KINOVA SDK USER GUIDE

KINOVA ROBOTICS

V1.0.6

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TABLE OF CONTENTS

OVERVIEW

The Kinova SDK is a complete set of interface, documentation, examples and software tools that help the developer interact with any Kinova product. It is available under Ubuntu and Windows systems.

Content

- The development center
- A set of project examples
- User guide
- HTML documentation on all APIs
- Tools to configure your product

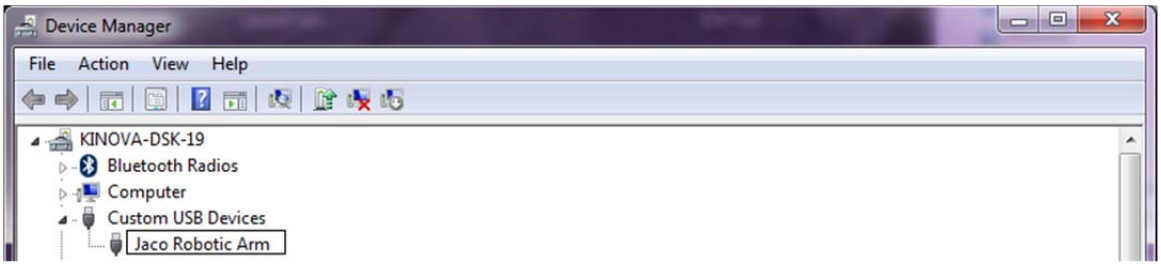
INSTALLATION

Windows 7

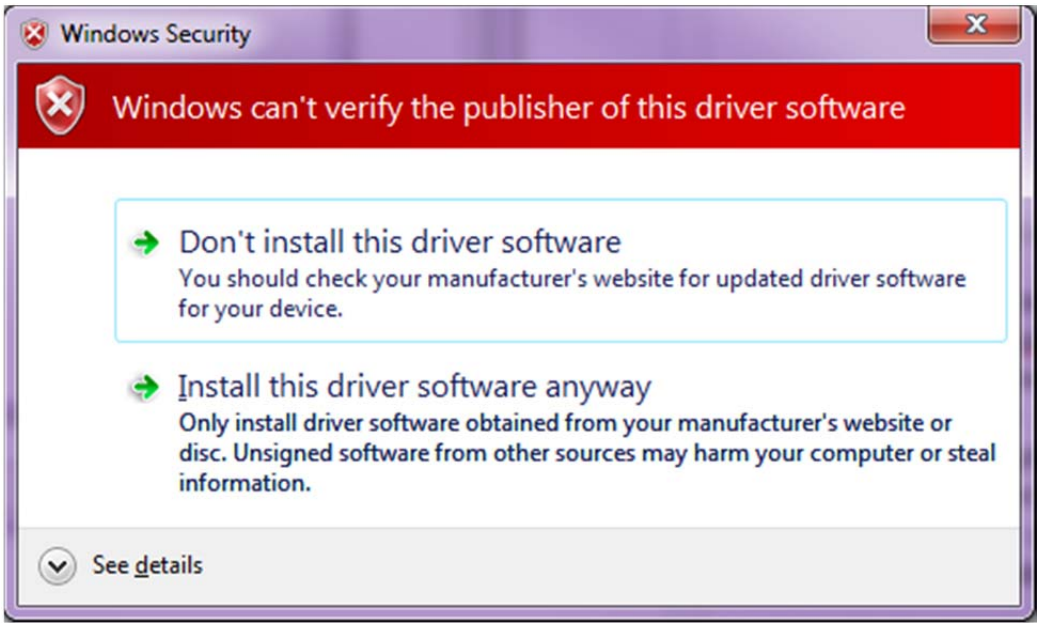
NEW INSTALLATION

If you have any Kinova products already installed on your computer, please refer to the UPDATE section. If it is your first installation of a Kinova product, follow the procedure below.

1. Download and install Microsoft Visual C++ Redistributable(x86, x64)
2. Execute the installer named **KinovaSDKInstaller**.
3. Connect the robot to your computer via USB.
4. Power on the robot.
5. In the Windows Control Panel, open the device manager and wait for the computer to detect a Custom USB Device.



6. Right click on the Kinova product that appeared and install the drivers that were copied on your disk when you executed the KinovaSDKInstaller. Assuming that you've installed the SDK in the default folder, it should be located at C:\Program Files (x86)\KinovaSDK\
7. A Windows Security window may appear:



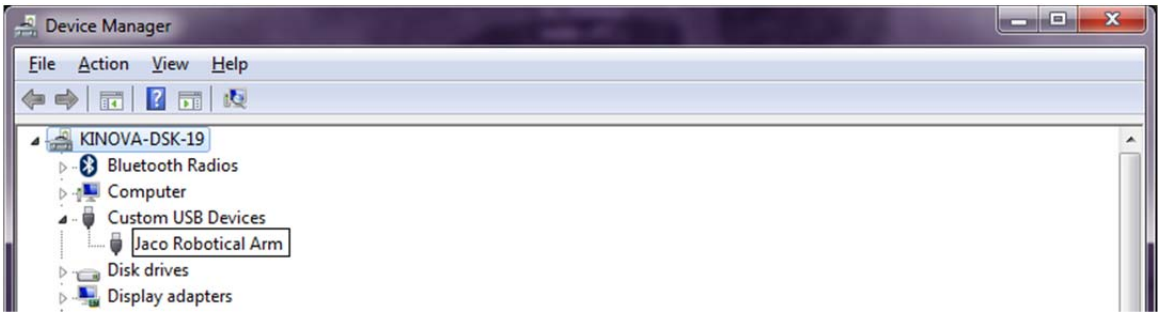
8. Choose to install the driver software anyway.
9. The SDK is ready!

UPDATE

This section explains how to install the Kinova SDK if you have any Kinova products already installed on your computer. This is necessary because the Kinova SDK has a new driver that is different from the one used in previous versions of Kinova software products like Jacosoft. Note that it is possible to have different driver versions on different USB ports. As an example, you could install the previous USB driver on USB port A and when the robot is connected on that port, Jacosoft is available. At the same time, you could install the new driver on USB port B and when your robot is connected to that port, the new SDK is available.

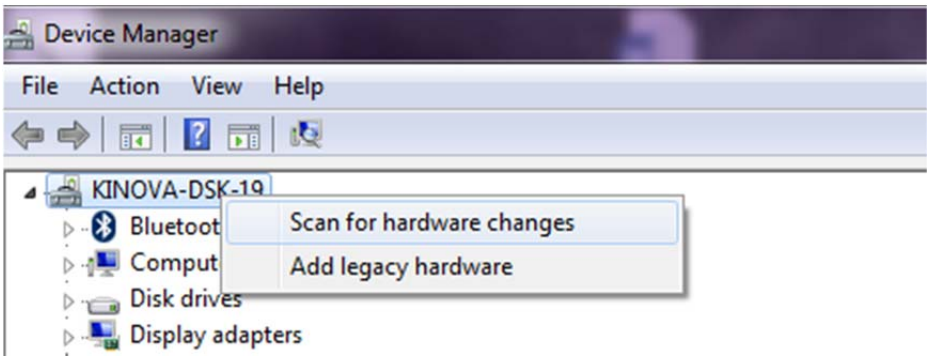
The procedure below explains how to uninstall a driver completely before installing the new Kinova SDK.

1. Connect the robot to your computer via USB.
2. Power on the robot.
3. In Windows Control Panel, open the device manager and look for the Custom USB Device called Jaco Robotical Arm.



4. Right click on it and choose uninstall

5. Check the option Delete the driver software for this device and click OK.
6. Stay in the device manager and right click on your computer. Choose Scan for hardware changes.

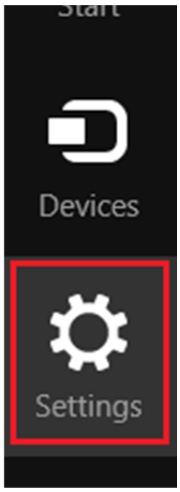


7. From here, follow the procedure in the section NEW INSTALLATION.

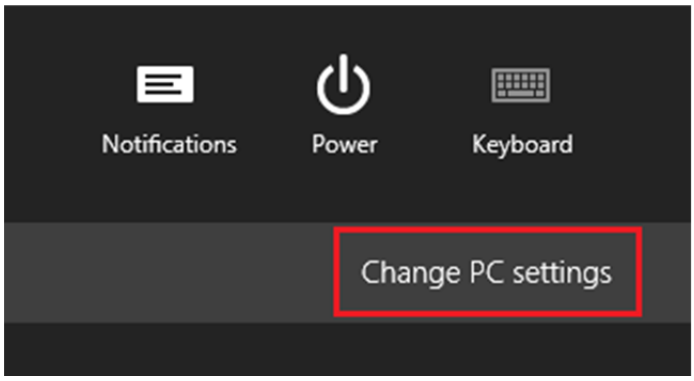
Windows 8.1

NEW INSTALLATION

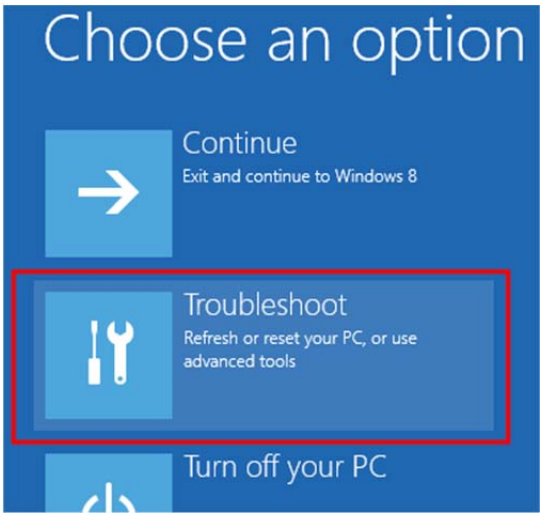
1. Move your mouse to the bottom-right corner of the screen and click on the Settings button.



