not scratch and hook with the surrounding equipment. Cable and trachea shall be separated. The trachea can be fixed with wire clips on the profile bracket, and the distance between the two wire clips shall not exceed 120mm. The length of the pipe

should be appropriate, not bending winding and binding deformation, and air leakage is not allowed.

2) Mechanical installation, appropriate tools should be selected to complete the unit assembly according to the provided parts, and the mechanical unit does not shake or loose after installation. The cylinder action of the execution components is gentle, without strong collision.

Task A1: Robot

- Installation positioning

The robot should be installed on the competition platform according to the position requirements in Figure 2 to ensure that the movement space of the robot covers the working area, and there is no abnormal situation such as less screws, loose base, collision or restriction. The mounting size error of the base shall not exceed ± 5mm.

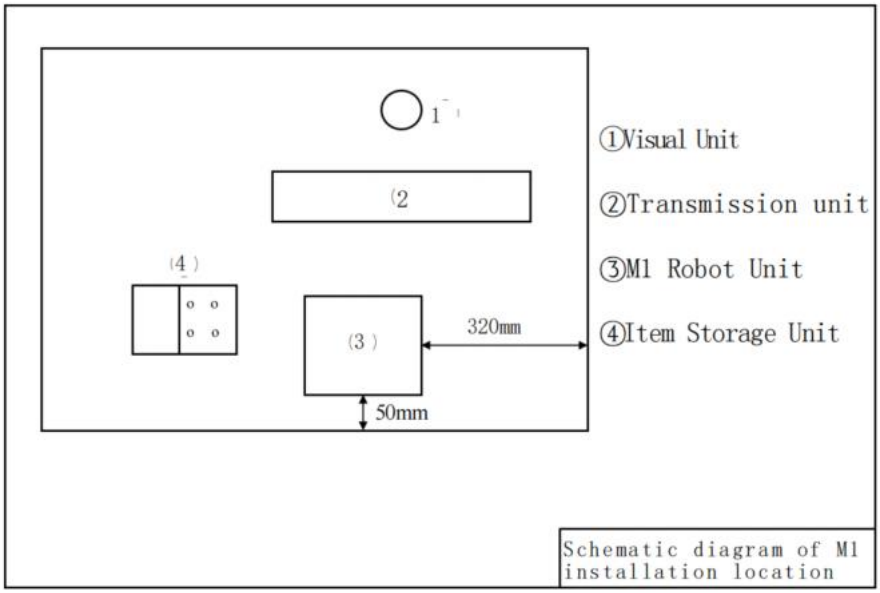

Figure 7: Schematic diagram of the M1 Pro installation location

- The wiring on the electricity

On the competition platform, according to the wiring requirements of Appendix F, correctly connect the power cord, emergency stop switch line and control signal line of the robot, and no abnormal phenomena such as loose wiring should be found. Note: Ask the referee before going on power.

Task A2: The Visual Suite

- Install fixed

(1) Install the camera bracket, camera, lens and light source according to the position requirements in Figure 4; the lens focus ring, aperture ring top wire is not loose, without misinstallation or missing installation phenomenon. The installation dimension error of the visual unit base shall not exceed ± 5mm.

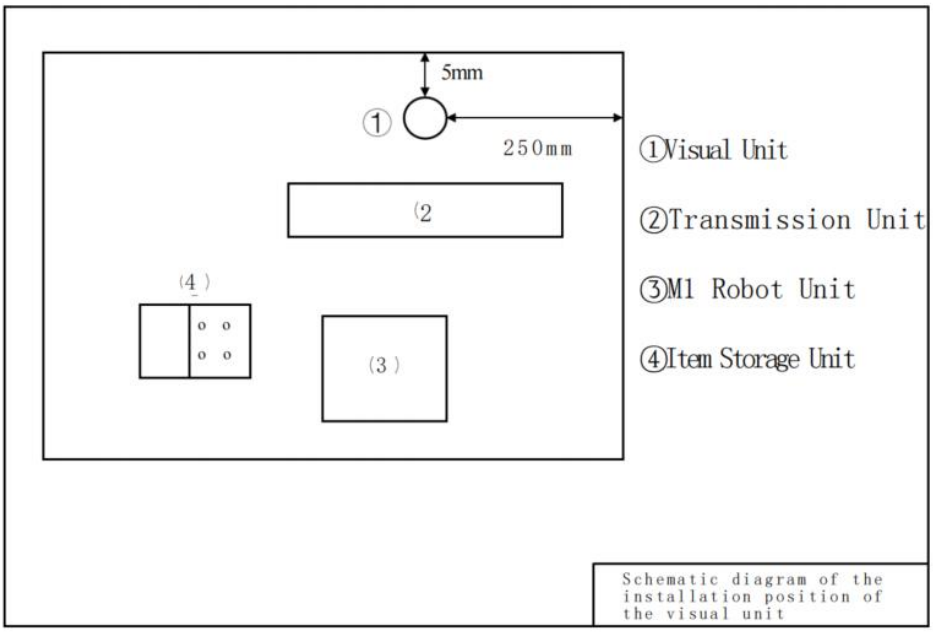

Figure 8: Schematic diagram of the visual unit installation location

(2) The power cord and communication line of the visual system are standardized, clean and firmly fixed, and the interface connection is correct

- Image debugging

Debug the lens parameters and camera parameters to ensure the output of clear, bright and sharp images.

