

# dobot\_xtrainer-with UI control interface version user manual

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深圳市越疆科技股份有限公司



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Before using this product, please read this user manual and related technical documents published online in detail and understand the relevant information to ensure that you use the robot arm with a full understanding of the robot arm and related knowledge. YUEJING recommends that you use this manual under the guidance of professionals. All safety information contained in this manual shall not be regarded as a guarantee of Dobot. Even if you follow this manual and related instructions, harm or loss caused during use may still occur.

The user of this product is responsible for ensuring compliance with the applicable laws and regulations of the relevant countries and ensuring that there are no major dangers in the use of the YUJING robotic arm.

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# 1. Overview

To facilitate the use of X-Trainer, Dobot provides a graphical UI interface, which only supports running under Ubuntu system and has the following functions:

- Debugging function : Xtariner mainly involves three parts: main hand, robotic arm (including gripper), and camera. For each part, users can set corresponding parameters and conduct preliminary debugging and control to determine whether each part is operating normally;
- Teleoperation function : Users can set corresponding parameters to enable the teleoperation function of Xtrainer, that is, to control the slave hand through the master hand and collect data at the same time.
- Data processing function : Users can set corresponding parameters to convert the data collected by remote operation into standard data for model training.

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# 2. Instructions

## 2.1 Prerequisites

- Complete the X-Trainer hardware installation.
- Complete the operating environment configuration (the operating system • only supports Ubuntu ).

For details on the hardware installation and operating environment configuration of X-Trainer, see the Dobot X-Trainer User Manual.

#### 2.2 Parameter settings

After starting the interface, please go to the Settings tab to set the parameters.

			+0.4	十日文		Computer passwo	rd
		Right robot	1/11	<b>刑</b> []]	р	Passw:	123
		IP Adress					- क्रंट मा
192.1	68.5.1	Right IP	1	92.168.5.	2	电脑	密码
		Safe Area				PC pa:	sscode
450.0	200.0	x.	200.0		450.0		
-450.0	~	v,	-290.0	-12-	-160.0	安全区域	
44.0	~ 1000.0	Z:	80.0	=	1000.0	XICA	
						safety area	
		Gripper		-	1000-1070-10		
2048	~ 3055	Pos:	2048	~	3055		
		3	夹爪参	数			Appl
32: Welcomet			gripper	parame	ters		
00: Port init successfu	ully						
	192.1 450.0 750.0 44.0 2048 2048	192.168.5.1 -450.0 ~ 290.0 -750.0 ~ -160.0 44.0 ~ 1000.0 2048 ~ 3055 2048 ~ 3055 2: Welcomet 0: Fort init successfully	Right robot         IP Adress         IP Adress         Right IP         Safe Area         -450.0       - 290.0         -750.0       - 160.0         44.0       - 1000.0         2048       ~ 3055         Pos:         2         Wekomet         0: Port init successfully:	机林         Right robot         IP Adress         IP Adress         IP Adress         IP Adress         IP Adress         Right IP I         Safe Area         X:       -290.0         -750.0       -         -750.0       -         44.0       -         1000.0       Z:         Safe Area         X:       -290.0         Y:       -750.0         Z:       80.0         Gripper         Pos:       2048         Quart Solution         gripper         2:       Welcome!         0:       Port init successfully	机械臂 i         Right robot         IP Adress         192.168.5.1       IP Adress         Right IP       192.168.5.1         Safe Area       Xi         -450.0       - 290.0         -750.0       160.0         Y:       -750.0         44.0       - 1000.0         Z:       80.0         Gripper         2048       - 3055         Pos:       2048	机械臂 ip         Right robot         IP Adress         192.168.5.1       IP Adress         192.168.5.1       Right IP       192.168.5.2         Safe Area       X:       -290.0         -450.0       -       290.0       -         -750.0       -       -160.0       X:       -290.0         44.0       -       1000.0       Z:       80.0       -       1000.0         2048       -       3055       Pos:       2048       -       3055         Quite and the successfully       gr ipper parameters       gr ipper parameters	机械臂ip       Computer passwo         Right robot       Passw:         IP Adress       Right IP         192.168.5.1       Right IP         192.168.5.1       Safe Area         -450.0       - 290.0         -750.0       160.0         Y:       -750.0         -750.0       160.0         Y:       -750.0         -160.0       Z:         80.0       - 1000.0         Z:       80.0         -160.0       Z:         90:       2048         -3055       Pos:         2048       - 3055