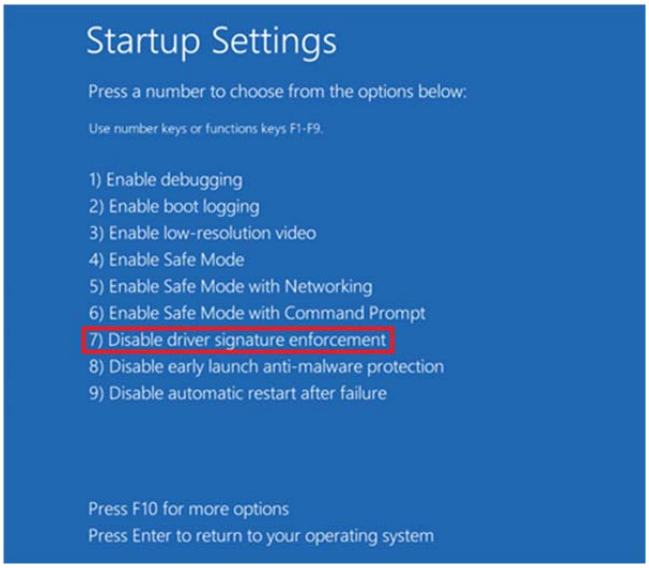
2. Click on the Change PC settings button located at the bottom of the menu.



3. Select the sub-menu Update and recovery.
4. Select the sub-menu recovery.
5. Click on the Restart Now button located in the Advanced startup section.
6. Wait until it restarts.
7. Select Troubleshoot.



8. Select Advanced options.
9. Select Startup Settings.
10. Click on the Restart button.
11. Press the F7 key on your keyboard to disable driver signature enforcement.



12. Right click on the bottom-left corner of the screen and select Device Manager.
13. From there, follow the same procedure as for Windows 7.

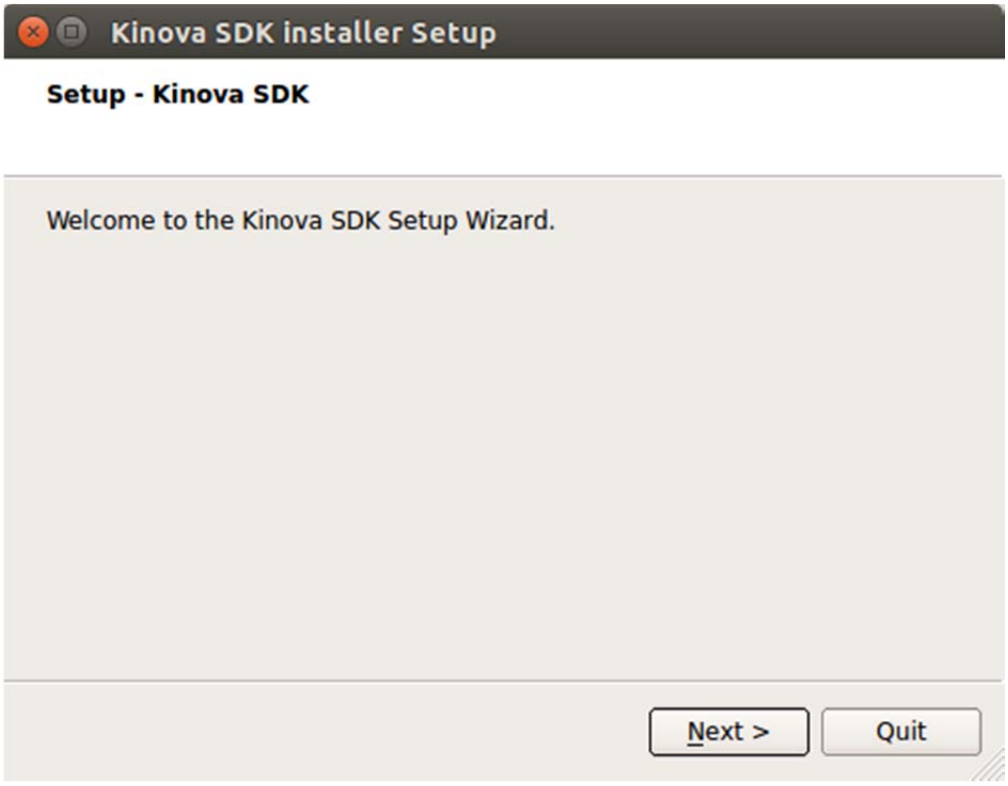
UPDATE

This section explains how to install the Kinova SDK if you have any Kinova products already installed on your computer. This is necessary because the Kinova SDK has a new driver that is different from the one used in previous versions of Kinova software products like Jacosoft. Note that it is possible to have different driver versions on different USB ports. As an example, you could install the previous USB driver on USB port A and when the robot is connected on that port, Jacosoft is available. At the same time, you could install the new driver on USB port B and when your robot is connected to that port, the new SDK is available.

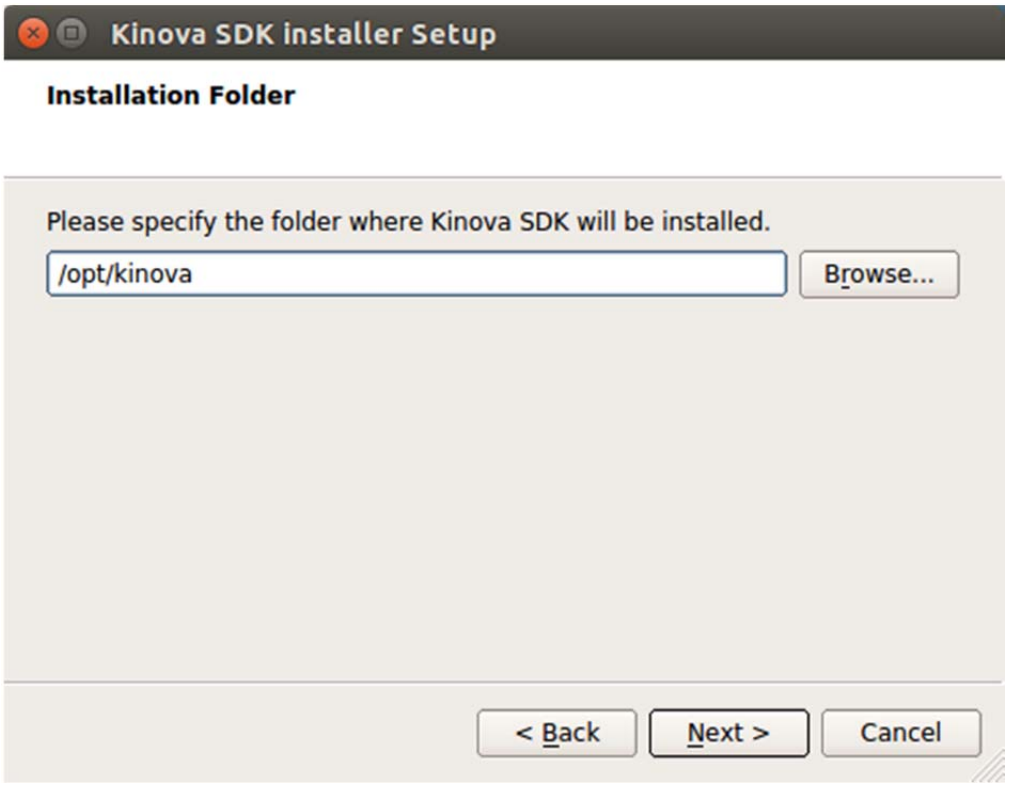
To install the Kinova SDK, follow the same driver uninstallation procedure as in Windows 7 and proceed afterward to Windows 8.1 new installation.