- Hand eye calibration

Using the calibration plate and the N-point calibration method, the hand-eye calibration work of the robot-visual system is performed to output the calibration conversion file.

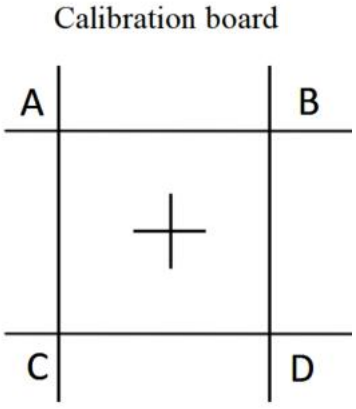

Figure 9: Schematic diagram of the calibration board

Task A3: The PLC

- Check the IO variable table

According to the PLC IO signal table, check the IO variable table, and observe the corresponding IO indicator lamp, and whether the wiring is correct.

- Check IO peripherals

  Test whether the IO peripherals work correctly according to the PLC IO signal table.

Table 3: Table PLC IO

The PLC I0 input signal table

NO.	address	Function annotation
1	I0.0	Visual station in place to detect photoelectric
2	I0.1	Detection unit red detection sensor
3	I0.2	Detection unit green detection sensor
4	I0.3	Detection unit blue detection sensor
5	I0.4	Feeding cylinder extension position sensor
6	I0.5	Feed cylinder retraction position sensor
7	I0.6	Feed position material detection sensor
8	I0.7	
9	I1.0	Start the button
10	I1.1	stop button
11	I1.2	emergency stop switch
12	I1.3	change-over switch
13	I1.4	Detection unit metal detection sensor

The PLC I0 output signal table

NO.	address	Function annotation
1	Q0.0	The leather shaft motor enables in reverse
2	Q0.1	The leather shaft motor positively enable in forward
3	Q0.2	
4	Q0.3	
5	Q0.4	Quinting gas to enable
6	Q0.5	
7	Q0.6	
8	Q0.7	

Task B: Face / voice / image recognition

Write perfect functions per task requirements per the given Python initial program. All the project storage paths of Python are "D: \ session number _ station number \ Python0201", and the folder Python0201 is Python + session + station number (such as the 01 station of the second game, the folder name is Python0201). Complete the following tasks as required:

1) Face model training;

2) Application of voice skills;

3) Intelligent recognition training of the image model;

Task description: This task module is uniformly provided by the organizing committee, and the players will complete the task based on the equipment.

Task B 1: Face model training

(1) Face collection. Optimize the face collection code, and run the program to collect the face data sets of the two contestants respectively. The name caps the pinyin capitals of the contestants, such as "Li Yan", the pinyin letter is "LY", and the id is "0" and "1" respectively.
(2) Face training. Optimize the face training code, run the program to train the face dataset, get the face model, name the custom, and store the location in the voice face Python project.
(3) Face verification. Optimize the face verification code, add your own name pinyin initial capital, load the face model, and realize the face recognition function.
(4) Complete the missing main program of voice face Python engineering, add face recognition code.

ask:

1) Face detection box, name pinyin initial capital and matching index all need to be displayed on the window;
2) The matching index needs 5% to be face verification.

Task B 2: Voice skills application

(1) Provides the " baiduasr. The py " file, containing the Baidu speech recognition function, is used for the main function to call.

(2) Recomplete the words " Main. The py " file only provides the main function header file, and the other code (TCP communication creation, sending, thread creation, voice function call, etc.) needs to be completed by the players themselves.

(3) Open the debugging assistant, run the voice Python project, establish a communication connection, and press the computer return button to issue voice commands.

The ① gives the "system start" voice command, and the Python project operation interface can print the recognized voice information; and give feedback to the debugging assistant "start";

The ② issues the "material classification" voice command, and the Python project operation interface can print the identified voice information; and give feedback to the debugging assistant "sort";

Task B 3: Intelligent recognition training of the image model

(1) The base engineering files and templates provided before the game contain inference_test. The py file, the necessary file required in this task requirement.

(2) Model training: Players need to use the Pytorch framework to adjust the training parameters, modify and optimize the model training code to run the program, generate and save the deep learning model, and name the " team number + Model. The pkl ", the storage path is under the model folder of Image Recognition Python Engineering (RobotRecognition folder).

(3) Model validation: Modify and run the model inference test code (inference_test. The py), reasoning and evaluating the trained completed models. Image recognition path requires D: VisionMaster / image, which is necessary to verify the score.

(4) M a i n for optimizing and perfecting image recognition Python engineering.py code. Run the image recognition M a i n using the debugging auxiliary validation provided before the game. The py code, establish the communication connection, the TCP debugging assistant sends "ok" to trigger the image recognition. Image recognition path requires D: VisionMaster / image, which is necessary to verify the score.

Task C: Machine vision system identification, detection, and measurement

The basic engineering documents and templates provided before the competition contain the following material picture library: 4 QR code pictures, 4 string pictures, and 2 rectangular pictures

(1) String defect detection

Establish a TCP communication with the TCP Commissioning Assistant. During the verification, you will randomly select 2 string images in the material picture library and conduct the verification (including 1 nondefective string and 1 defective string, as provided before the competition) to run the visual program to accurately determine whether the numbers in the string picture are defective. Send a false to the TCP assistant if there is a defect, and a true to the TCP assistant if there is no defect.