Operator: Dobot-547

Except for the computer password, keep the other parameters as default. Click Apply after the modification is completed .

2.3 Debug Function Description

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#### 2.3.1 Main hand debugging

Click the switch to the right of Main hand to enable the main hand.

		X-Trainer
nable Robot: OF Camera: O	FF Main hand : OFF	
Panel Settings DataProcess	]	
Control Debug		Image
Manuplation		
Select		
Safety protection		
Sensor protection		
Show img		
Control		
Task name:	clean_6666	
Start	Stop	
g		
2024-07-17 10-48-35:862: Welcome!		
2024-07-17 10-48-36:530: Port init suc 2024-07-17 10-48-37:741: Main hand:	cessfully enable	
rator: Dobot-547		Version: 20240

If the main hand is normal, the switch will turn ON and the log will display "Main hand: enable". After enabling the main hand, the main hand will fall a short distance, which is normal.

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		X-Trainer	
Enable Robot: 000 Camera: 0	or Main hand	]	
Control Debug		Image	
Manuplation			
Select			
Safety protection			
Sensor protection			
Show img			
Control			
Task name:	clean_6666		
Start	Stop		
Log			
2024-07-17 10-48-35:862: Welcomet 2024-07-17 10-48-36:530: Port init st	ccessfully		
2024-07-17 10-48-37:741: Main hand	enable		

2.3.2 Debugging from hand and gripper

Click the switch on the right side of the Robot to enable the slave hand and gripper.

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		X-Trainer	
Enable			
Robot Camera :	HT Main hand: OFF		
Panel Settings DataProcess			
Control Debug		Image	
Manuplation			
Select			
Safety protection			
Sensor protection			
Sensor protection Show img Control			
Task name:	clean_6666		
Start	Stop		
Log			
2024-07-17 10-51-11:606: Welcomet 2024-07-17 10-51-12:260: Port init suc	cessfully		

After the slave completes initialization, the switch will turn ON and the log will display "Robot: enable".

le		Annamer
ot: 💿 Camera: 🔘	Main hand:	
el Settings DataProcess	1	
Control Debug		Image
Manuplation		
Select		
Safety protection		
Sensor protection		
Show img		
Control		
Task name:	clean_6666	
Start	Stop	
-07-17 10-51-11:606: Welcome!	ressfully	
⊢0/-1/ 10-52-02:818: Kobot: enab	le	

Go to the Debug page and debug the slave hand and gripper:

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Get Angle in the Robot area to get the joint angles of the hand (displayed in the log, from left to right are the joint angles of J1 to J6). Select a color on the right side of Set Light and click Confirm to set the color of the X-Trainer indicator light (only used to debug the indicator light, and will not cause the actual status of the X-Trainer to change).

		X-Trainer	
le			
bot: 0N Camera:	Main hand:		
nel Settings DataPro	cess		
Control Debug		Image	
Robot			
Test	Cet Angle		
Set Light: red	T Confirm		
ister Eight. Ittu	Comm		
Gripper			
Control	Open		
Camera			
Search			
Set to:	* Comfirm		
Calibration			
Calibuation	Canfirm		
Calibration:	Comm		
24-07-17 10-51-11:606: Welcon 24-07-17 10-51-12:260: Port in	ne) it successfully		
24-07-17 10-52-02:818: Robot: 24-07-17 10-54-06:832: Left ro	enable bot pose: -89.9984, -0.0013, -90.0094, -0.0	022, 89.9996, 90.0003	
14-07-17 10-54-06:832: Right 1	obot pose: 90.0000, 0.0069, 90.0004, 0.000	i, -90.0001, -89.9999	

Click the button in the Gripper area to control the opening and closing of the two slave grippers.