Ubuntu 12.04/14.04 installation

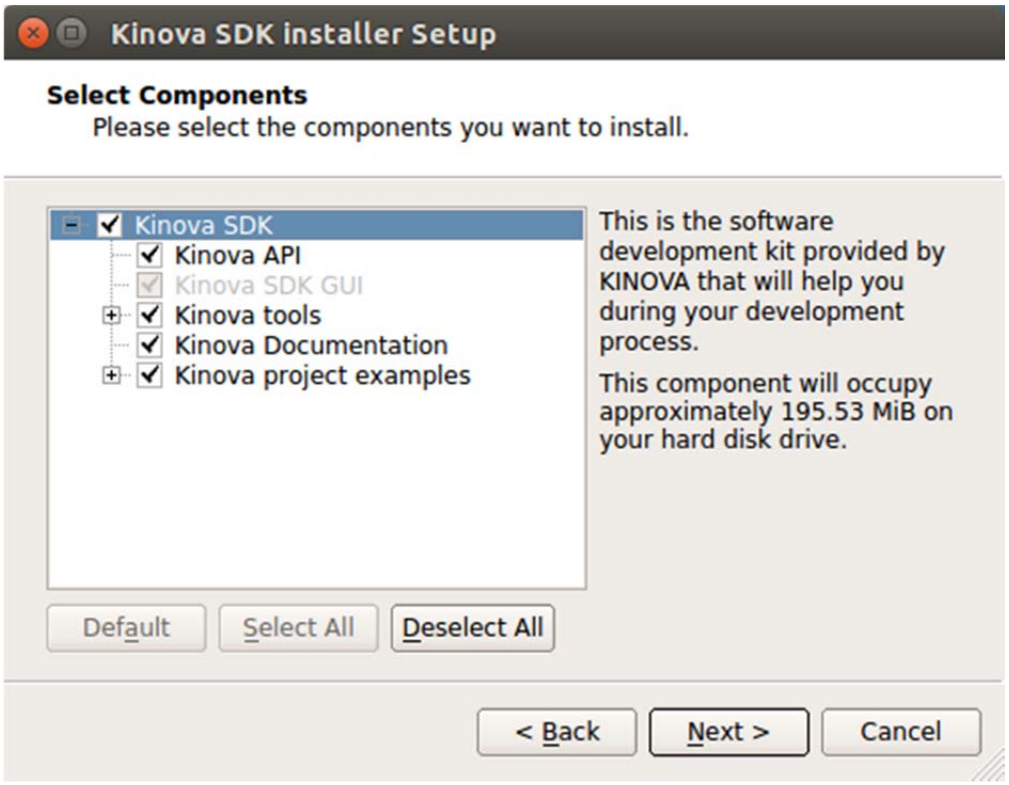
1. Execute the bash script named *installSDK32.sh* if your computer's architecture is 32 bits or *installSDK64.sh* if your computer's architecture is 64 bits.
2. The script will ask for root permission to install a package named kinova-api.
3. The Kinova SDK Installer Setup window will appear to install the remainder of the SDK.



4. Choose an installation folder (default: /opt/kinova)



5. Choose which components you need to install.

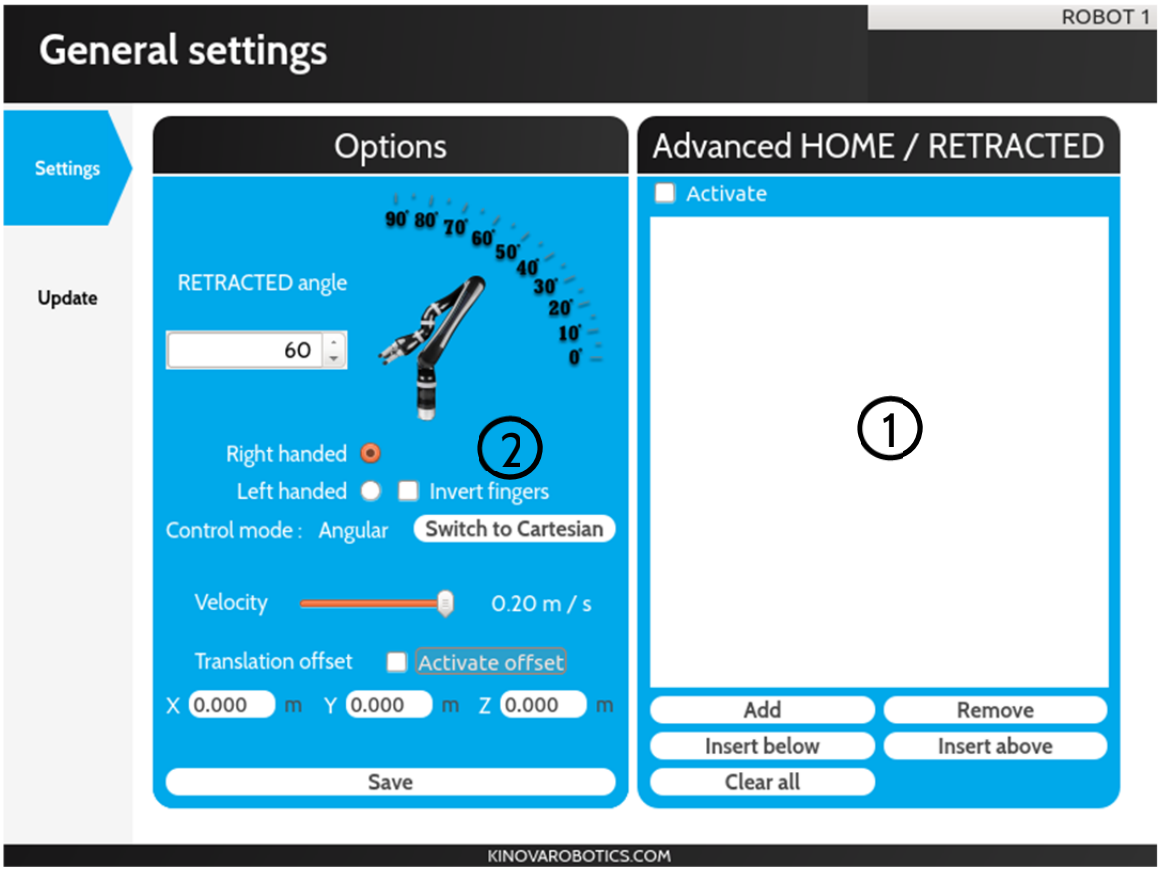


6. Click on the next button until installation is completed.
7. The SDK is installed. To launch the Development Center, execute [installation folder]/GUI/KinovaSDK.sh

DEVELOPMENT CENTER

General settings

SETTINGS



① Advanced HOME / RETRACTED position

Activate	Check to enable the advanced HOME / RETRACTED feature.
List of positions	Contains the list of positions (angular or Cartesian) that represents the new path that the robot will follow between the HOME and the RETRACTED position.
Add	Click to add the current robot's position at the end of the

positions list.

Remove Click to remove the selected position from the position list.

Insert below Click to add the current robot's position below the selected position in the positions list.

Insert above Click to add the current robot's position above the selected position in the positions list.

Clear all Click to clear the entire positions list.

② Options

Retracted angle The angle of the default RETRACTED position shown by the image aside.

Handedness Select the radio button to set the robot in right handed mode or in left handed mode.

Invert fingers Check to invert the closing finger when a 3 fingers robot is closing only 2 fingers. This mode is mainly used with a left handed configuration.

Control mode Displays the current control mode. It can be either angular or Cartesian.