(2) QR code identification

Establish a TCP communication with the TCP Commissioning Assistant. During the verification, a QR code image will be randomly selected from the material picture library provided before the competition for verification, run the visual program, identify the QR code content, and send the identified QR code content to the TCP debugging assistant.

(3) Graphic identification

Establish a TCP communication with the TCP Commissioning Assistant. During the verification, a rectangular image will be randomly selected from the material picture library provided before the competition for verification, and the visual program is run to identify the wireframe graphic image, which can accurately identify and measure the length / width of the rectangle, and send the measurement results to the TCP debugging assistant.

Task D: Task 1 function alignment adjustment

(1) Face recognition confirmation, verification into the competition platform system.

(2) Voice verification, and the start of the regional classification process.

(3) The robot took out the qr code material 7,8,9 in the feeding unit, placed on the visual identification area on the conveyor belt, and according to the material placed in the different slot unit (chute 1 placed qr code as "low", chutes 2, qr code as "mid", chute 3 placed qr code as "high").

(4) The robot takes out the letter material of No.2 in the feeding unit, and places it on the conveyor belt in the visual return character recognition area, and gives the results to the PLC. The PLC displays the results on the "material monitoring interface" of the HMI touch screen, and places the letter material in the NG area of the feeding unit.

(5) The robot takes out the blank materials in the feeding unit No.6 and No.4 respectively and places them in the testing unit for color and material detection, and displays the detection results on the "material monitoring interface" of the HMI touch screen, and finally all the blank materials are placed in the NG area of the feeding unit.

(6) Voice verification, and the start of the material distribution process.

(7) The PLC notifies the robot to place the image material in the corresponding chute

according to the material requirements in different areas.

(8) If a material identification is not required by the following task, the material is placed in the NG area for storage.

(9) The robot places the image material in the corresponding chute according to the material requirements.

* Material requirements: Chute 1 needs 1 mineral water; groove 2 needs 1 mineral water, 1 bread; trough 3 needs 1 instant noodles, 1 mineral water, 1 bread.

Note:

The material location information of the ① feeding unit is shown in Figure 10 below:

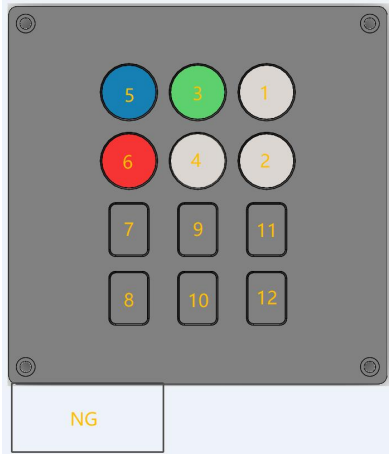

Figure 10: Schematic diagram of the feeding unit location

① HMI interface material monitoring interface single reference is as shown in Figure 11 below:

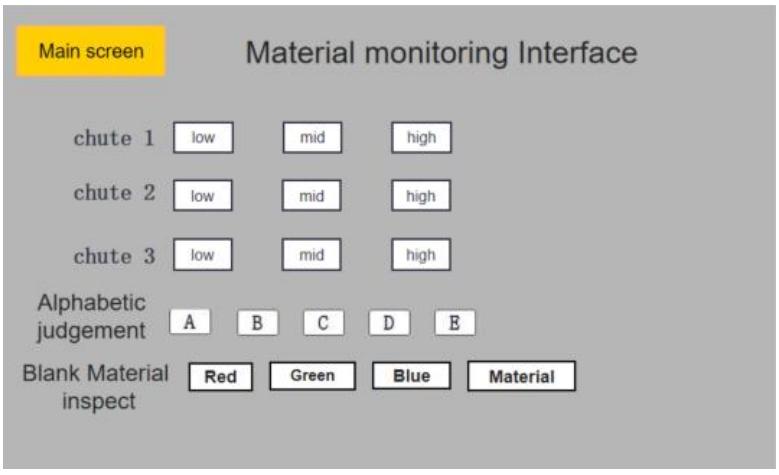

Figure 11: Schematic diagram of the HMI material monitoring interface

Task module 2

Task module E interactive system programming

Task E1: Main HMI Interface

Players need to complete the human-computer interaction main interface. The touch screen model is: Siemens KTP700 Basic PN, and the schematic diagram of the main interface is shown in Figure 12. Players do not need to make an interface layout consistent with the main interface diagram, but must include the following elements:

Title content:

(1) "2022 Artificial Intelligence Robot System Integration and Application Platform";

(2) "System operation": operation indicator, green when the system operates; black when the system is not running;

(3) "Barn status": warehouse indicator lamp, warehouse without material is red; black when warehouse with material;

(4) "System standby": standby indicator, yellow is standby; black is not standby;

(5) Item name and counting box: "Fruit / vegetable", "Food", "Drink" and "Clothing", respectively display the counting of the corresponding image item on the chute storage unit, with the format of 0-99; if and only when the program is initialized, the counting starts again.

