ROS SDK User Guide

ROS-SDK

Installing ROS Packages

> **Tip**
>
> Supported ROS versions:
>
> Ubuntu 20.04
>
> - ROS1: Noetic
> - ROS2: Foxy, Galactic
>
> Ubuntu 22.04
>
> - ROS2: Humble, Iron
>
> Note, Ubuntu 18.04 version is not supported. Use docker to run a newer Ubuntu if you just have to.

> **Warning** Note, before downloading the package, you need to have ROS installed and source the version you need to use. Otherwise, the downloaded package will **not be usable**.

In the path where you want to install the SDK, open the terminal and enter the following command:

```
wget -O hextool.bash https://ros.dl.hexmove.cn/ros.dl/hextool.bash && bash hextool.bash
```

> **Tip** To prevent typos when typing commands, it is recommended to use the browser that comes with Ubuntu to open this website and copy the command from the browser to the terminal.

This is an EXAMPLE, installing the orcs-diff sdk.

PLEASE SELECT the correct SDK according to what you have purchased.

- Tool selection, choose `1: Download SDK`

```
2024-10-23 21:28:14 (136 KB/s) - '/tmp/hexmove/hex-tool/hex-tool' saved [62603
/6260368]

Setting language to en-US because LANG=en_US.UTF-8

 Hello! hex-tool is a command line tool developed by HexMove.
 It is mainly used to facilitate the installation of SDKs and other tools.
 The tool supports skipping compilation tests, directly specifying the installa
ion of a certain SDK, etc.
 (especially convenient for automatic environments such as docker).
 If you are interested, please refer to the comments in the bash script.

 DISCLAIMER: Docs to modify the script are provided as is.
 You can modify it as you like, but there is no guarantee that it will work as
xpected.

Downloading SDK meta information from the Internet...

Choose operation
Type Q/q to quit.
1) Install SDK
2) Install a single package
3) Force add hexmove apt source
```

- SDK selection, choose the SDK you want to download. Please select according to the product you actually purchased. Here is an example with ORCS-MCNM.

```
Downloading SDK meta information from the Internet...

Choose operation
Type Q/q to quit.
1) Install SDK
2) Install a single package
3) Force add hexmove apt source
1

Please choose the product category you brought:
Type Q/q to quit.
0) ARK
    Contains: ARK-MINI, ARK
1) HAMMER
    Contains: HAMMER-80
2) TRIGGER
    Contains: FIBOT, TRIGGER-A, TRIGGER-X
3) RAY
    Contains: RAY
4) NEOS
    Contains: NEOS
5) ORCS
    Contains: ORCS-DIFF, ORCS-MCNM-PRO, ORCS-MCNM, ORCS-MINI
```


```
    Contains: ARK-MINI, ARK
1) HAMMER
    Contains: HAMMER-80
2) TRIGGER
    Contains: FIBOT, TRIGGER-A, TRIGGER-X
3) RAY
    Contains: RAY
4) NEOS
```

- Confirm the location of the new folder is correct

```
3) RAY
    Contains: RAY
4) NEOS
    Contains: NEOS
5) ORCS
    Contains: ORCS-DIFF, ORCS-MCNM-PRO, ORCS-MCNM, ORCS-MINI
5

Please choose SDK to install:
Type Q/q to quit.
5) ORCS-DIFF
    ROS Dev kit for the ORCS-DIFF Robot, chassis only
6) ORCS-MCNM-PRO
    ROS Dev kit for the ORCS-MCNM-PRO Robot, chassis only
7) ORCS-MCNM
    ROS Dev kit for the ORCS-MCNM Robot, chassis only
8) ORCS-MINI
    ROS Dev kit for the ORCS-MINI Robot, chassis only
7
hexmove-apt-source-exists
Confirm to install SDK sdk_orcs_mcnm_ws? This will create a new directory sdk_
cs_mcnm_ws in the current directory /home/kisonhe/Desktop.
Type Y/y to confirm, N/n to reject, Q/q to quit:
```