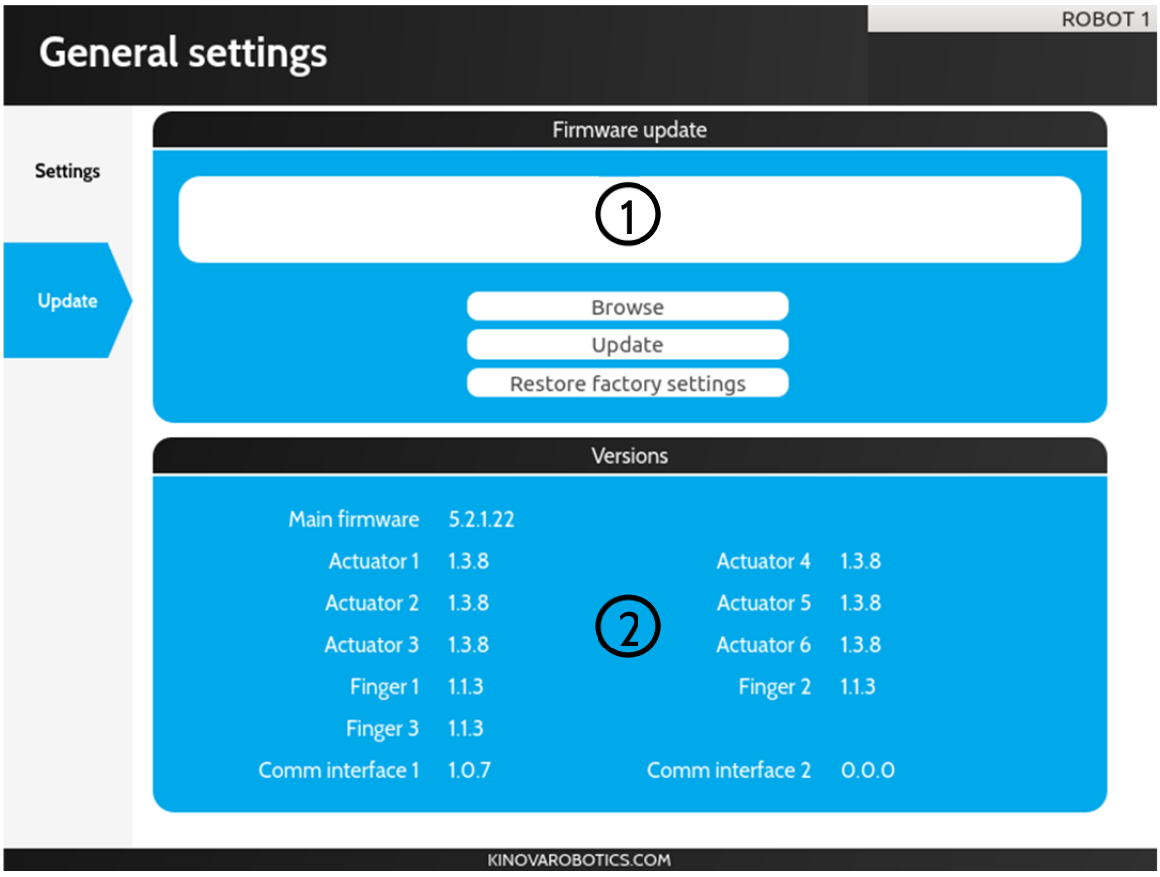
Switch button Select to toggle between the angular control mode and the Cartesian control mode. Note that if the robot's position cannot switch to Cartesian mode because of a singularity, the robot will stay in angular mode.

Velocity Select the Cartesian velocity of the robot.

Activate offset Check to apply a position offset on the end effector. The offset is described by the text fields X, Y and Z.

Save Press to send the modification to the robot. If you perform a modification in the Option panel nothing will be applied unless the save button is pressed. The exception is the velocity which is applied directly when modified.

UPDATE



1 Firmware update

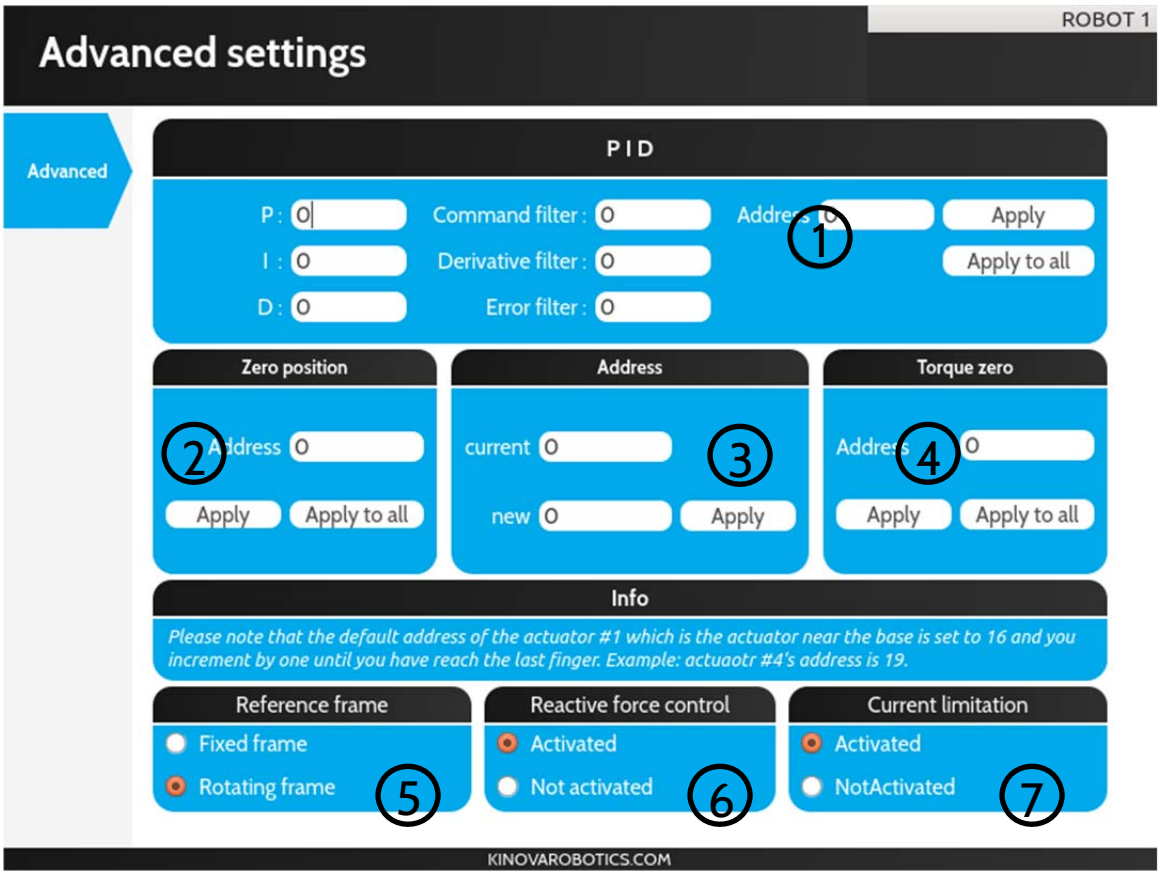
White panel Displays the complete path to the HEX file that will be uploaded to the robot when the button update is pressed.

Browse	Press to choose a HEX file on your disk that contains a firmware update.
Update	Press to update your robot with the chosen HEX file.
Restore factory settings	Restore the robot with its factory settings.

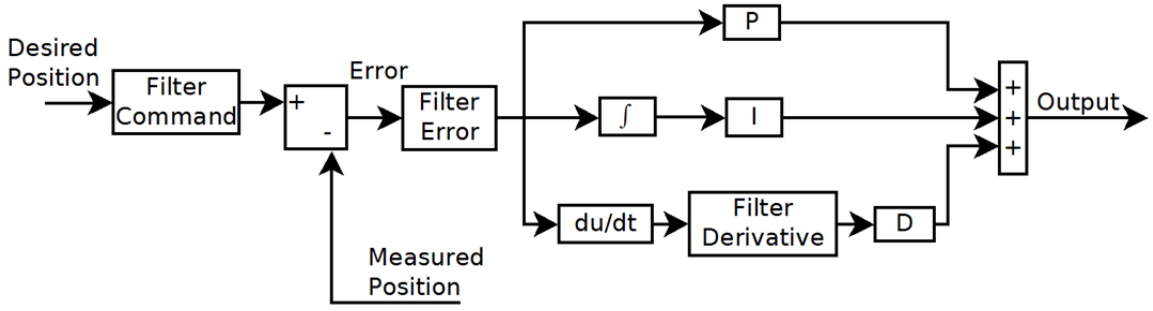
② Versions

Main firmware	Displays the main firmware's code version.
Actuator X	Displays the code's version of the actuator X where X is a number greater than 0.
Finger X	Displays the code's version of the finger X where X is a number greater than 0.

Advanced settings



① PID (Proportional, Integral and derivative)



P The proportional part of the controller. (Suggested range [0, 2])

I	The integral part of the controller.
D	The derivative part of the Controller. (Suggested range [0, 0.1])
Command filter	Filters the commands sent to the actuator. The filter is of first order and the parameter value is a frequency in rad/s. The suggested range is [0, 500].
Derivative filter	Filters the error derivative signal (derivative of (desired position - measured position)). The filter is of first order and the parameter value is a frequency in rad/s. The suggested range is [0, 500].
Error filter	Filters the error signal (desired position - measured position). The filter is of first order and the parameter value is a frequency in rad/s. The suggested range is [0, 500].
	Setting these parameters out of the suggested range can severely damage the robot and it is not covered by the warranty.

② Zero position

Address	The address of the actuator to modify.
Apply	Apply the *zero position*. The actual position of the targeted actuator will now be 180°.
Apply to all	Apply the *zero position* to every actuator of the robot.
	Setting these parameters incorrectly can severely damage the robot and it is not covered by the warranty.

③ Address

Current	The current address of the actuator.
New	The new address to assign.
Apply	Apply the new address on the actuator.
	Setting these parameters incorrectly can severely damage the robot and it is not covered by the warranty.

④ Torque zero

Address	The address of the actuator on which the *torque zero* will be applied if you press Apply.
Apply	Apply the *torque zero*. The actual torque of the targeted actuator will now be considered as 0
Apply to all	Apply the zero position on every actuator of the robot.
	Setting these parameters incorrectly can severely damage the robot and it is not covered by the warranty.