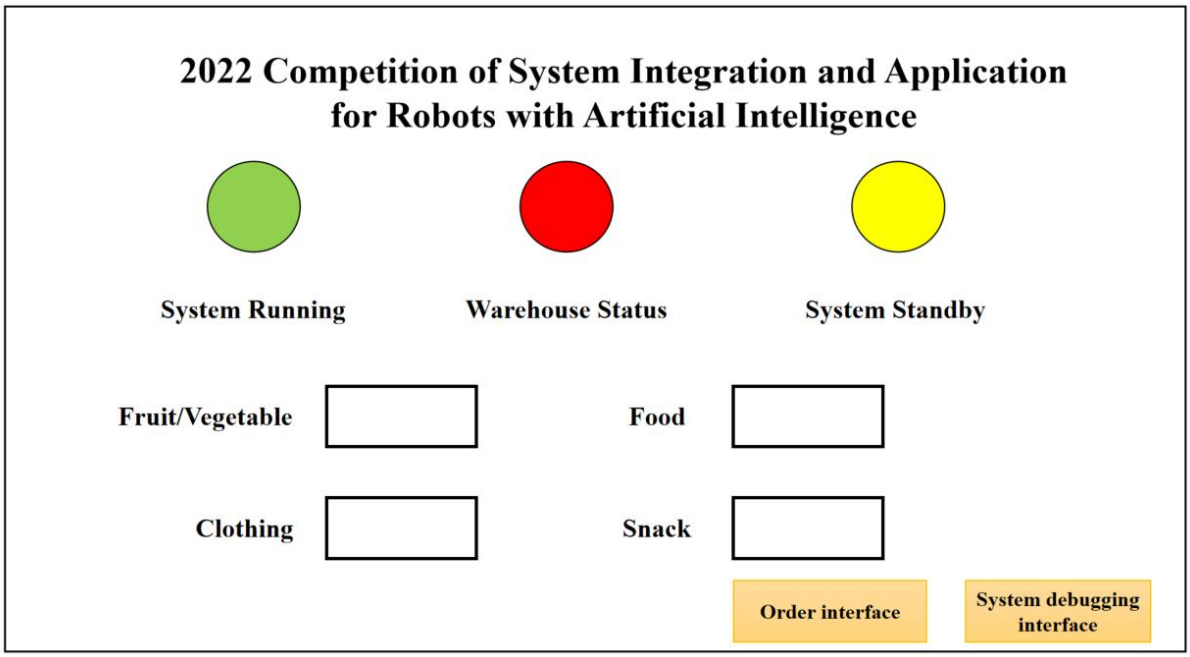

Figure 12: Schematic diagram of the main interface

Task E2: The HMI system debugging interface

Players need to complete the human-computer interaction system debugging interface. The touch screen model is: Siemens KTP700 Basic PN, and the schematic diagram of the system debugging interface is shown in Figure 13. Players do not need to make an interface layout consistent with the system debugging interface diagram, but must include the following elements:

(1) Title content: "System debugging interface";
(2) "System Start" button: when the button is pressed, the PLC system is in the starting state, and the operation indicator of the main interface changes from black to green;
(3) "conveyor belt positive" button: when the button is pressed, the conveyor belt runs clockwise for 3 seconds and stops
(4) The "conveyor belt reverse" button: when the button is pressed, the conveyor belt runs counterclockwise for 3 seconds and stops
(5) "Single Operation" button: when the button is pressed, the system will complete one feeding operation, color detection operation and material sorting action;
(6) "Continuous Operation" button: when the button is pressed, the system will continuously complete 20 material sorting actions;
(7) "System Stop" button: when the system starts, when the button is pressed, the system stops, and the system completes the current material sorting, stop the action. At the same time, the operation indicator light of the main interface changes from green to yellow;
(8) When the "Main interface" button is pressed, you can switch to the corresponding interface.

