Virtual Industrial Robot Expert

V1.6.3

User and Customer Support Guide

Table of Contents

• Introduction

• Objective

This manual is the user and customer support guide, intended to providing installation and operating guidance for users of Virtual Industrial Robot Expert V1.6.3.

• Background

- National policy orientation

The Ten-Year Development Plan of Education Informatization (2011-2020) (Ministry of Education) emphasized the national investment in education informatization. It mentioned vocational education informatization is a key measure to cultivate high quality workers and skilled personnel, but a vital weakness in education informatization. We should promote the digital campus building of vocational schools, to greatly enhance the informatization application level in teaching, training, research, management, and services. The objectives are as following,

To accelerate the construction of development environment for vocational education informatization: to enhance the digital campus building of vocational schools, rural vocational schools in particular, and improve the informatization level of vocational schools comprehensively; to

build informatization teaching facilities such as simulation training center, establish management information system in key business fields including learning and training, and create digital environment for self-learning of students, teachers, and employees, as well as scientific management.

To improve practical teaching of vocational education: to give full play to the advantages of IT, optimize teaching process, and enhance the informatization level in internship, training, project teaching, case study, vocational skill competition, and skill identification; to reform the personnel training model, and incorporate IT into industry-education integration, work-learning integration, school-enterprise cooperation, and internship; to innovate educational content, promote the integration of IT with professional courses, and focus on improving teachers' application skills in modern IT and students' IT-related vocational skills; to strengthen practical teaching, and innovate the application models of simulation training resources to increase the utilization effectiveness.

As required in the national education policies in vocational education, great importance should be attached to simulation training center, training software and resources in vocational education, so as to improve the practical skills of teachers and students, and foster high-skilled personnel really meeting the market demand.

- Huge market potential

There are 14,105 secondary vocational schools and 1,334 higher vocational schools, according to the statistics of the Ministry of Education in 2013. Considering the current development of training laboratories in secondary and higher vocational schools, we believe the combination of original training equipment with virtual simulation software has been accepted by schools, and the value of virtual simulation software has been recognized. Existing virtual simulation software in the market is varied in level. 2D virtual teaching software is mature, and accounts for the largest market share. 3D virtual teaching software is still under development. Similar 3D virtual teaching software is not launched in the market, which offers better user experience, more realistic virtual scenario, and huger market potential.

- Supplementing our virtual simulation software products to grab market share

zSpace 300 is a VR device with our high priority in promotion. Although we provide various virtual 3D simulation software, covering logistics, finance, business management, etc., few is used on the zSpace 300.

• Definition

Term	Definition or description
	Shenzhen GTA Education Tech Ltd.
Virtual Industrial Robot Expert	With industrial robot model for training based on VR hardware, the software vividly simulates industrial applications, offers indefinitely repeated practical operations without damage to components, and provides a new teaching model for academic majors related to

	industrial robots.
3D	Digital three dimensional / stereoscopic technology based on computer / internet, i.e. three-dimensional digitalization
VR	Virtual reality, a computer simulation system which can create and experience virtual world. The simulation environment generated integrates multiple resources and offers interactive dynamic views in 3D and systematic simulation of real world behaviors, which giving users immersive experiences.
zSpace 300	Interactive zSpace Table-based VR product based on 3D virtual display, launched by zSpace in 2015.

- References

None

• Purpose

- Function and Features

There are three modules available currently: Mechanical Structure, Control System, and Sensing System.

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- Performance Features

None

• Operating Environment

- Hardware Environment

VR terminal (zSpace 300)

Parameter	Description		Specifications
Hardware Configuration	CPU	Intel(R) Core(TM) i3-4370 CPU @ 3.80GHz 3.80GHz	
	Hard Disk	500GB	
	Memory	8.00GB	
	Monitor	24-inch, resolution: 1920 x 1080; supporting 2D and 3D Brightness: 2D ⩾ 250cd / m2 ; 3D ≥ 150cd / m2, Horizontal visual angle ≥ 170°, Vertical visual angle ≥ 160° Contrast: 800 : 1 or above; Color ≥ 16700000 Pixel defect: ⩽ 7.	
	Capture Locator	Equipped in the monitor, the locator can achieve a 3D effect and localization by means of 3D glasses. Available capture range: 1.2m in length, 1.5m in width, and 1m in height based on the center of the motor	
	Tracking 3D Glasses	The 3D glasses can be used to view the 3D scenario. There are five tracking points, so that the	

		capture locator can accurately achieve a 3D effect and localization. A set of tracking 3D glasses includes complete tracking glasses and legless tracking Clip-ons.	
	Stylus	It can move, rotate and split the objects in the 3D scenario. It offers movement and rotation data in 3 degrees of freedom coordinate axes, and the related resolution, accuracy and refresh rate are required as follows: 3D axial resolution: X axis ⩽2mm, Y axis ⩽2mm, Z axis ⩽ 2mm. Accuracy: spacing accuracy ⩽ 2deg, swing accuracy ⩽2deg, deflection accuracy ⩽2deg. 3D axial accuracy: X axis⩽+/-3mm, Y axis⩽+/-3mm, Z axis⩽+/-3mm. 3D axial refresh rate: X axis ⩾ 100Hz, Y axis ≥ 100Hz, Z axis ≥ 100 Hz.	
	Model	zSpace300	
	Port	Display Port (1.2): ⩾1; DVI port: ⩾1; positioning processing unit interface	
Operating System	Windows 10 (64-bit)		
3D Application software System	3D Application software System includes three parts: desktop VR system drive platform, 3D desktop system software platform, and desktop VR interaction system. Desktop VR system drive platform: offering basic application architecture, system parameter adjustment and management for VR. 3D desktop system software platform: offering 3D desktop functions, including addition, deletion, change, and arrangement of desktop icon, as well as lockup and property change. Desktop VR interaction system: 3D display platform, offering real-world virtual 3D environment in combination with Capture Locator; zooming in / out, rotating, and disassembling virtual objects in combination with the stylus; as well as offering various tools for 3D interaction, and multi-view functions such as		

	multi-angle view, and composite view.	