⑤ Reference frame

Fixed frame	Set the robot to fixed frame. When a translation is performed, the orientation stays the same.
Rotating frame	Set to rotating. When a translation is performed, the orientation follows the first actuator.

⑥ Reactive force control

Activated	Select to activate the reactive force control.
Not activated	Select to deactivate the reactive force control.

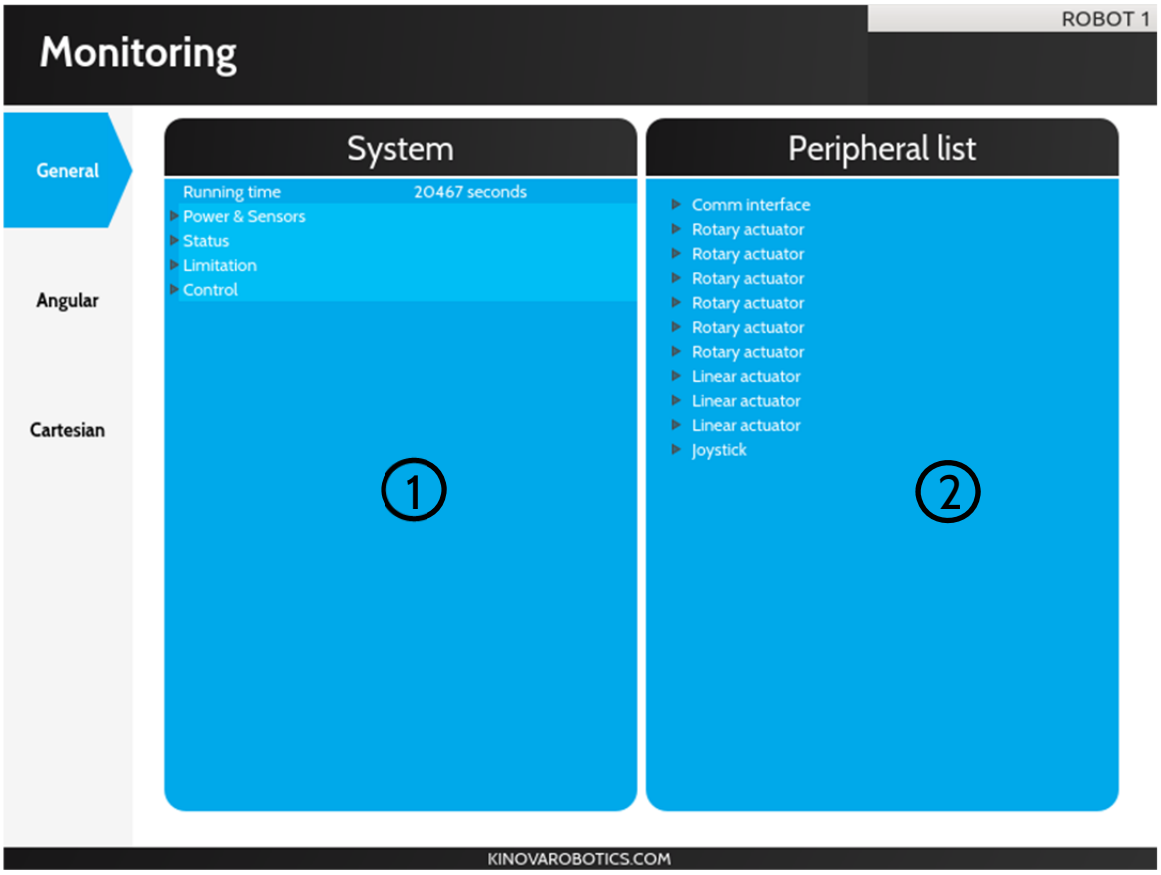
⑦ Current limitation

Activated	Select it to activate the current limitation.
Not activated	Select it to deactivate the current limitation.

Setting these parameters incorrectly can severely damage the robot and it is not covered by the warranty.

Monitoring

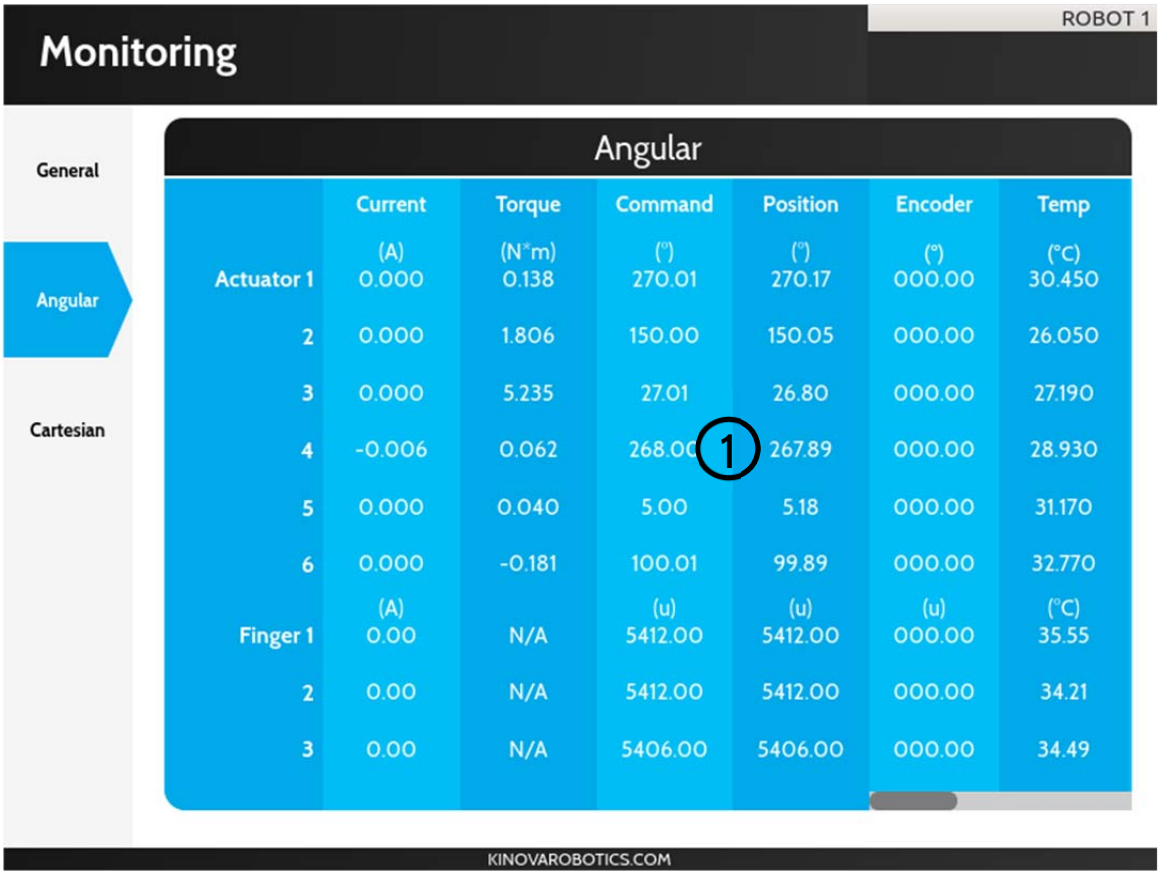
GENERAL



① **System** — Displays general information stored in the robot.

② **Peripheral list** — Lists all peripherals detected on the robot's communication bus. Each peripheral can be expanded to display its type, address, port and code version.