- Enter the password to complete the installation(because script needs to run things like apt-get install xxx). Script will do compile test.

```
[100%] Linking CXX executable /home/kisonhe/Desktop/sdk_orcs_mcnm_ws/devel/li
pkg_vehicle/xnode_vehicle
[100%] Built target xnode_vehicle
Base path: /home/kisonhe/Desktop/sdk_orcs_mcnm_ws
Source space: /home/kisonhe/Desktop/sdk_orcs_mcnm_ws/src
Build space: /home/kisonhe/Desktop/sdk_orcs_mcnm_ws/build
Devel space: /home/kisonhe/Desktop/sdk_orcs_mcnm_ws/devel
Install space: /home/kisonhe/Desktop/sdk_orcs_mcnm_ws/install
Creating symlink "/home/kisonhe/Desktop/sdk_orcs_mcnm_ws/src/CMakeLists.txt"
nting to "/opt/ros/noetic/share/catkin/cmake/toplevel.cmake"
####
#### Running command: "cmake /home/kisonhe/Desktop/sdk_orcs_mcnm_ws/src -DCATI
_DEVEL_PREFIX=/home/kisonhe/Desktop/sdk_orcs_mcnm_ws/devel -DCMAKE_INSTALL_PRI
X=/home/kisonhe/Desktop/sdk_orcs_mcnm_ws/install -G Unix Makefiles" in "/home
sonhe/Desktop/sdk_orcs_mcnm_ws/build"
####
####
#### Running command: "make -j4 -l4" in "/home/kisonhe/Desktop/sdk_orcs_mcnm_
build"
####
SDK sdk_orcs_mcnm_ws compiled and tested successfully.
Before starting to use the SDK, please source the setup.bash file in the SDK
ectory :)
```

SDK Package Structure Description

The packages are similar, here is an example with ORCS-DIFF.

```
root@1c2edac84f0b:~# tree -d -L 5
.
└── sdk_orcs_diff_ws
    └── src
        ├── demo
        │   └── demo_general_chassis
        │       ├── demo_vehicle
        │       └── tools
        └── drivers
            └── xpkg_vehicle
                ├── include
                ├── ini
                ├── launch
                ├── scripts
                ├── src
                └── tools

14 directories
```

- demo folder: Contains demo launch files, users can refer to them to write their own launch files.

> **Warning** Note, the launch files in the demo folder are designed to only start one at a time. Do not launch multiple launch files simultaneously.

- drivers folder: Basic robot driver software, such as charging stations (if any), chassis control, etc.
- urdf folder: Used to store URDF files
- In addition, two other packages were installed via apt:
  - ros-$ROS_DISTRO-xpkg-comm responsible for physical communication with the chassis.
  - ros-$ROS_DISTRO-xpkg-msgs responsible for providing message types.

If you are not professionally guided, do not modify any packages other than the demo folder.

Using the SDK Package

The package provides a test demo, please refer to Using ROS Demo

Using ROS demo

Pre-launch Check

> **Tip** Please first acquire basic knowledge of `ROS`. You can refer to the ROS1 Tutorial and ROS2 Tutorial to understand the common conventions of the `ROS` system.

Please ensure the following are completed:

1. ROS-SDK installation is complete; if it is your first time installing the SDK, it is recommended to ***restart*** after the first installation.
2. Compilation has been completed without errors.
3. The workspace has been sourced.
4. If using the CAN-COM HUB, ensure the CAN bus is correctly connected and devices can be detected.
   - Use lsusb in the terminal to see the following devices.
5. Ensure the remote control is turned off; or if it is on, ensure it is set to CAN mode.

   > For information about the remote control and modes, please refer to the remote control section in the product user manual.

Chassis Devices

> **Warning** Be cautious, when attempting to control the robot with software for the first time, ensure there are no obstacles within the robot's range of motion, or elevate the robot.