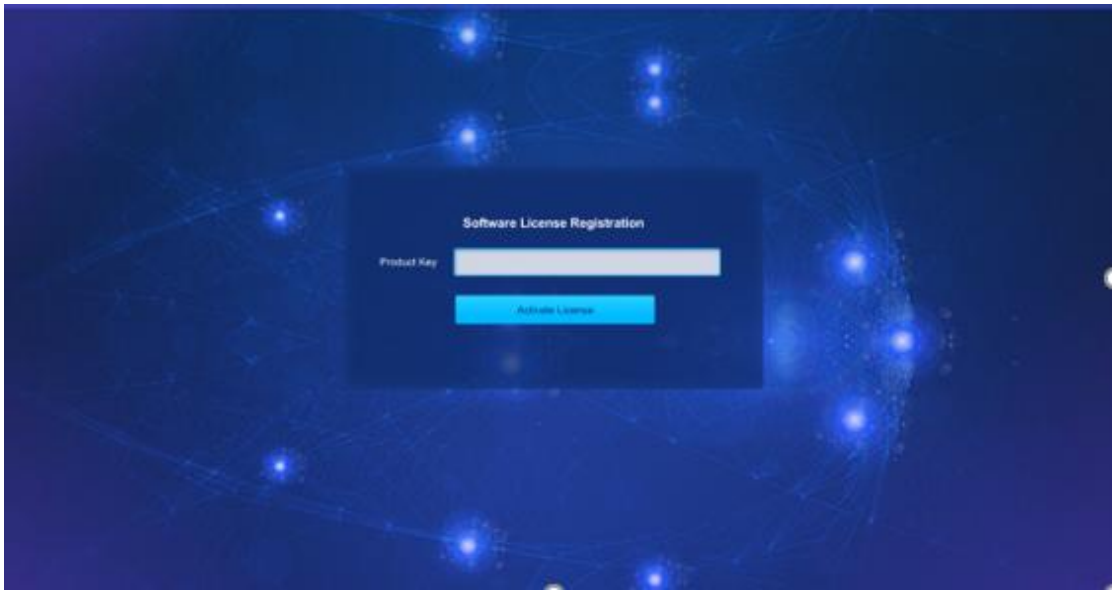
- Software Environment

None

• Operating Instructions

- Operation Description

- Client login



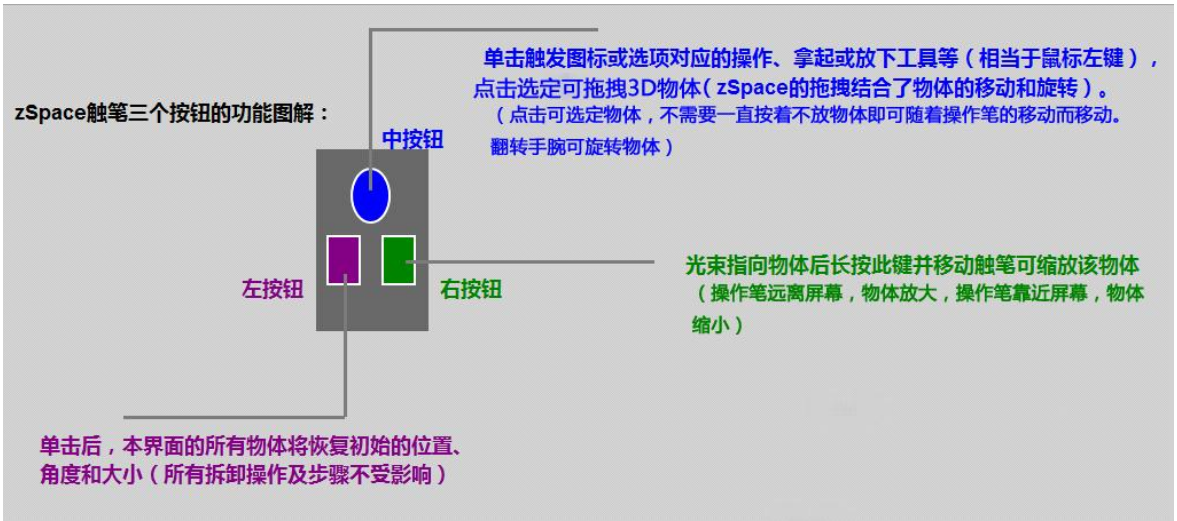
Login interface

Instruction:

- The application code will pop up after the running of the software. Fill in the registration code and authorization code obtained through the application code, and then click “Activate License” to enter the system. After the registration, the registration interface will not appear unless you reinstall the software.
- Click on the  button in the top right corner of the interface to exit the software license registration.

- Descriptions of buttons on the stylus

Simialr to the mouse, the styls has three buttons: middle button, left button, and right button. User can conduct the following functions by pressing the buttons,



Middle button: click on the icon or item to conduct the corresponding operations, take up or lay down the tool (similar to left button of the mouse), click on an object, and drag (withought holding) it to move and rotate it (by rotating the wrist).

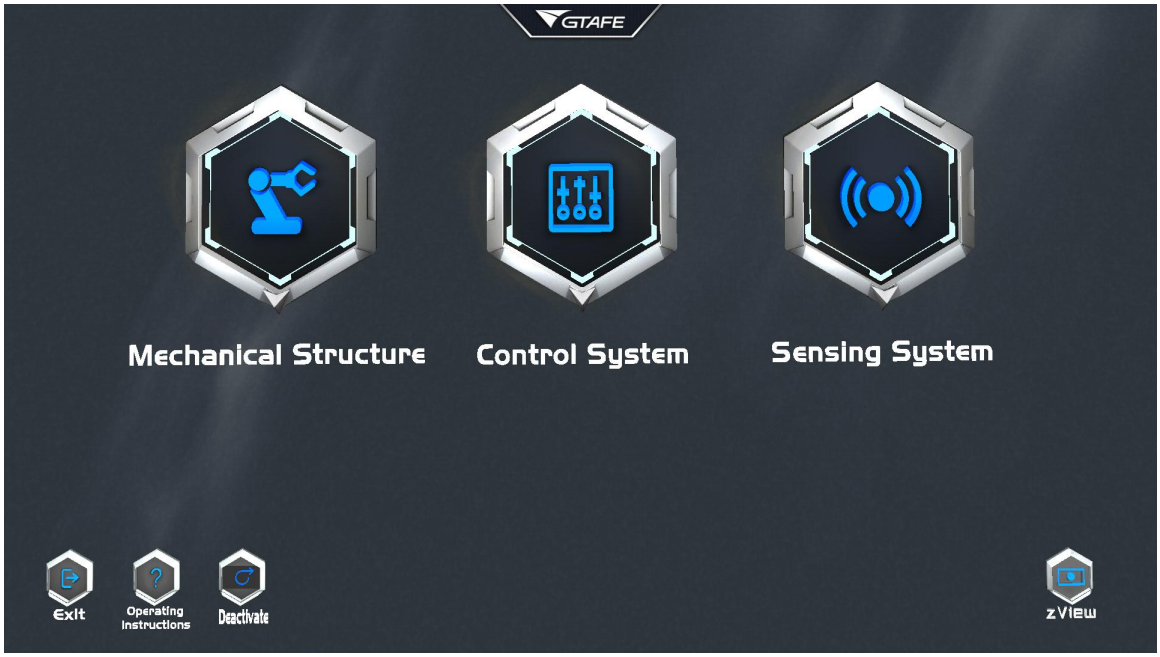
Left button: reset all objects to original position, angle and size (not applied to disassembly operations)

Right button: press and hold to drag forward and backward to zoom in or out the object after the ray points to an object.

The default ray length of the stylus is 8m. There is a tip on the stylus, facilitating the identification.

- Main interface

There are three modules available currently: Mechanical Structure, Control System, and Sensing System. This guide focuses on Mechanical Structure.



Press the middle button of the stylus to select the Mechanical Structure to enter the sub-module page.

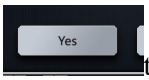
User can press the middle button of the stylus to select the “Exit” button on the lower-left corner of the interface to exit the software interface.

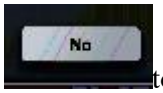
Click on the “OK” button to exit the software.

Instruction:

1. After entering the homepage, click on the Mechanical Structure to enter the Mechanical Structure interface;

2. Click on the 

to bring up the Exit interface. Select the 

to exit the software, or 

to go back to the original interface;

3. Click on the 

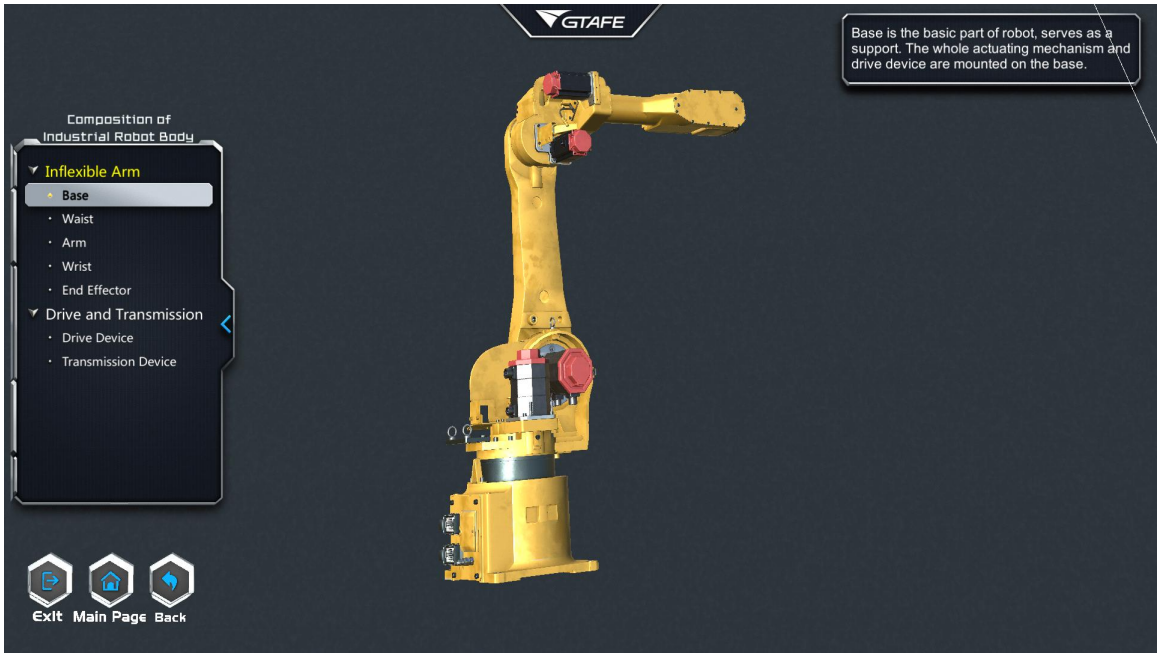
to go back to the main interface;