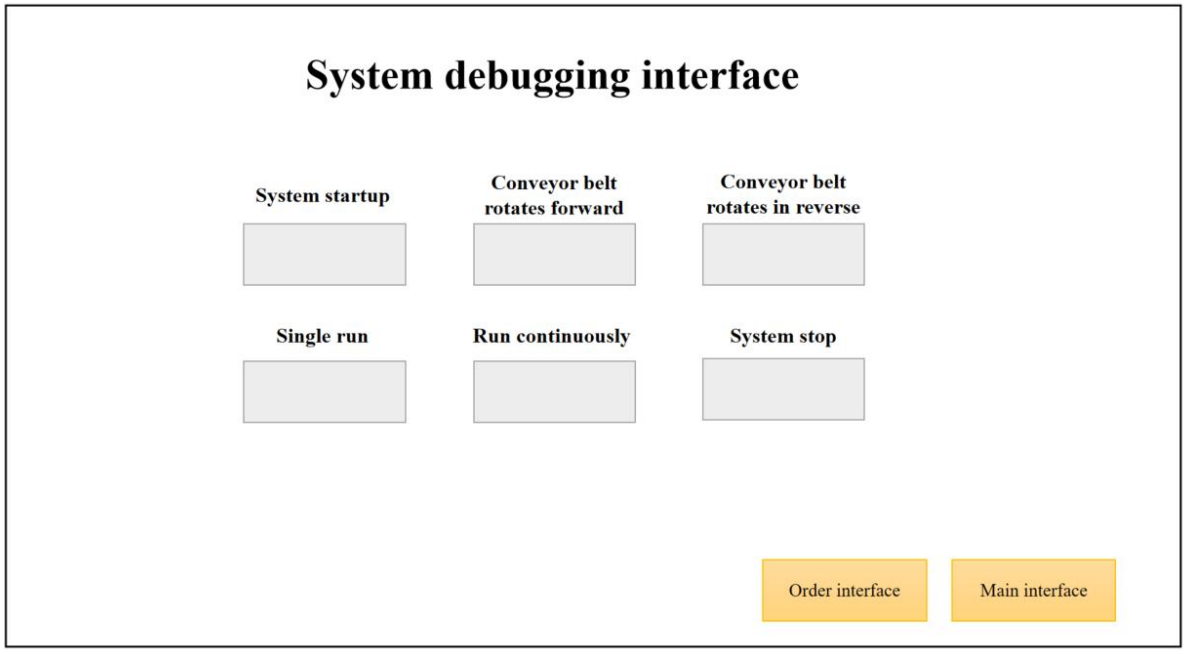

Figure 13: Schematic diagram of the system debugging interface

Task E 3: The HMI order interface

Players need to complete the human-computer interaction order interface. The touch screen model is:Siemens KTP700 Basic PN, and the schematic diagram of the order interface is shown in Figure 14.

The player does not need to make an interface layout consistent with the order interface diagram, but must include the following elements:

(1) Title content: "Commodity order quantity";

(2) Material name and display box: the material name is "Fruit / vegetables", "Food", "beverage" and "clothing", the display box synchronously updates the display material order quantity of the visual system, the format is the number, showing 0-99.

(3) The PLC system needs to realize the data synchronization function, synchronize the order number of the visual system in real time, and display it on the HMI touch-screen order interface.

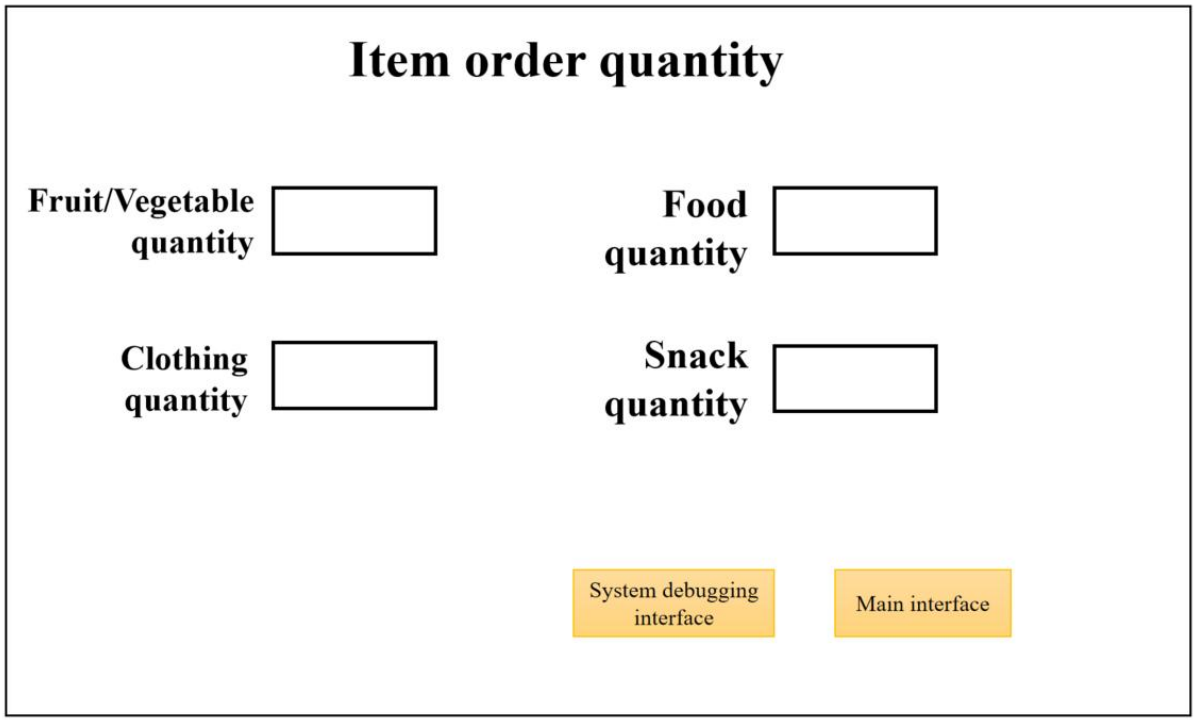

Figure 14: Schematic diagram of the order interface

Task E 4: The PC front-end interface

Players need to use Python development tools to design and develop the front-end interface on the PC end, and to integrate and realize the real-time interaction function of multi-command task distribution and information. The front-end of the PC interface, the actual operation of the platform and the information displayed on the HMI touch screen need to be updated and synchronized in real time. Functional functions are shown in the figure below:

（1）PC front-end software can display "User ID", "User Name" and "Model Name";

（2）In the information preview box, the real-time synchronous display of face collection state, face training state, face recognition state, and order information should be displayed;

（3）PC front-end software can be face recognition start, system start function operation;

（4）The PC front-end software should display the relevant information of the identified materials in real time, and the information overlapping with the HMI should be consistent. The content is shown in Figure 15 / 16, including: sorting times, material category, material name, and placement location.