There are two test demos for the chassis:

```
* demo_basic_ctrl.launch
* demo_key_ctrl.launch
```

`demo_basic_ctrl.launch` is a standard launch file that can be used directly with autonomous driving, controlling the robot's movement via the `/cmd_vel` topic.

`demo_key_ctrl.launch` supports keyboard control, using `turtle_teleop_key` to control the robot with the keyboard. If you have not yet seen the ROS `turtlesim` tutorial, please check it out first.

> **Tip** Note that the movement is not controlled with the arrow keys, please check the usage tips printed in the terminal and press the forward button indicated.

Successful launch will display the following terminal message

```
[ INFO] [1714662015.789025136]:  xnode_vehicle: Vehicle online
[ INFO] [1714662015.789215455]:  xnode_vehicle: CAN mode locked
[ INFO] [1714662016.189858534]:  xnode_vehicle: mode OK(CAN mode)
[ INFO] [1714662016.789707014]:  xnode_vehicle: Vehicle enable
[ INFO] [1714662016.789779160]:  xnode_vehicle: Device type = MARK1_DIFF
[ INFO] [1714662016.789801928]:  xnode_vehicle: ### Vehicle init finish ###
[ INFO] [1714662017.290447759]:  xnode_vehicle: cal_mode = odom ||| model = Di
fferential
[ INFO] [1714662017.290510966]:  xnode_vehicle: track_width = 0.520m ||| wheel
_base = 0.410m
[ INFO] [1714662017.290542395]:  xnode_vehicle: ### Odom init finish ###
[ INFO] [1714662017.290570052]:  xnode_vehicle: ========== VEHICLE READY TO G
O ==========
```

For parameter settings and communication `msg` in the launch file, please refer to the `src/drivers/xpkg_vehicle/README.md` file, below are explanations of a few key parameters:

- `calc_speed` sets the odometer calculation method, `true` for using speed, `false` for using motor encoder values, with the default setting recommended as false.
- `mode_can_lock` is the CAN mode lock setting, `true` forces CAN mode, switching to other modes with the remote control will trigger a warning and wait for recovery, setting `false` allows the user to choose the control mode.

!!!note If the chassis cannot be controlled, it may be because `mode_can_lock` is set to `false`, and it has been switched to another mode.

- `rate_x` controls the rate multiplier for input speed, 1 is full speed, it is recommended to set it below 0.2 during testing.

After successfully launching the package, you can view ROS topics through `rostopic list`, below are a few key topics:

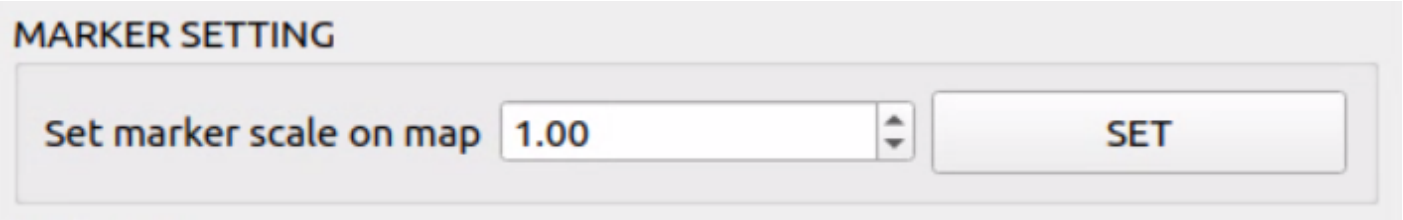
- The chassis node sends messages of type `nav_msgs/Odometry` to the topic `/odom`. This message represents the chassis odometer information, including the current pose of the chassis as well as linear and angular velocity information.

- The chassis node sends messages of type `tf2_msgs/TFMessage` to the topic `/tf`, which include chassis tf transformation information, to be enabled in launch parameters.
- The chassis node subscribes to messages of type `geometry_msgs/Twist` from the topic `/cmd_vel`. Upon receiving this message, the chassis moves, where `linear.x`/`linear.y` represent linear velocity, and `angular.z` represents rotational speed.