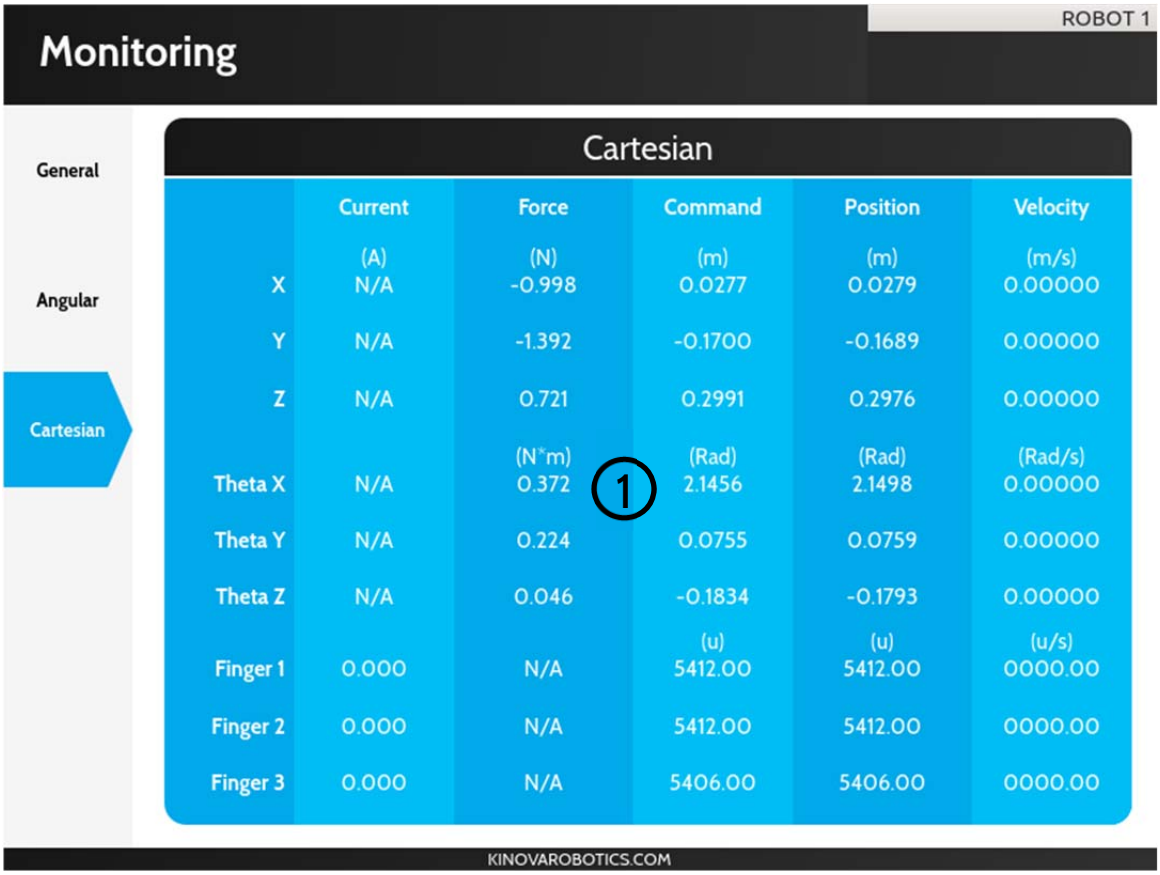
ANGULAR



1 Angular

Displays all the information on every actuator. It includes the current, torque, command, position, encoder value, temperature, velocity, acceleration along the X axis, acceleration along the Y axis and acceleration along the Z axis.

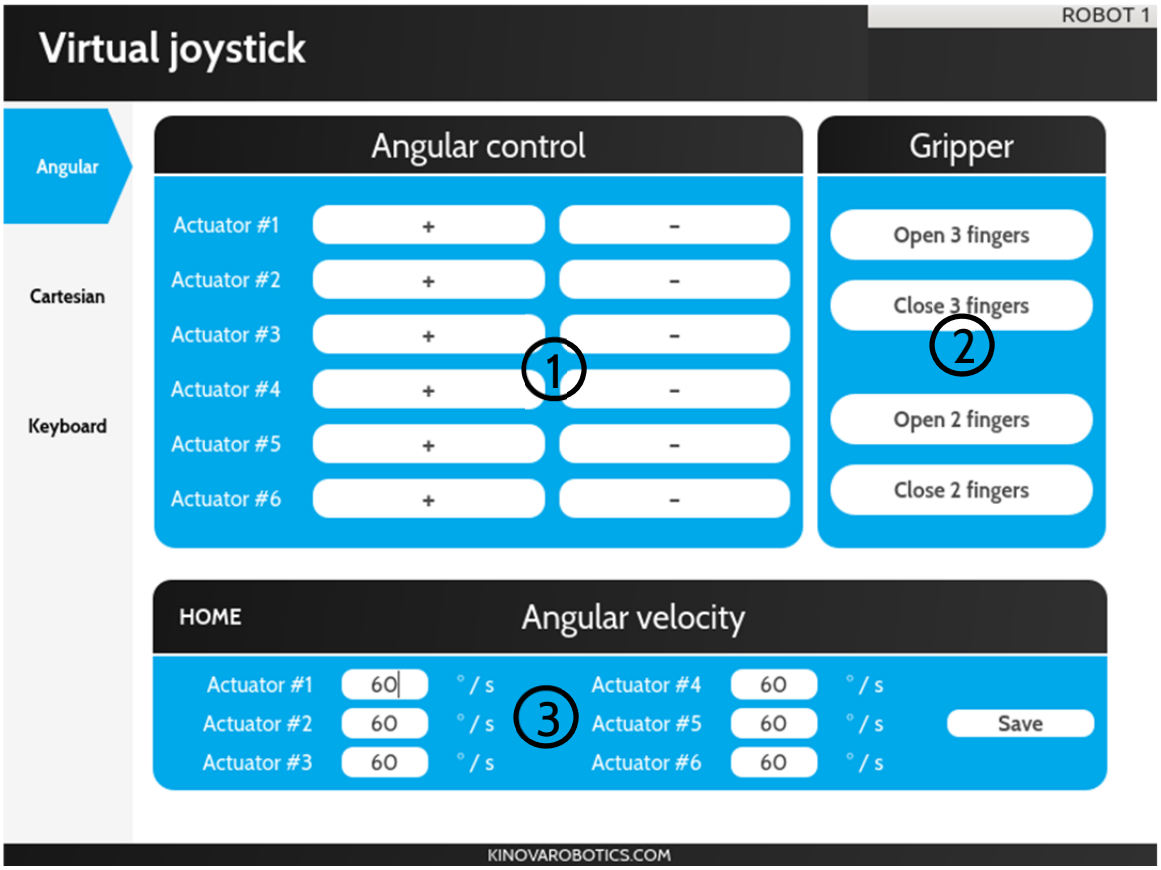
CARTESIAN



1 Cartesian Displays all the information on the end effector. It includes the force, command, position and velocity.

Virtual joystick

ANGULAR



① Angular control

Actuator X + Press and hold to move the actuator X counter clockwise where X is a number great than 0.

Actuator X - Press and hold to move the actuator X clockwise where X is a number great than 0.

② Gripper

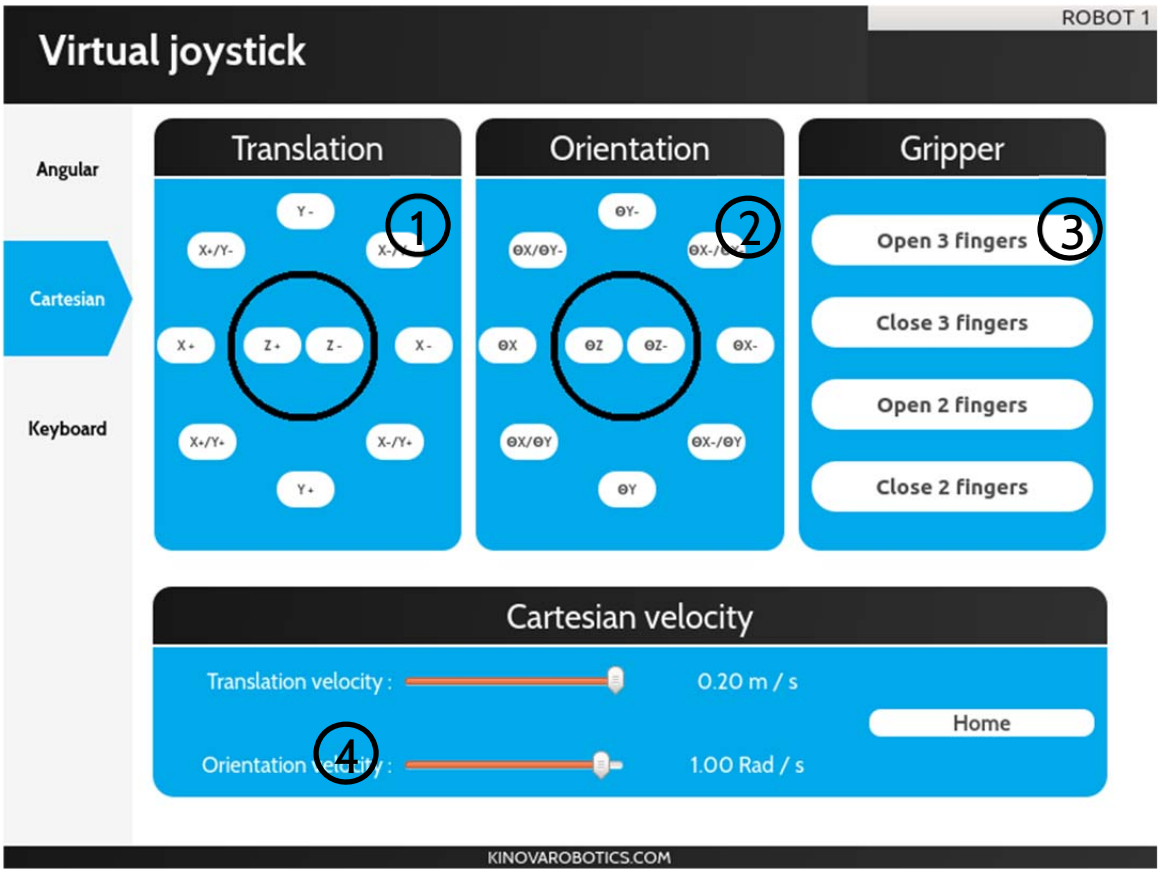
Open 3 fingers Press and hold to open a 3 finger gripper.