4. Click on the 

to go back to the previous menu.

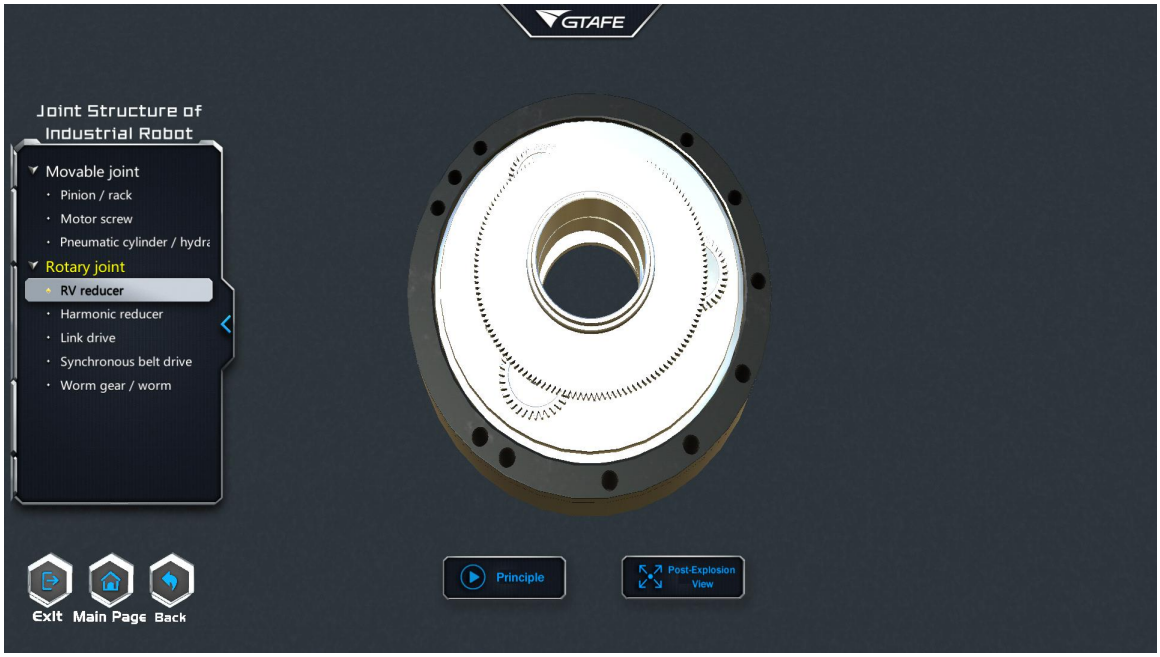
- Basic Structure of Mechanical Structure

Composition of Industrial Robot Body:

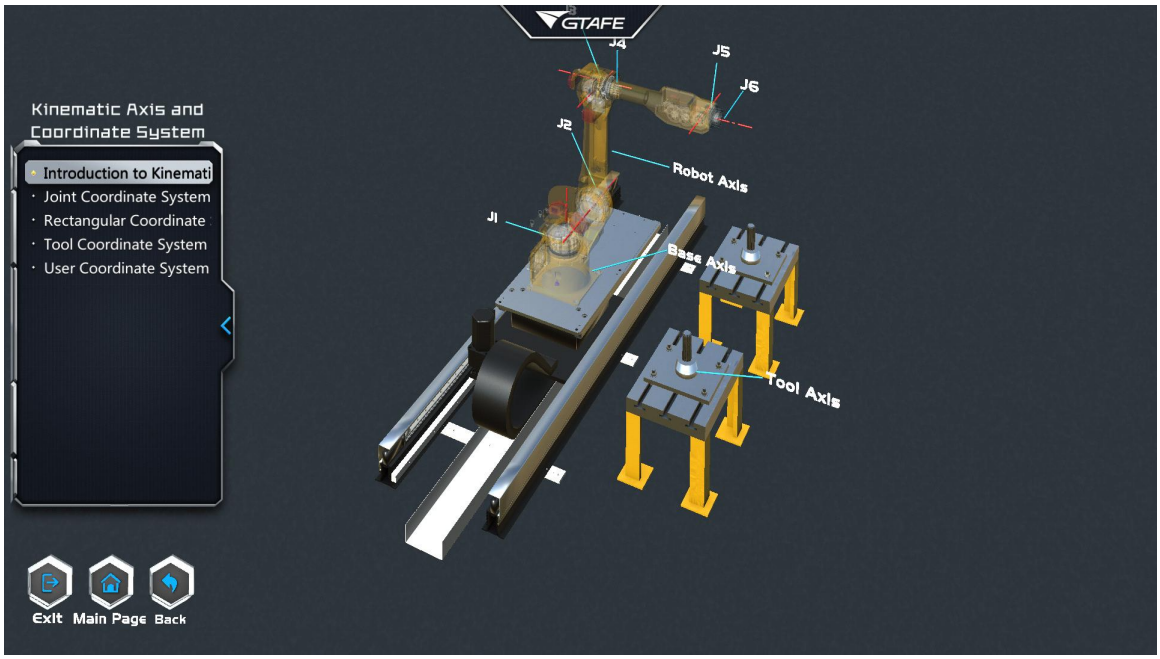


Main Parameters and Technical Indicators of Industrial Robot:

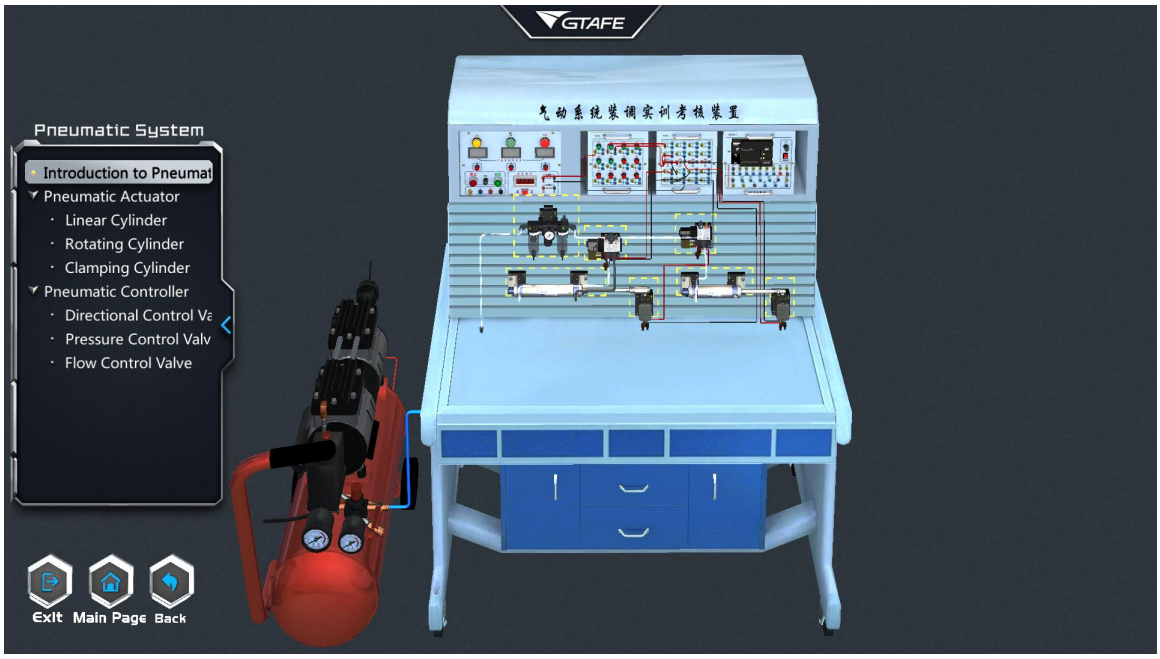
Joint Structure of Industrial Robot:



Kinematic Axis and Coordinate System of Industrial Robot:

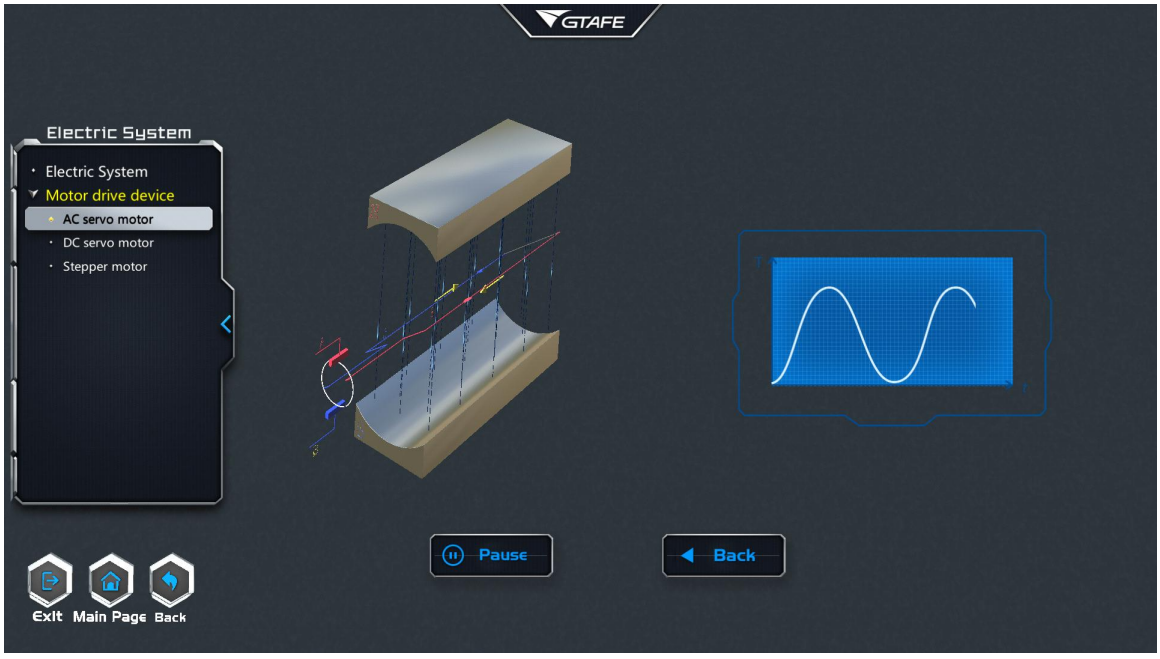


Pneumatic System:



Hydraulic System:

Electric System:



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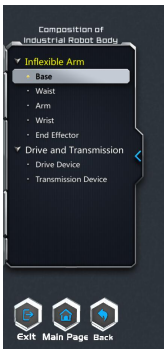
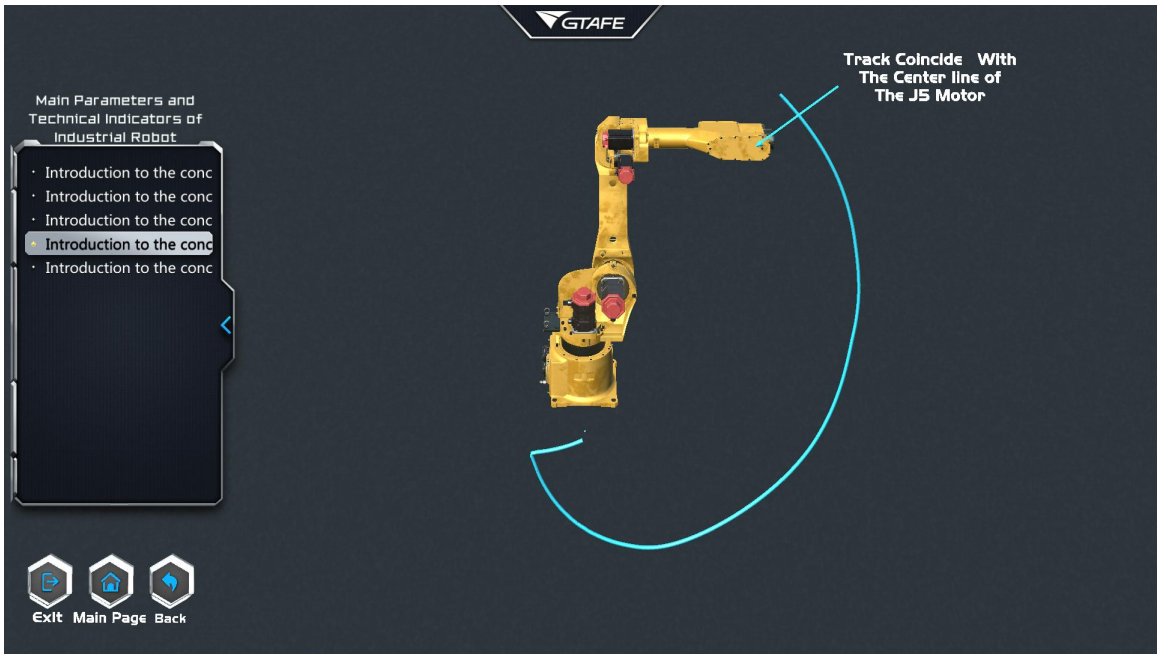
- # Instruction for Modules of Mechanical Structure

- Click on the icon to enter the corresponding interface. Here we select the 
- to enter the Industrial Robot Body interface.
- There is a robot model on the operating window by default. After the stylus tip hovers over the model, press the middle button of the stylus and move it, the model will move with the stylus (forward, backward, left, and right) accordingly; after the stylus tip hovers over the model, press the right button of the stylus and move it forward and backward vertically to the screen, to zoom in or out the model; press the left button to reset the model to original position and size.
- Click on the menu bar 

in the left corner. Select a part of the robot, then the corresponding part will show clear view in the right, with other parts blurred, as below,

- Multiple types are available for some modules. They are shown on the lower-right corner. Take drive device as an example (as below). Click on the end effector to show the corresponding model.
- Explanation in PowerPoint is offered for some parts, such as Main Parameters and Technical Indicators of Industrial Robot.