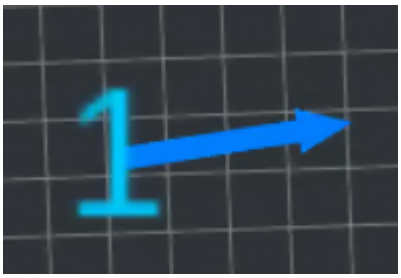
Rviz Navigation Plugin

> This plugin is only compatible with ROS1 version.

Marker Setting

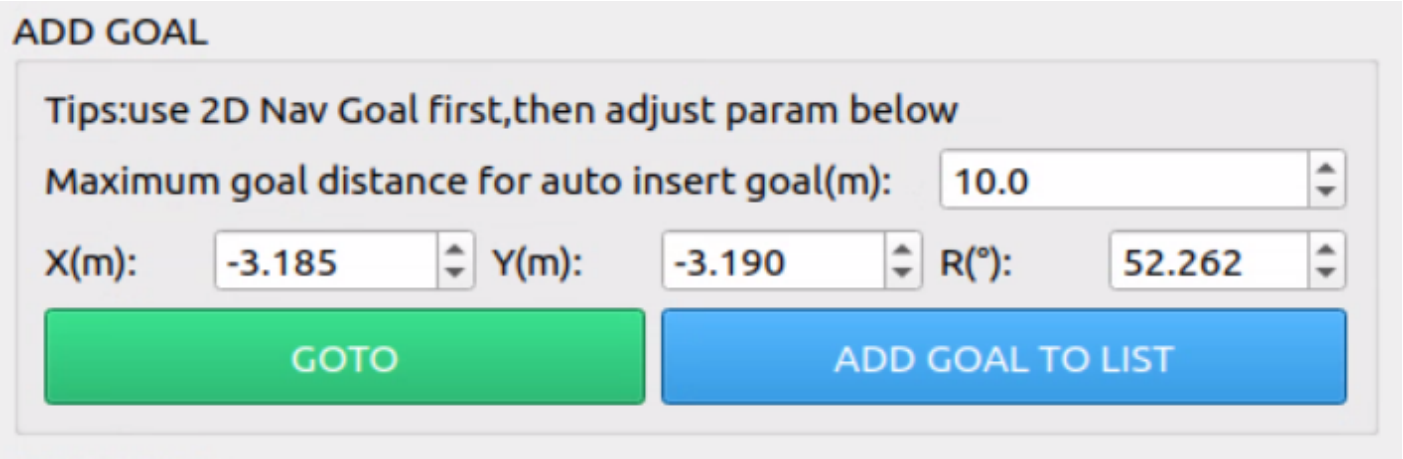


To set the size of the markers for target points, you can adjust the marker scale factor (1.0 is the default value). Remember to click "*SET*" to refresh all the markers.