Close 3 fingers	Press and hold to close a 3 finger gripper.
Open 2 fingers	Press and hold to open a 2 finger gripper.
Close 2 fingers	Press and hold to close a 2 finger gripper.

③ Angular velocity

Text field	Set the velocity of a specific actuator.
Save	Send the new velocity configuration to the robot.

CARTESIAN



① Translation

Button +	Press and hold to move the end effector along the positive axis described by the button.
Button -	Press and hold to move the end effector along the negative axis described by the button.

② Orientation

Button +	Press and hold to move the end effector around the axis described by the button counter clockwise.
Button -	Press and hold to move the end effector around the axis described by the button clockwise.

③ Gripper

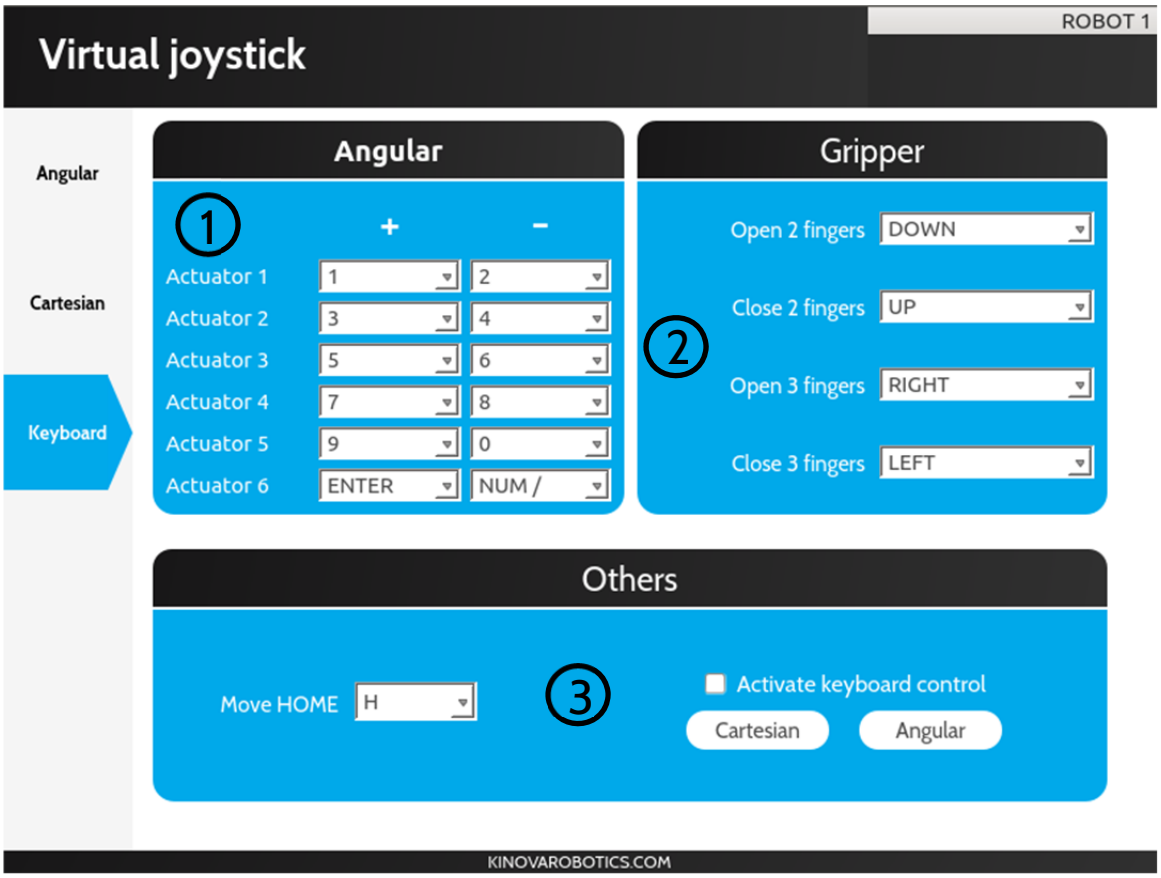
Open 3 fingers	Press and hold to open a 3 finger gripper.
Close 3 fingers	Press and hold to close a 3 finger gripper.
Open 2 fingers	Press and hold to open a 2 finger gripper.
Close 2 fingers	Press and hold to close a 2 finger gripper.

④ Cartesian velocity

Translation velocity	Set the translation velocity of the end effector.

Orientation velocity	Set the orientation velocity of the end effector.

KEYBOARD



① Control (Angular or Cartesian)

Combo box	Select a key that will be mapped with the specified movement. Note that this panel can be changed by pressing the angular or Cartesian button.

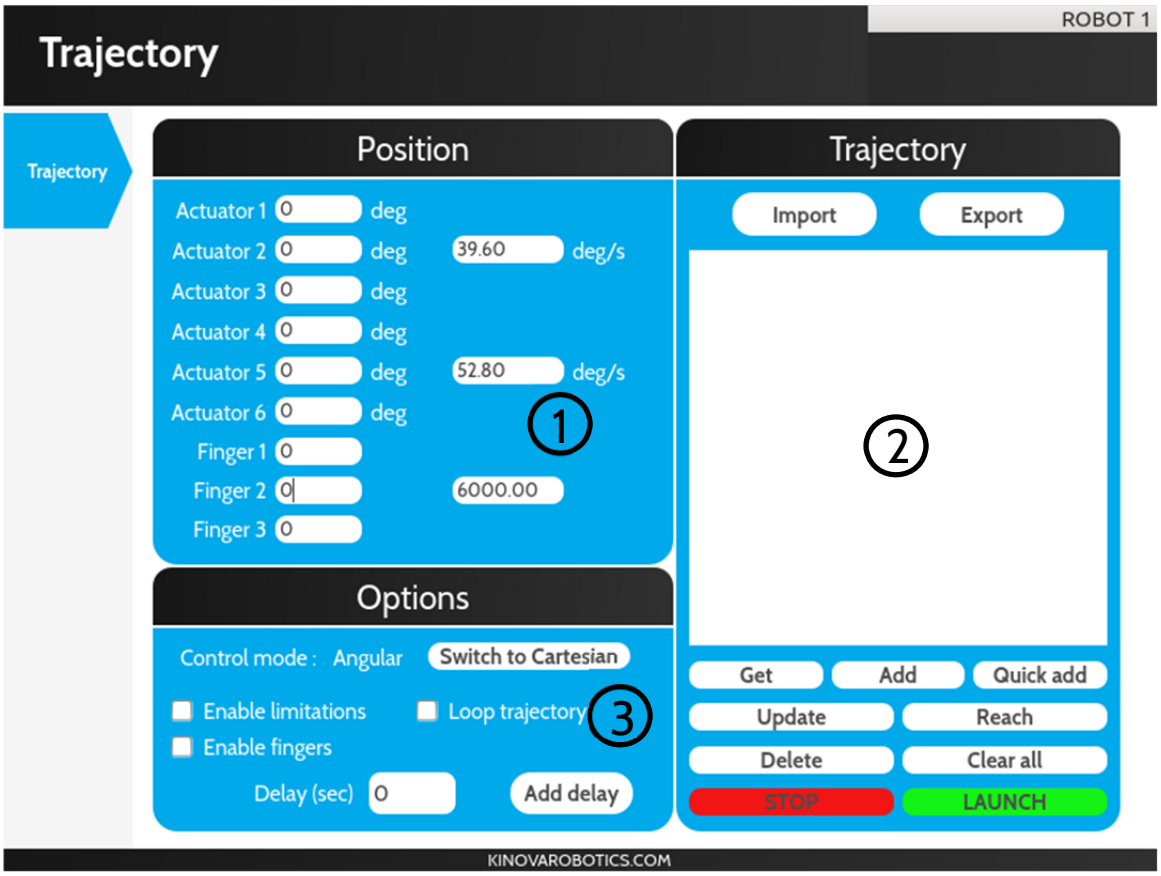
② Gripper

Combo box	Select a key that will be mapped with the specified gripper movement.

③ Others

Move HOME	Select a key that will be mapped with the Move HOME functionality.
Activate keyboard	Check to activate the keyboard control with the robot. Note that the robot's joystick will always have a higher control priority than the keyboard.
Cartesian	Press to switch the control panel to Cartesian.
Angular	Press to switch the control panel to Angular.

Trajectory planner



① Position (Angular or Cartesian)

Left section	Displays the current position or the position of a selected trajectory point.
Right section	Displays the max velocity of the robot for the selected trajectory point.