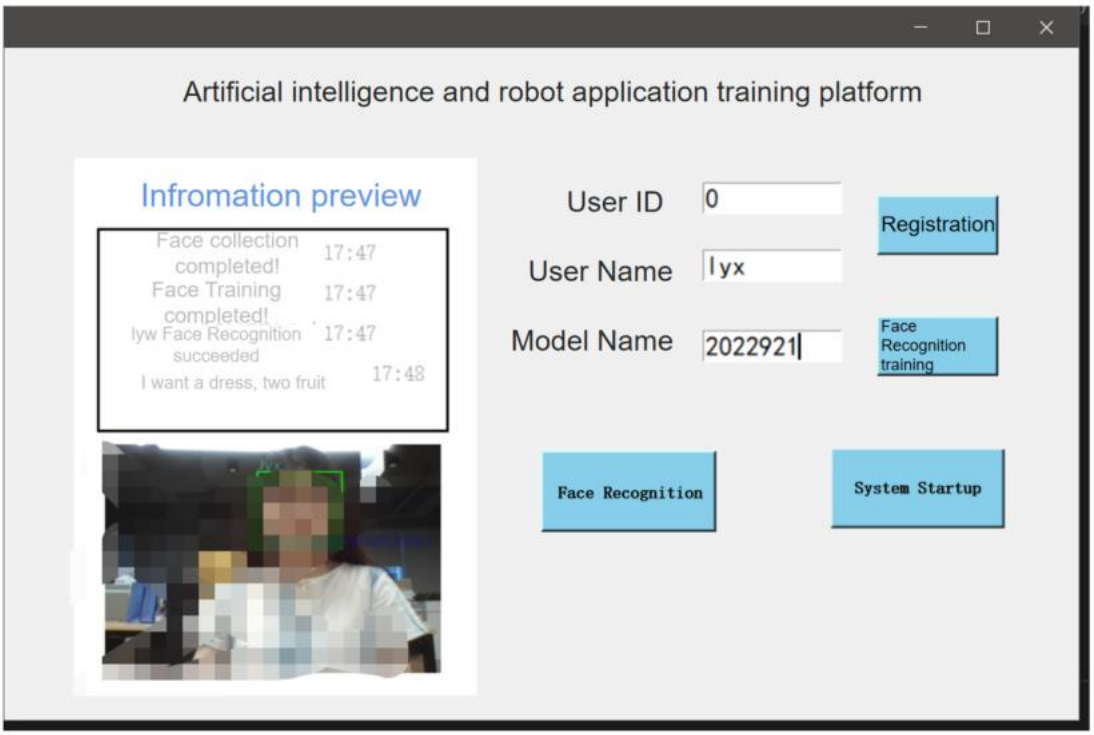

Figure 15: Schematic diagram of the PC front-end interface

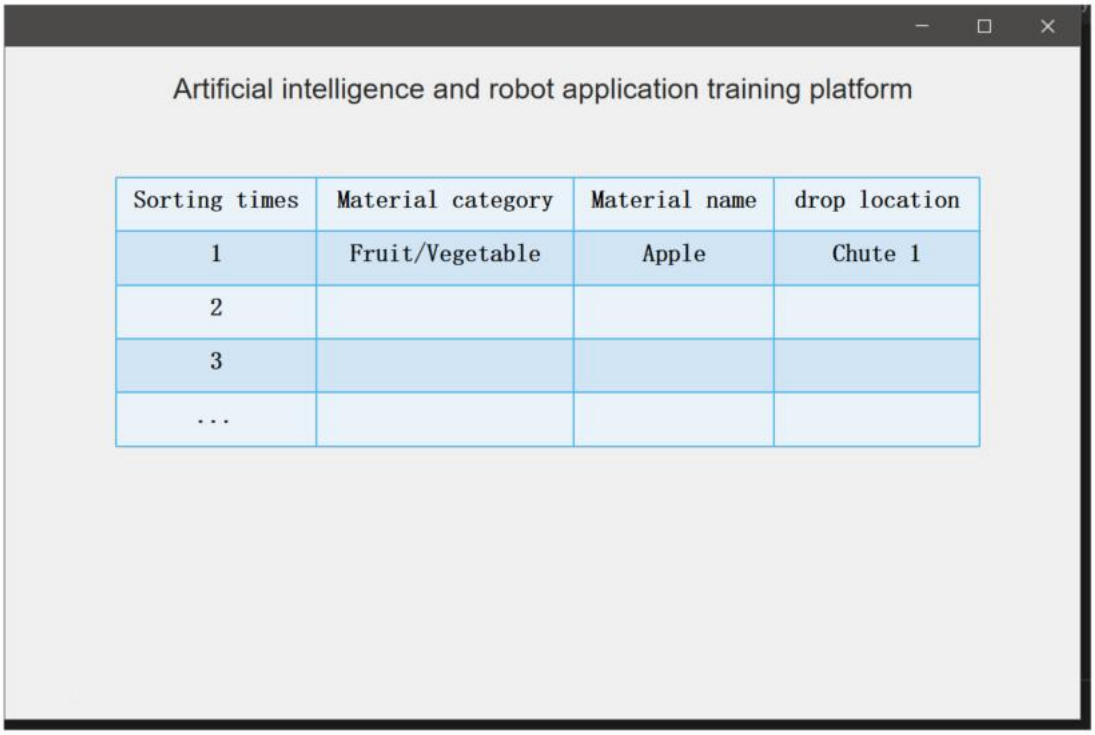

Figure 16: Schematic diagram of the PC front-end interface

Task module F task 2 function joint adjustment

Task F1: Joint adjustment preparation

(1) Before the system joint commissioning, the referee will randomly add all materials into the warehouse, and confirm that the initial status of goods orders quantity is "0".

(2) Initialization check. The initial state of the bin is: the feeding cylinder is retracted and the belt is stationary. The initial status is: System Run indicator is black and System Standby indicator is yellow. If the bin has material, the "bin status" shows black; if the warehouse has no material, the "bin status" shows red.

Task F2: Face verification

The referee randomly selects one contestant for face verification, and the matching index needs 5% to pass the face verification. Each validation time does not exceed 30s, and only two validation opportunities exist. If the verification is not passed within the specified time, it means that the face verification fails, the overall alignment adjustment fails, and the corresponding alignment adjustment score is deducted.

Task F 3: Voice order

(1) The "system start" voice command is issued, and the system has no specific actions. The "run" indicator on the touch screen interface shows green, and the "standby" indicator shows black.

(2) On the basis of the touch screen has order, let players randomly by voice recognition issued an order, for "2 fruits / vegetables, 2 drinks, 1 set of clothing, 3 food", the system confirmed after receiving orders platform system running, at the same time order interface real-time update material order quantity, required order material through the robot programming control placed in the platform "NG module".