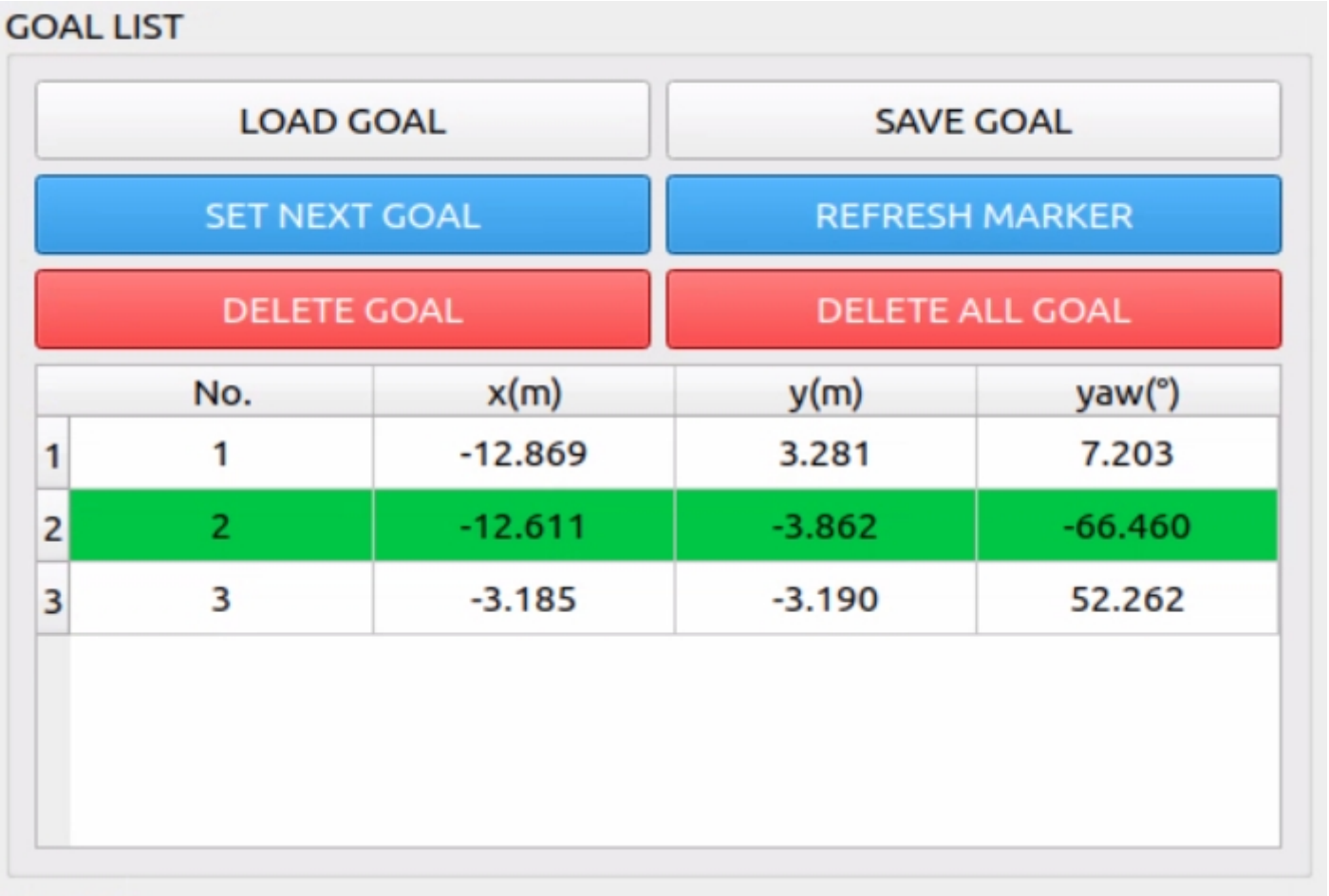
The marker consists of two parts: the numerical part represents the sequence number of the target point, an d the arrow part indicates the stopping direction of the target point.