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	X-Trainer	
Inable		
Robot: Camera: Main han	d: OFF	
Panel Settings DataProcess		
Control Debug	Image	
Robot		
Test: Get Angle		
Set Light: red -	Confirm	
Gripper		
Control Open		
Camera		
Search		
Set to:	Comfirm	
Calibration		
Calibration: Confirm		
Jog		
2024-07-17 10-51-11:606: Welcome! 2024-07-17 10-51-12:260: Part init successfully		
2024-07-17 10-52-02:818: Robot: enable		
2024-07-17 10-54-06:832: Left robot pose: -89,9984, -0. 2024-07-17 10-54-06:832: Right robot pose: 90.0000, 0.0	0015, -90.0094, -0.0022, 89.9996, 90.0003 0069, 90.0004, 0.0004, -90.0001, -89.9999	

#### 2.3.3 Camera Debugging

Go to the Debug page, with the switch on the right side of Camera turned OFF, click Search and the software will automatically search for the ID of the connected camera.

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Under normal circumstances, the software will search for the IDs of three cameras, and the user needs to set the position of each camera in turn (according to the correspondence between the camera ID and the installation position recorded during installation).

1. Select the camera ID from the drop-down box.

Camera		
Search	230322276936	1
Set to:	218622275674	
Calibration	218622275344	

 Select the position corresponding to the camera (top: top, left: left side from hand, right: right side from hand).

amera			
Search	230322276936		-
Set to:	top	•	Comfirm

3. Click Confirm .

Click the switch on the right side of Camera to enable the camera. After the camera is enabled, check Show image on the Control page to view the real-time images of each camera on the right.

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			X-Trainer
nable			
Robot	: OFF Camera: O	Main hand: OFF	
n			
Panel	Settings DataProces	S	
Co	ontrol Debug		Image
M	anuplation		
IVIa	anuplation		
S	Select		
	Safety protection		
	Sensor protection		
	C Share inte		
	Show ing		
C	Control		
	Task name:	clean_6666	
	Start	Stan	
og			
2024.0	7 17 10 51 11-606 Webser		
2024-0	7-17 10-51-12:260: Welcome?	uccessfully	
2024-0	07-17 10-52-02:818: Robot: ena 07-17 10-54-06:832: Left robot	ble pose: -89.9984, -0.0013, -90.0094, -/	0.0022, 89.9996, 90.0003
2024-0	07-17 10-54-06:832: Right robo	t pose: 90.0000, 0.0069, 90.0004, 0.0	004, -90.0001, -89.9999
2024-0	7-17 10-57-52:479: Robot: ena	ible 86222275674 anabla	
2024-0	7-17 10-58-50:736: Camera 21	8622275344 enable	
2024-0	7-17 10-58-51:972: Camera 23	0322276936 enable	
	7 17 10 58 51 072; Comora: o	nable	

## 2.4 Remote operation function description

#### 2.4.1 Main hand operation instructions

This section introduces how to use the main hand end handle. Please refer to this section to operate the robot after completing the configuration in the following text.



- Unlock/Sync button (yellow button on the left):
  - Short press (0.5s) to lock/unlock the main hand. When unlocked, you can drag the main hand freely.
  - $\circ$   $\;$  Long press (2s) to synchronize/disconnect. During synchronization, the

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slave hand synchronizes with the master hand's current posture and normal operation speed at a low speed. After synchronization is completed, the movement of the slave hand can be controlled by teleoperation.

The left and right main hands need to use this button to unlock and synchronize respectively.