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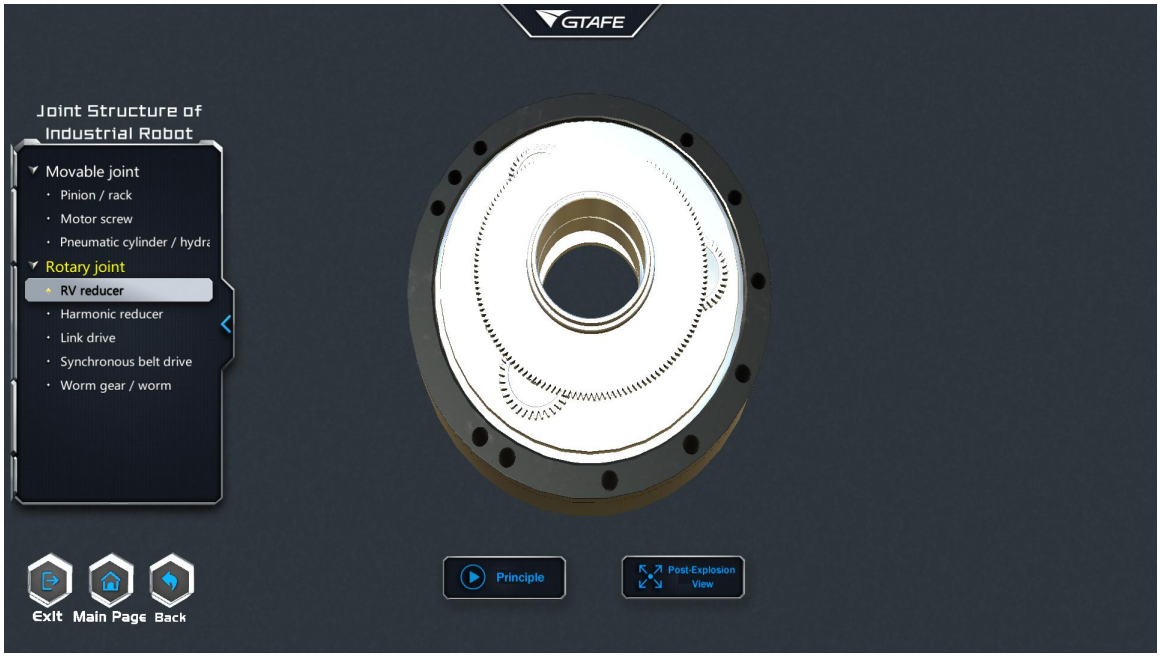
- Click on the  on the keyboard to turn to previous or next page of the PowerPoint;
- Click on the  or  on the keyboard to toggle full-screen mode.
- In the interface of Joint Structure of Industrial Robot, Pneumatic System, and Hydraulic System, after the explanation and explosion, user can select a part with the stylus. When the stylus hovers over the part, the part will shine. If you press the middle button of the stylus, the name of the part will appear on the upper-right corner, as below.

- If explanation for principle exists, a click on the Principle can play the animation of principle. Moreover, the peripheral model will become blurred (semi-transparent) to highlight the key point.

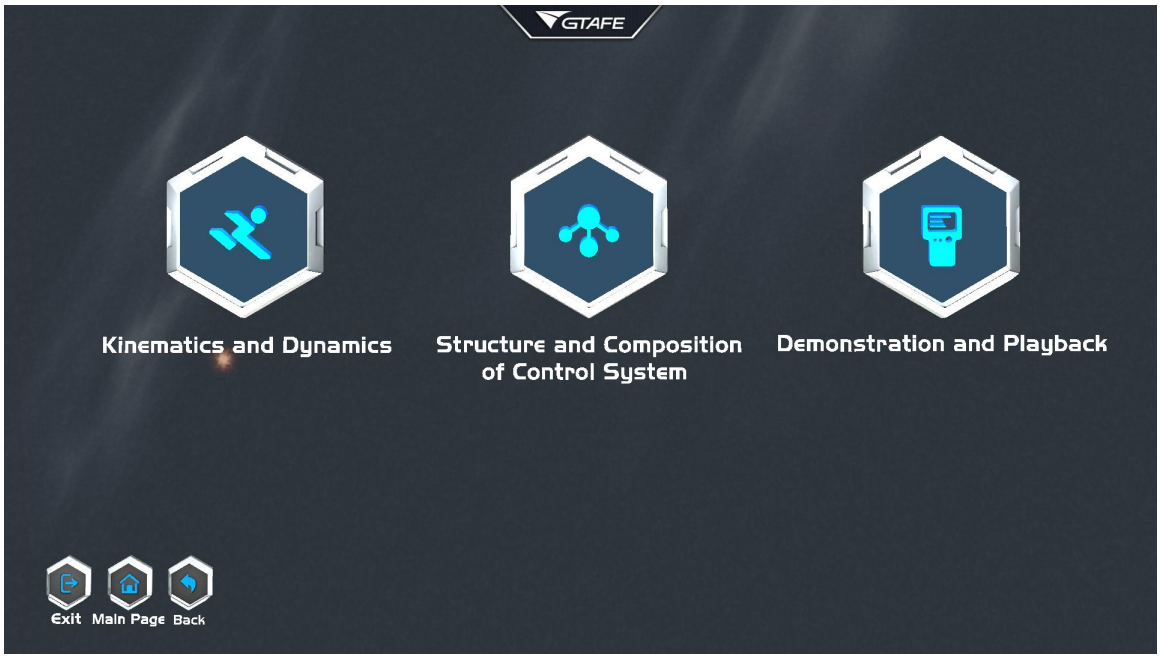


- In the “Post-explosion view” and “Restored view”, the Reset function (left button) of the stylus is invalid. During the explosion, user can use the right button of the stylus to zoom in or out the whole object, or use the middle button to move the whole object.

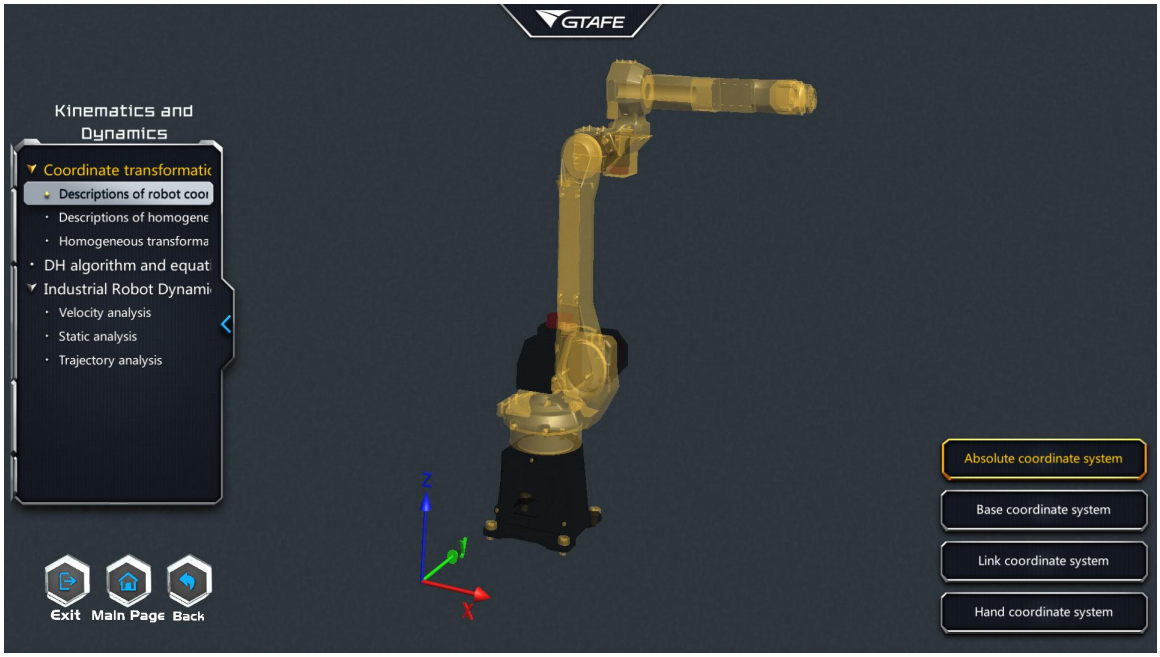
- During the display of principle, a click on the “Principle” button can pause the display of principle.
- Click on the “Post-explosion view” button, which will change into “Restored view”

button. Click on the “Restored view” button, then the explosion animation will be played reversely, and finally shows the restored view.