Add Goal



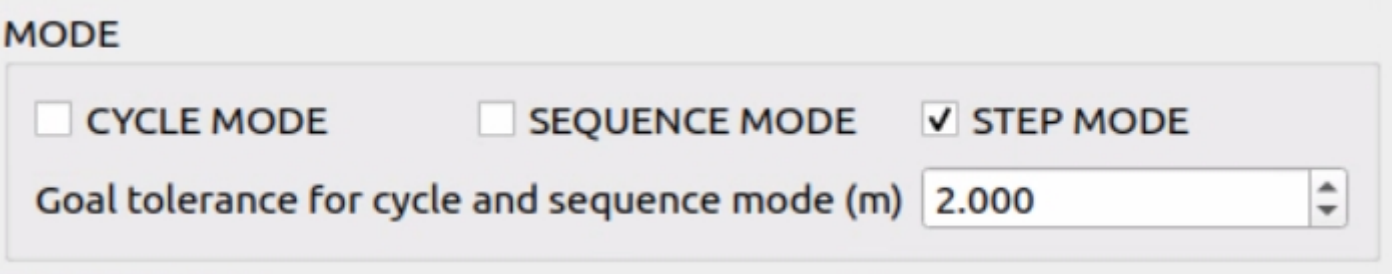
1. Please use the built-in functionality of Rviz (2D Nav Goal) to select the goal point on the map.
2. You can fine-tune the coordinate position by entering the X, Y, and R values.
3. If you need to go directly to the goal point, click on the *GOTO* button.
4. If you need to add a goal to the goal list, click on the *ADD GOAL TO LIST* button.
5. If the current goal and the previous goal on the goal list are too far, an intermediate goal point will be automatically inserted in the list. The maximum allowable deviation distance can be modified in the interface shown above, with the default being 10 meters.

Goal List Management



- The added goal points will be displayed in this list, and the parameters in the list can be directly edited. After editing, click the "REFRESH MARKER" button to update all markers.
- The green rows in the list represent the next goal to be executed. To switch to the next goal, select the corresponding row in the list and click the "SET NEXT GOAL" button.
- The "LOAD GOAL" and "SAVE GOAL" buttons are used to save and load the list. The list will be saved in ini/memory.txt and can be directly modified in the document.
- To delete a single goal, select the corresponding row and click the "DELETE GOAL" button.
- To clear the list of goals, click the "DELETE ALL GOAL" button.

Mode Setting

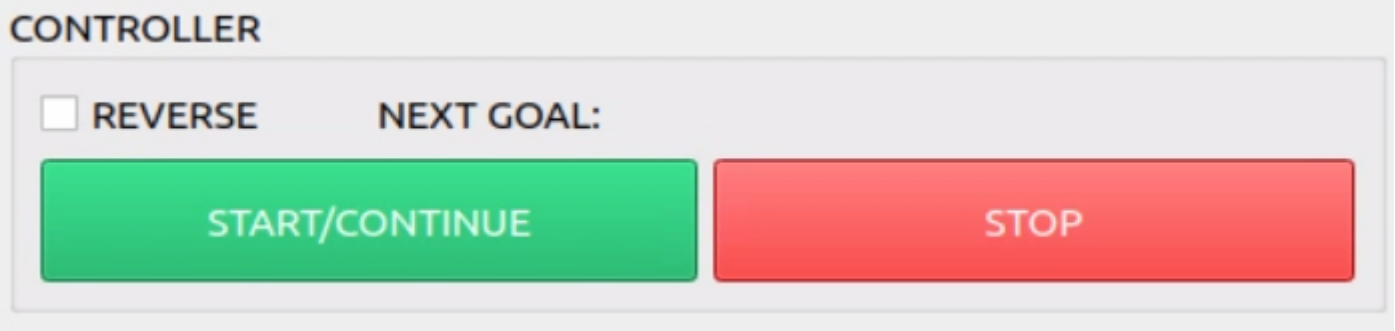


This is used to set execution mode for goal points in the list.

cycle mode	After executing the last goal point, the system will continue to execute the first goal point.
sequence mode	After executing all goal points in the list, the system will stop.
step mode	Goals will be executed one by one in the listed order.

To smooth the path, you can adjust the Goal Tolerance setting. Once the robot enters the radius of this distance from the target point, it will automatically move to the next target point. The smaller the environment, the smaller this value needs to be. This setting does not affect the arrival at the final destination point.

Start Control



- By default, the list executes the target points from top to bottom. If *REVERSE* is selected, the target points are executed in reverse order.
- Due to system issues, multiple clicks may be required when using the *START* and *STOP* buttons. This control button only affects the goal points in the list. After starting, information about the next goal point will be displayed in the *NEXT GOAL*.