Record button (green button on the right):

Press briefly (0.5s) to start recording and collecting data, and press again to terminate recording.

After the master and slave hands are synchronized successfully, pressing the button on either side will start or stop the data recording of the entire X-Trainer. It does not support recording the data of a single side.

• Gripper control trigger:

Press the trigger to close the hand gripper, and release the trigger to open the hand gripper. The degree of opening and closing of the gripper can be controlled according to the pressing distance.

# **NOTICE**

- Hold the handle with both hands before unlocking to prevent accidental falling of the master or slave hand.
- Ensure an appropriate safety distance between the master hands and lock them in a safe position before synchronizing the master and slave hands to prevent accidental falling, collision, or other anomalies.
- Do not collide with the master hand after it is locked to prevent servo damage.
- Ensure the slave hands do not interfere with each other during operation, which could damage the robot arms or cameras.

2.4.2 Set the master-slave hand synchronization posture

After completing this step, the synchronization posture information of the master and slave hands will be saved in the configuration file. If there is no abnormality (the master and slave hands are not synchronized), there is no need to repeat the setting.

1. Enables the main hand.

X-Trainer	×
Enable	
Robot: Camera: O <sup>017</sup> Main hand: O	

2. Short press the yellow button to enable the master hand, then drag the two master hands to the same initial position as the slave hands, as shown in

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the figure below.



- 3. On the Debug page, click Con firm in the Calibration area . After the setting
  - is successful, the master hand will be automatically enabled.

		X-Trainer	
nable			
Robot: Camera:	Our Main hand: Our		
Panel Settings DataPro	cess		
Control Debug		Image	
Robot			
Test:	Get Angle		
Set Light: red	• Confirm		
Gripper			
Control	Open		
Camera			
Search		¥	
Set to:	- Comfirm		
Calibration		_	
Calibration :	Confirm		
g			
2024-07-17 11-05-31:933: Welcom 2024-07-17 11-05-32:604: Port ini	et it successfully		
2024-07-17 11-05-34:646: Main h 2024-07-17 11-22-26:935: Calibrat	and: enable tion success: ok		
rator : Dobot-547			Version 2024061

- 2.4.3 Remote operation
  - Enable each part of X-Train one by one. Please wait for the previous button to turn ON before clicking the next button.

	X-Trainer	×
Enable		

- 2. Select the required functions according to the actual situation.
  - Safety protection is a limitation on the operating speed and position of the slave. By default, the slave gripper can only move in the area

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directly above the EVA foam on the workbench, and the speed cannot be too fast, otherwise the protection mechanism will be triggered.

- Sensor protection is a protection mechanism for the master hand to prevent loosening of the grip. If the master hand grip is released during teleoperation, the protection mechanism will be triggered. This function is only supported by the new version of X-Trainer with the master hand sensor installed.
- It is recommended not to check Show img, as it will cause remote operation to freeze.

Triggering the protection mechanism will cause remote operation to stop and the indicator light on the table to turn red to alarm.

- If the slave alarm is not triggered at the same time (the indicator light at the end of the slave is not red), the user only needs to stop and restart the remote operation on the UI interface to clear the alarm.
- If the user triggers the slave alarm during operation (the indicator light at the end of the slave is red), you need to use the slave's host software (PC: DobotStudio Pro 2. X, mobile: Dobot CRStudio) to connect to the slave to clear the alarm (if you suspect that the alarm is triggered by collision detection, you can try pressing the button at the end of the slave to directly clear the collision detection alarm ).

	X-Trainer
Enable	
Robot: ON Camera: Nain hand:	<b>(0x ()</b>
Panel Settings DataProcess	
Control Debug	Image
Manuplation	
Select	
Safety protection	
Sensor protection	
Show img	

 Change Task name to the name of the data set collected by this teleoperation (user-defined), and then click Start.