(3) During the material sorting process, materials not in the order or those exceeding the order quantity should be placed in the chute storage unit according to category. Meanwhile, and the number of materials in the chute storage unit should be displayed on the touch screen main interface. The chute storage categories are shown in Table 4 below:

Table 4: Chute Storage Table

Image material	Slide storage unit
Fruit / vegetable	Slide 1
beverage	Slide slot 2
dress	Slide slot 3
foodstuff	Slide 4

(4) Issue the "positive start" voice command, and the belt stops for 3s.

(5) Issue the "reverse start" voice command, and stop the belt turning in reverse for 3s.

(6) The "single operation" voice command is issued, the "run" indicator on the touch screen interface is green, and the single operation recognition and sorting action is performed. The robot performs

the grasping, sorting and placement, and counts and displays the materials on the touch screen main interface and the order interface. After performing one action, then the action is stopped.

(7) Issue "continuous operation" voice command "running" indicator, touch screen interface display green, perform continuous operation action, robot grab sorting placement, while the touch screen main interface and order interface to count and display, the warehouse continuously pop up material, repeat until the warehouse empty warehouse, touch screen interface "warehouse" indicator display red, stop the action, finally complete "F3- (2) voice order sorting task".

(8) Issue the "system stop" voice command. After the system completes the sorting of the current material, stop the action. The "Run" indicator on the touch screen interface shows black, and the "standby" indicator shows yellow.