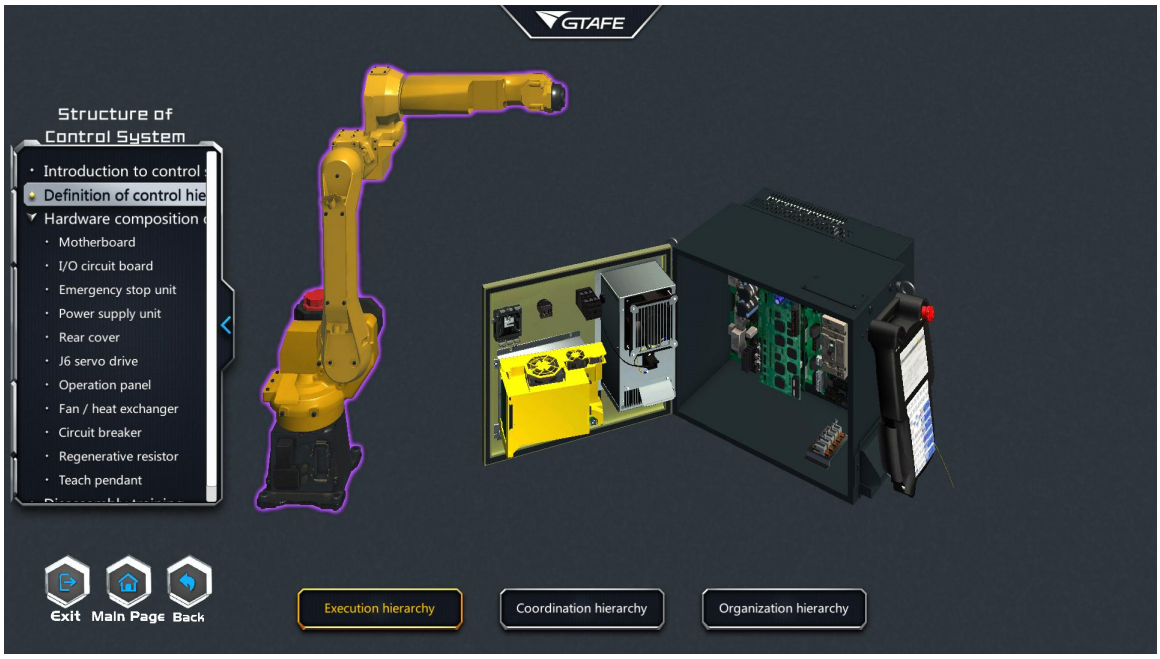
- Control system



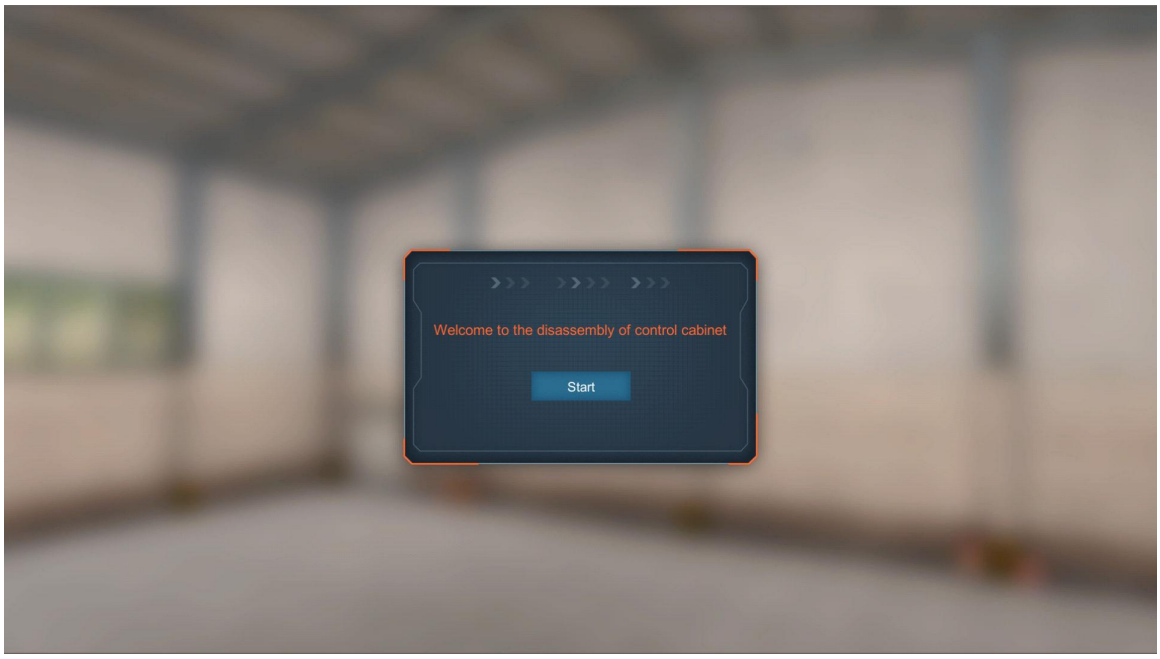
Control system



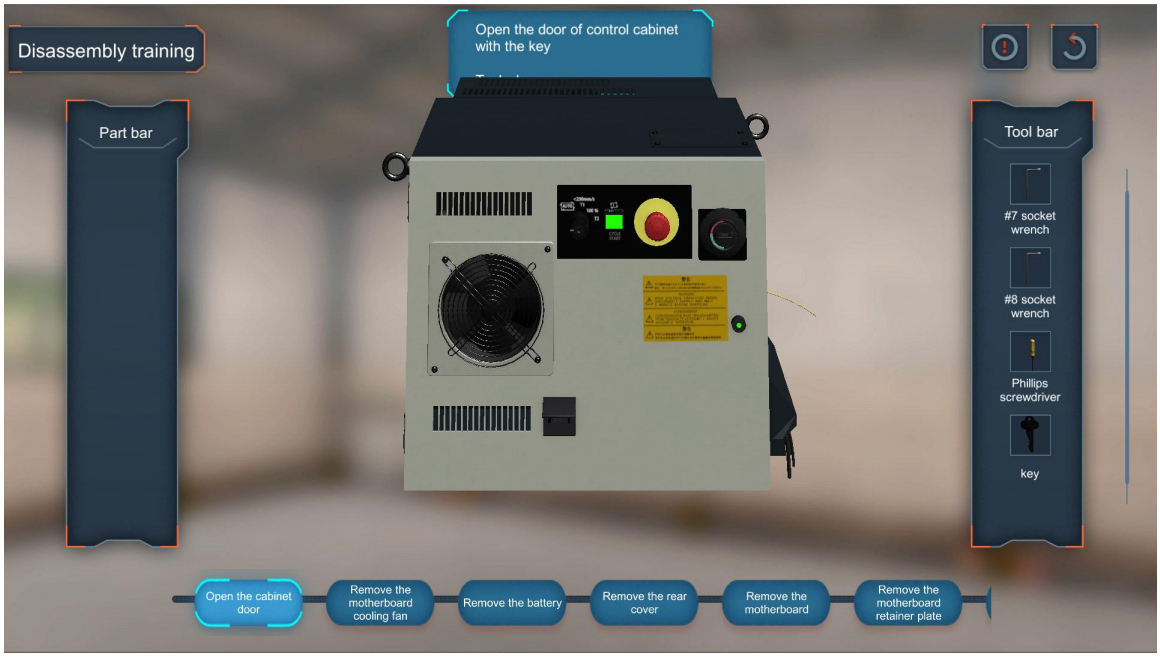
Kinematics and Dynamics



Structure and Composition of Control System

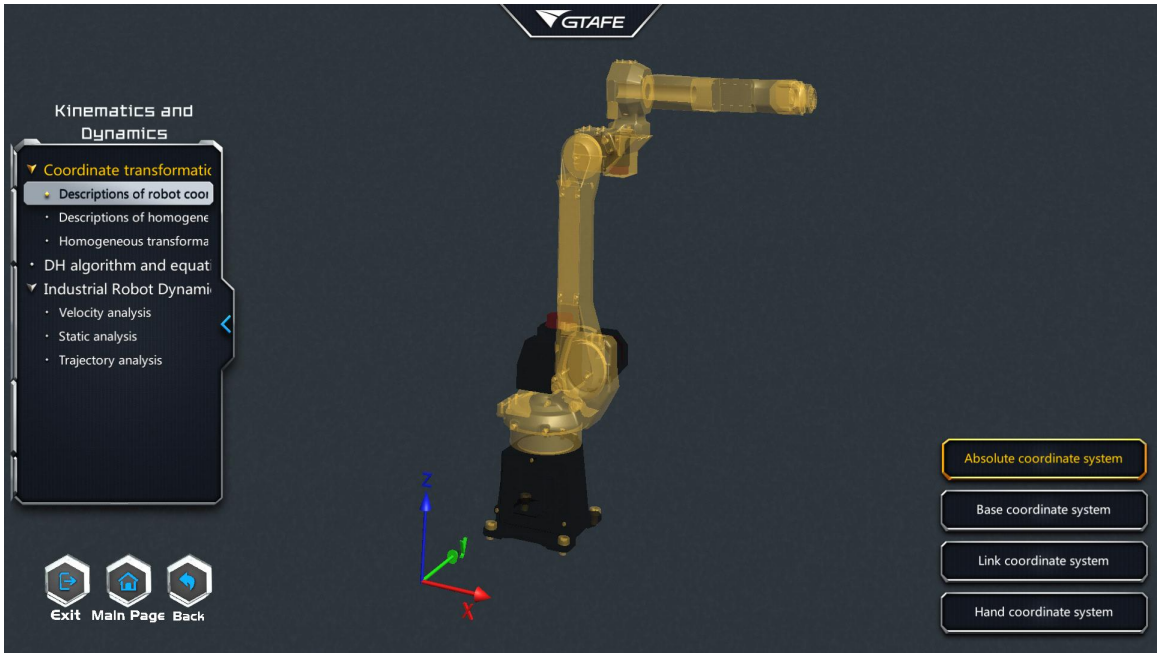


Select the “Disassembly of control cabinet” to enter the Start interface.

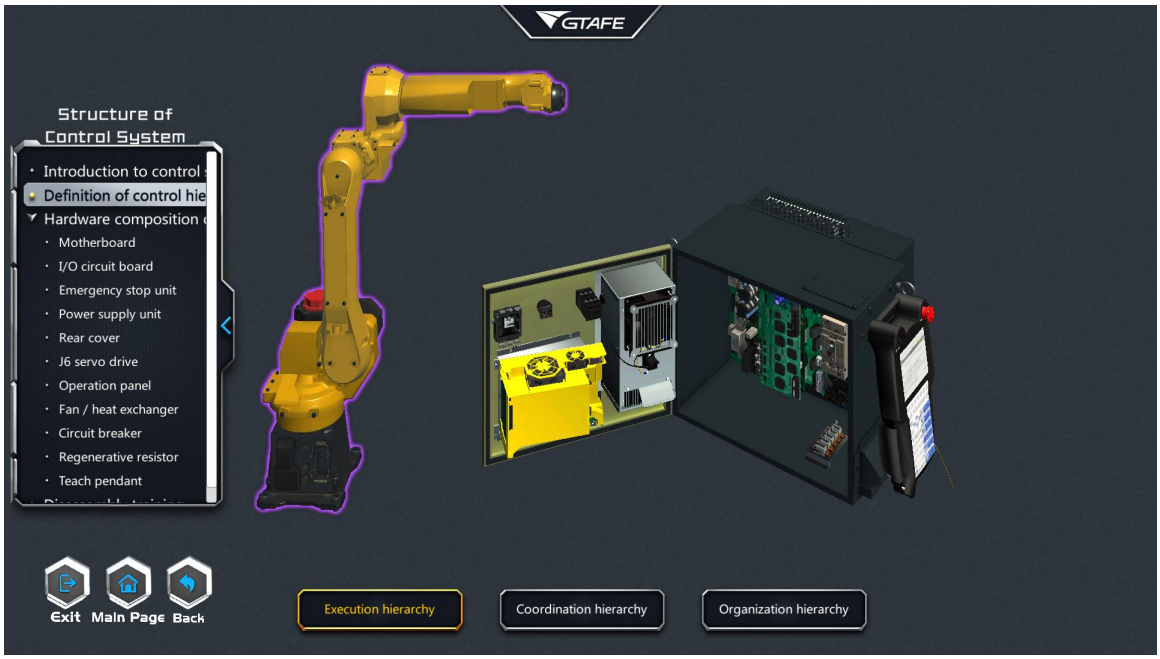