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		Image
ontrol Debug		inage
anuplation		
Select		
Safety protection		
Sensor protection		
Show img		
Control		
Task name:	clean_6666	
Start	Stop	

- 4. After starting remote operation, the recommended steps are as follows:
  - a) First, short press the yellow button on the handle to unlock the main hand and drag it to the initial position and lock it.
  - b) Then long press the yellow button to synchronize the slave hand gesture.
  - c) Then unlock the main hand for remote control.
- 5. When you need to end the remote operation, click Stop , and the software will automatically disconnect from the master hand (the master hand's enabling status remains unchanged) .

Panel	Settings	DataProcess	
Сог	ntrol Del	bug	
Ma	nuplation		
Se	elect		
	✓ Safety p ✓ Sensor p Show in	protection protection ng	
С	ontrol		
51	Task name		clean_6666

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		X-Trainer	
nable			
Robot: 💽 Camera: 💽	Main hand: OFF		
Panel Settings DataProces	s		
Control Debug		Image	
Manuplation			
Select			
✓ Safety protection			
✓ Sensor protection			
Show img			
Control			
Task name:	clean_6666		
Start	Stop		

#### 2.5 Data processing function description

After the remote operation is completed, you can find a folder named with Task name in the datasets folder at the same level as the software .

collect\_data folder in the folder, which contains the original collected data. If you need to use the collected data for algorithm training, you need to compress and integrate the data first. The steps are as follows.

 Go to the DataProcess page and click Open Dir to open the folder named after the Task name.

		X-Trainer	,
nable			
Robot : OFF	Camera : OFF Main hand : OFF		
Panel Settings	DataProcess		
To train format			
Open Dir:			
	ves *		
Make video:	·		

Cancel	Choose dataset dir	٩	Open
⊘ Recent	<ul> <li>▲ dobot projects datasets →</li> </ul>		5
습 Home	Name 🔻 Size	Туре	Modified
Documents	🛅 clean_123		-
-	🛅 clean_1234		五
Downloads	Clean_dish		29
႕ Music	🚡 fold_clothes		四
Pictures			
🖬 Videos			
E thinclient_drives			
dt_xtrainer			
+ Other Locations			

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 Choose whether to generate a video based on actual needs. The video is generated using images collected by the camera during training and can be used to check whether there are any abnormalities in the collection process.

		X-Trainer ×	
Enable			
Robot: OFF	Camera: OFF Main hand:	(ur)	
Panel Settings	DataProcess		
To train format			
Open Dir:	ot/projects/datasets/Clean_dish		
Make video:	yes 🔹		
	Confirm		

3. Click Confirm, and then wait patiently for the data processing to complete.

	X-Trainer
able	
Robot : OFF	Camera: OUT Main hand: OUT
Panel Settings	DataProcess
To train format	
Open Dir:	ot/projects/datasets/Clean_dish
Make video:	yes •
	Confirm
g	
g 2024-07-17 11-41-46	132: Wokome:
g 2024-07-17 11-41-46 2024-07-17 11-41-46 2024-07-17 11-53-41	132: Welcome: 1300: Port init succesfully 552: No data found!
g 2024-07-17 11-41-46 2024-07-17 11-41-46 2024-07-17 11-52-41 2024-07-17 12-02-34	132: Welcome: 800: Port init successfully 552: No data fondt 557: Processing datasets (JA) (20240711145380) : done
g 2024-07-17 11-41-46 2024-07-17 11-41-46 2024-07-17 11-20-2-44 2024-07-17 12-02-24 2024-07-17 12-02-24 2024-07-17 12-02-24	132: Welcome: 800: Port inis successfully 552: No data fond! 757: Processing datasets (J2) 202407111453501 : done 251: Processing datasets (J2) 202407111453501 : done

train\_data folder will be generated in the folder named after the Task name, which contains the processed training data and can be used for model training.

If you select yes for Make video , the software will also generate an output\_videos folder containing the output video.

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