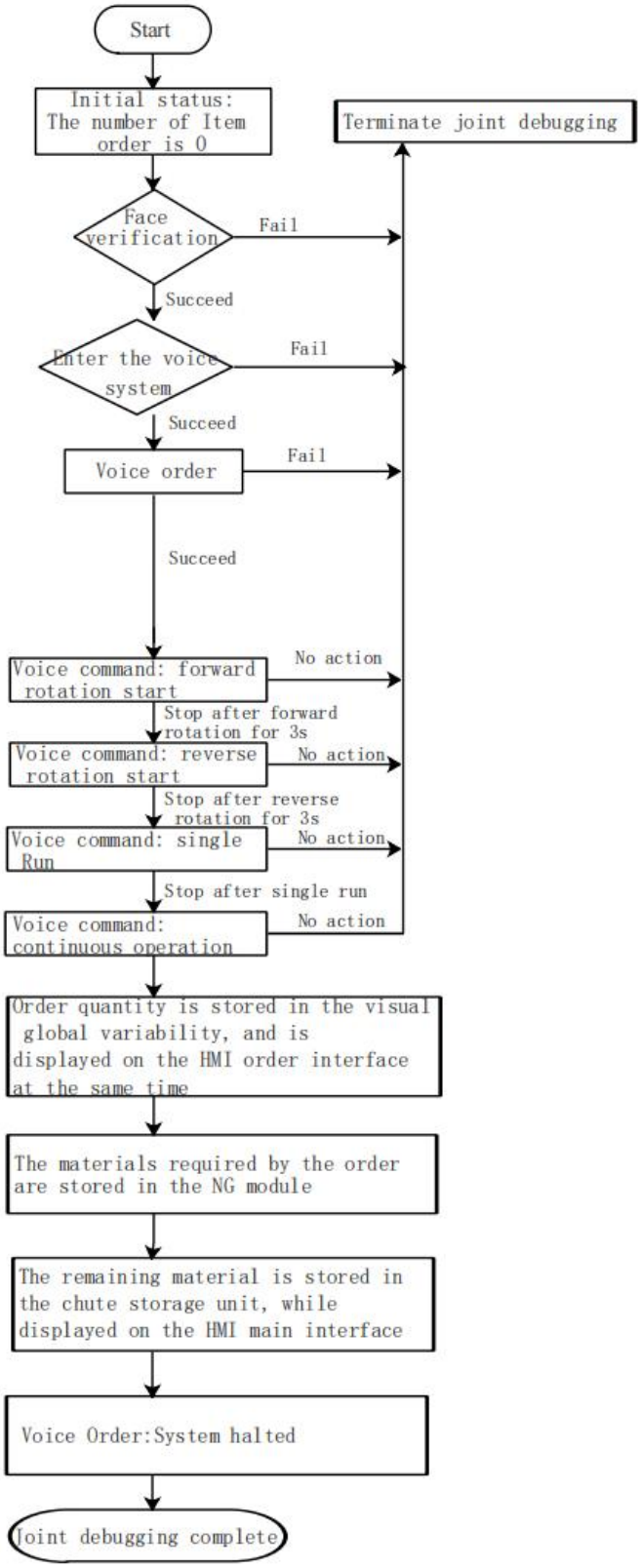

Figure 17: Flow chart of the system operation

appendix

(1) communication junction.

- **Create a TCP server, with an IP address of 127.0.0.1 and a port number of 7890, waiting for the Python image recognition client to request a connection;**
- **Create a TCP server, the IP address is 127.0.0.1, the port number is 6000, waiting for the Python voice face client connection request;**
- **Create a TCP server, the IP address is 192.168.1.125, the port number is 5000, waiting for the M1 Pro robot client connection request;**
- **Create a TCP client, with an IP address of 192.168.1.12 and a port number of 4000, is connected to the server of the PLC.**

(2) Write the instruction process

Note: TCP command signal table, only for the reference of the players, can customize the signal name according to the task implementation.

Table 5: TCP signal table received from the visual system

NO.	Signal name	Function annotation	Congruent relationship
1	A	Fruit / Vegetable material order	PLC server
2	B	Beverage material order	
3	C	Apparel material order	
4	D	Food material order	
5	arrive	Material in place signal	
6	red	Return to the empty material identification result: red	
7	green	Return to the empty material identification result: green	
8	blue	Return to the empty material identification result: blue	
9	metal	Return to the empty material identification result: metal	
10	A	Returns the image recognition results: fruits / vegetables	Image Recognition Client

11	B	Returns the image recognition result: drinks	
12	C	Returns the image recognition result: clothing	
13	D	Returns the image recognition result: food	
14	start	Voice control command: system startup	Voice-face client
15	stop	Voice control command: the system stops	
16	single	Voice control instruction: a single run	
17	continue	Voice control instruction: continuous operation	
18	foreward	Voice control command: positive start	
19	reversal	Voice control command: reverse start	
20	Sports point data	M1 Pro Robot Movement	Robot client

Table 6: Visual system sends the TCP signal table

order number	Signal name	Function annotation	Congruent relationship
1	ok	Image storage of completion signal	Image Recognition Client
2	cmd1	Send the System Start command to the PLC	PLC server
3	cmd2	Send the Forward Start command to the PLC	
4	cmd3	Send the Invert Start command to the PLC	
5	cmd4	Send the Single Single Run instruction to the PLC	
6	cmd5	Send the Continuous Run instruction to the PLC	

7	cmd6	Send the System Stop instruction to the PLC	
8	check	Color and material detection signal	
9	run	Sorting completion signal	
10	true	Order confirmation signal	
11	a	Chute 1 material count signal	
12	b	Chute 2 material count signal	
13	c	Chute 3 material count signal	
14	d	Slot 4 material count signal	

Table 7: Robot IO output signal table

No.	Address	Function annotation
1	DOUT 01	Robot end suction switch

4. Scoring criteria

Table 8: Scoring criteria

Task module	Sub-task module	detailed rules and regulations	value
Task 1	A	Robot installation and positioning / robot wiring	2
		Visual system installation positioning / visual system camera wiring	2
		Machine Vision Camera Parameter Setting	2
		Machine vision hand-eye calibration	2
		Electrical wiring installation and adjustment	2
	B	Face model training	7
		Speech skills application	7

		Intelligent recognition training of the image model	7
	C	Robot visual image recognition and detection	8
		Robot Vision System Communication	8
	D	Face verification / voice order	6
		Material sorting	7
Task 2	E	HMI Touch System Programming	8
		PC front-end interface development and programming	8
	F	Face verification / voice order	6
		Information communication and real-time monitoring	8
		Material sorting	10
amount to:			100

Explain:

1. There are two overall joint adjustment opportunities for each team. If there is interrupted in the middle, it means that the joint adjustment fails and the joint adjustment is terminated.

2. If the system fails to complete a complete set of joint adjustment tasks continuously, the system joint adjustment and comprehensive score will be deducted, but the step score of the corresponding link can be obtained.

3. In the scoring stage of all links, players are forbidden to modify or block the code without the permission of the referee!