Select “Start”, and follow the steps of disassembly of control cabinet.

Animation of the Motion Track



Teaching PowerPoint



Demonstration operation

Instruction:

1. Click on the

to enter the Kinematics and Dynamics interface;

2. Click on the

to enter the Structure and Composition of Control System interface;

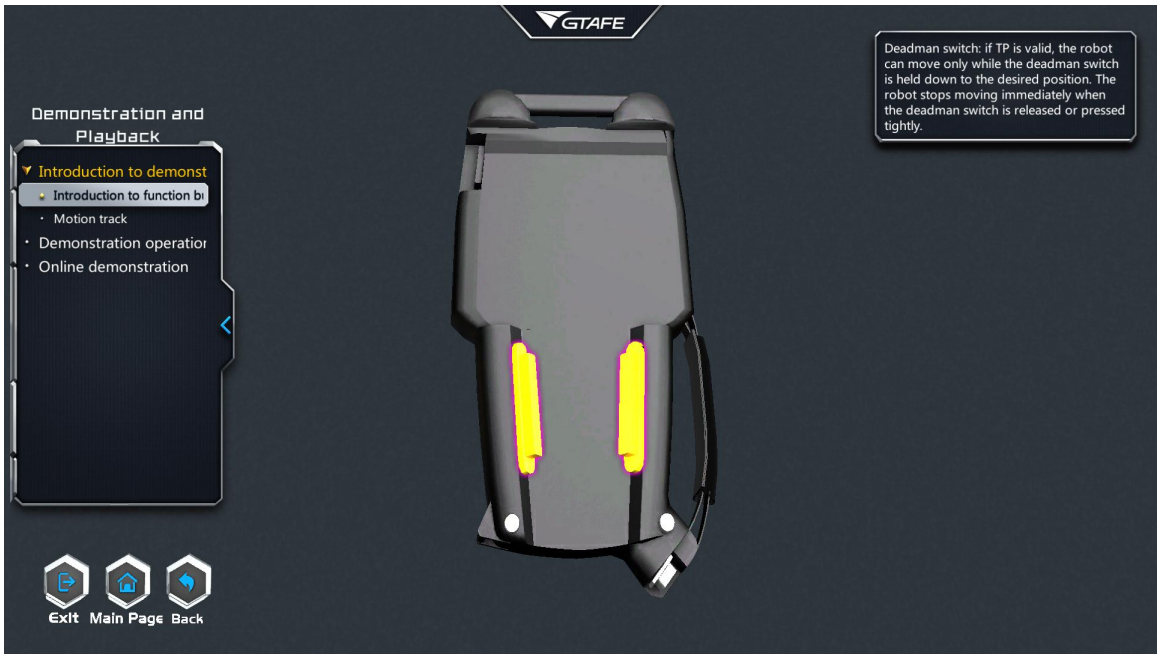
3. Click on the

to enter the Demonstration and Playback interface;