② Trajectory

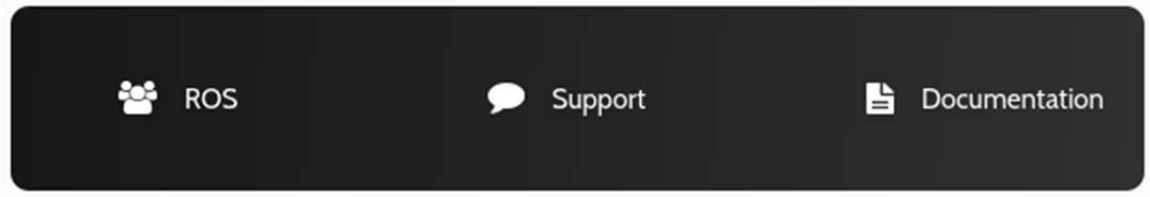
Import	Press to import a trajectory. The trajectory must have been saved in a KTJ file on disk.
Export	Press to export a trajectory on disk in a KTJ file.
Position list	Displays the list of positions contained in the trajectory. Each point can be selected and their data will be displayed on the position panel.
Get	Press to display the current robot's position on the position panel.
Add	Press to add a point in the list based on the information on the position panel.
Quick add	Press to execute a combination of a Get and Add.
Update	Press to update the selected point in the list with the information from the position panel.
Reach	Press to move the robot to the selected point in the list.
Delete	Press to delete the selected point in the list.

Clear all	Press to clear all the positions in the list.
Stop	Press stop the robot movement. It will also cancel any trajectory loops.
Launch	Press execute the trajectory. If the Loop Trajectory check box is checked, the robot will execute the trajectory until the stop button is pressed.

③ Options

Move HOME	Select a key that will be mapped with the Move HOME functionality.
Activate keyboard	Check to activate the keyboard control with the robot. Note that the robot's joystick will always have a higher control priority than the keyboard.
Cartesian	Press to switch the control panel to Cartesian.
Angular	Press to switch the control panel to Angular.

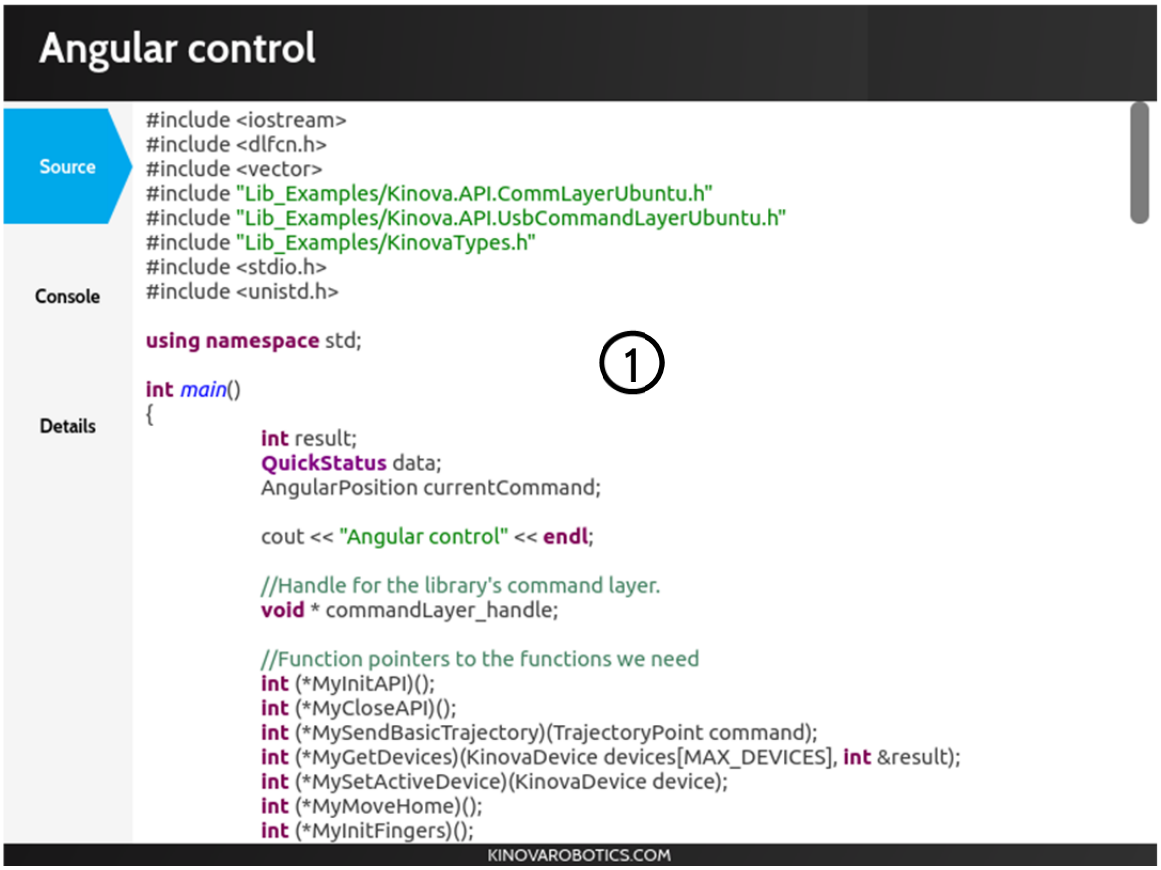
Resources



These are shortcuts to support elements found on Kinova's website.

Examples

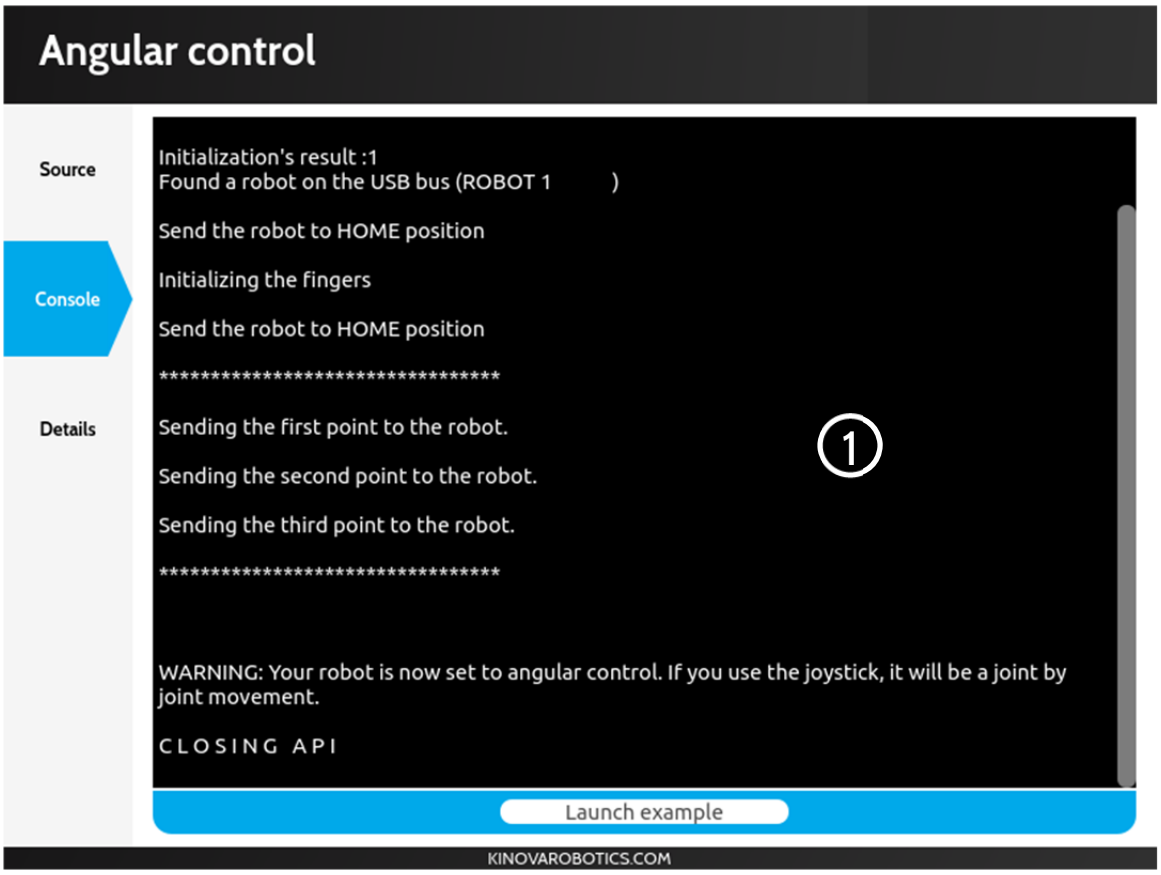
SOURCE



① Source

Code	Displays the code that reflects the example.

CONSOLE



① Console

Output Displays the output of the example's execution in a console like window.

CONTACTING SUPPORT

If you need help or have any questions about this product, this guide, or the information detailed in it, please contact a Kinova representative at:

- Support@KinovaRobotics.com

We value your comments!

To help us assist you more effectively with problem reports, the following information is required when contacting Kinova or your distributor support

- Product serial number
- Date/Time of the problem
- Environment where the problem occurred (per example 30° Celsius, raining, ...)
- Actions performed immediately before the problem occurred

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