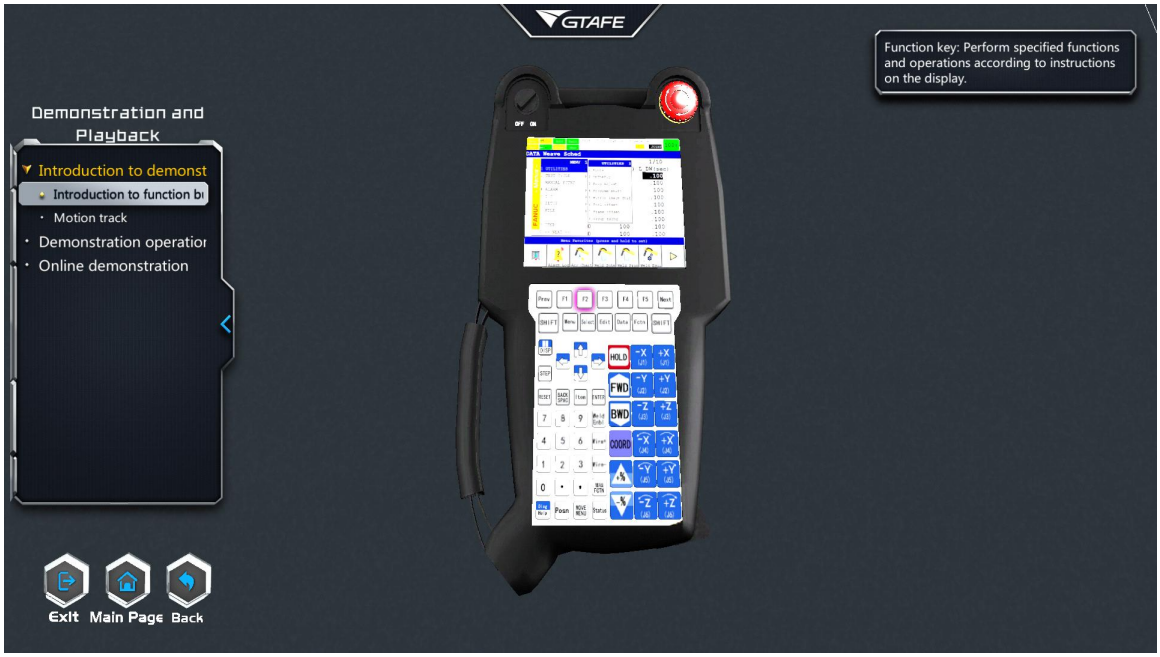
- Introduction to teach pendant

Lift the emergency stop button

Toggle mode



Dead man's switch



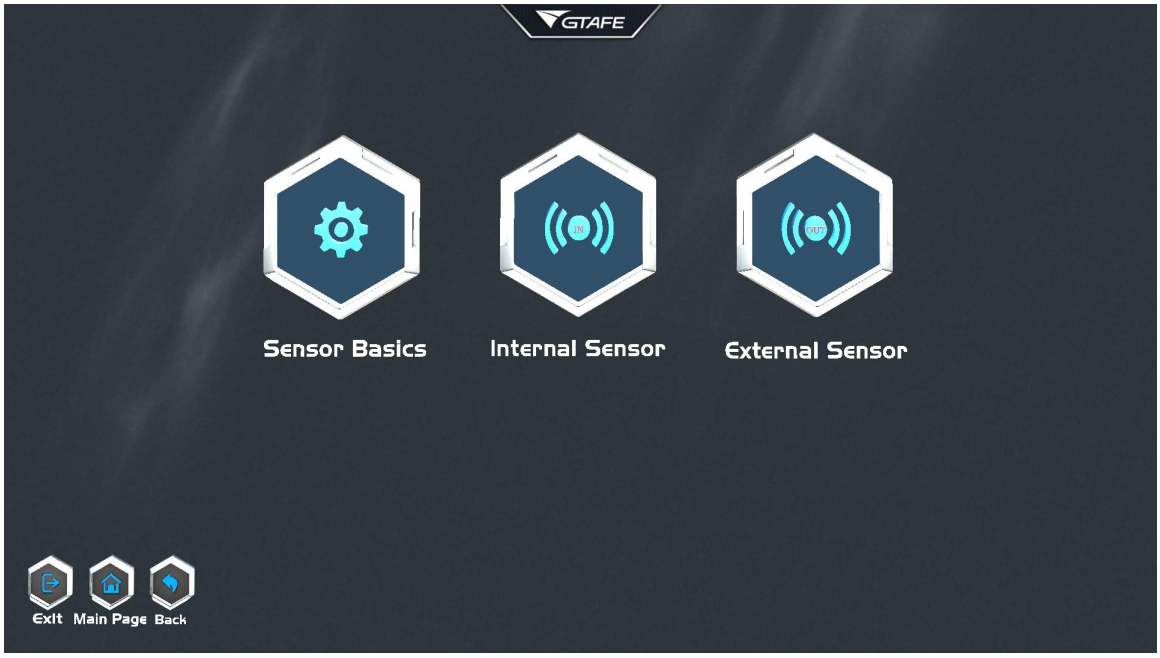
Shift + function keys

Instruction:

- After clicking on the 示教器的简介 in the Demonstration and Playback, for the teach pendant, lift the  , turn the  to ON, and press the dead man's switch  .

Only after Shift is pressed and held in combination with  , the robot can move.

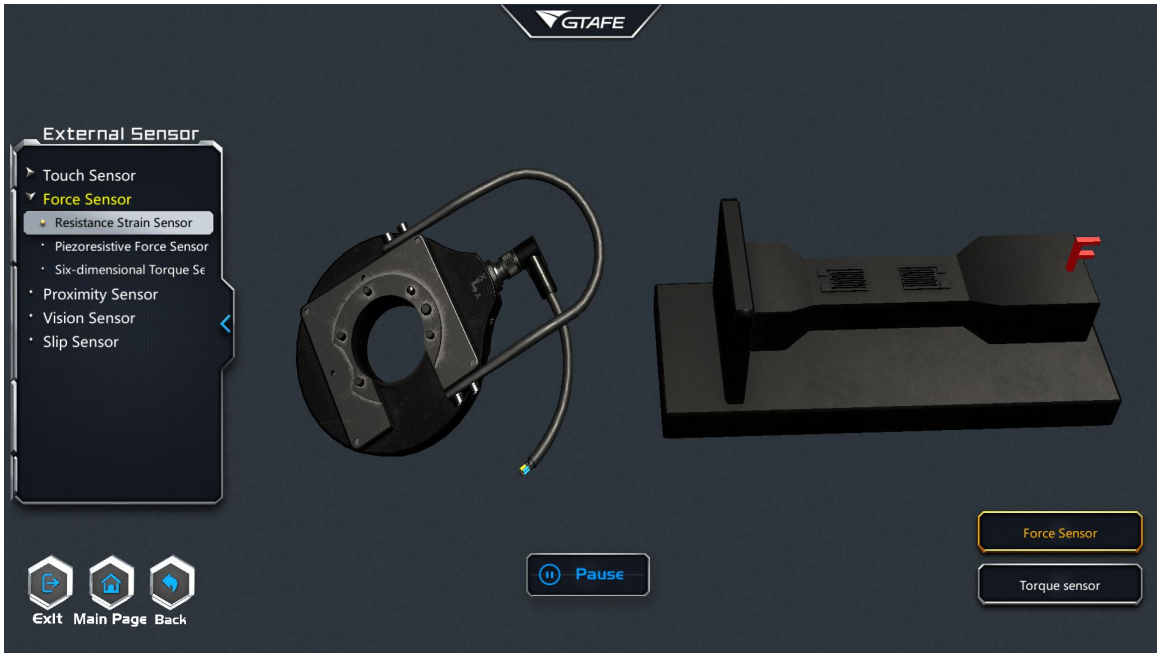
- Sensing System



Sensing System

Sensor Basics

Internal Sensor



External Sensor

If explanation for principle exists, a click on the Principle can play the animation of principle. Moreover, the peripheral model will become blurred (semi-transparent) to highlight the key point.

- Operating Video

• Application notes

- If the registration code is undetectable, license request failed, or other problem happened, please contact Service Center.
- A license is useable on only one computer.

• Appendix

None