

Weston Robot

Basic Training LIMO

Confidential

www.WestonRobot.com



Agenda

01

Main Components

02

Basic Operations

03

Development

Main Components

What's in the box



LIMO



Mecanum Wheels



Rubber Track



Screw Box



Charger



Box Key

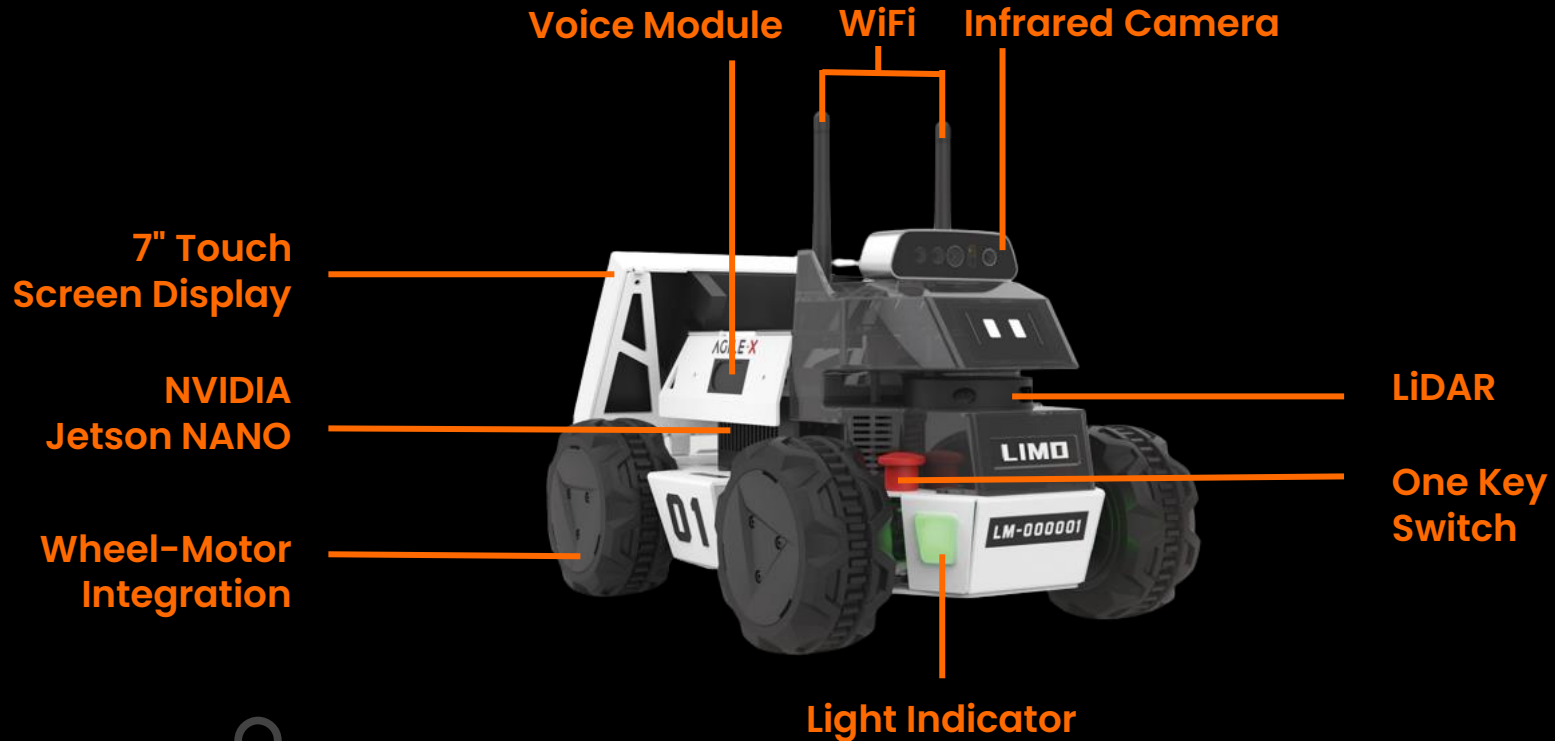


Allen Driver



Quick Start Guide

LIMO



Basic Operations

Types of Mode



Ackermann Mode

A geometry designed to solve the problem of wheels on the inside and outside of a turn needing to trace out circles of different radii in the steering of vehicles.



Track Mode

It has good off-road performance and can climb 40° slopes and small steps

Types of Mode



Mecanum Wheel Mode

The omni-directional motion equipment based on Mecanum wheel technology can realize forward, lateral, oblique, rotation and combinations of motion modes.



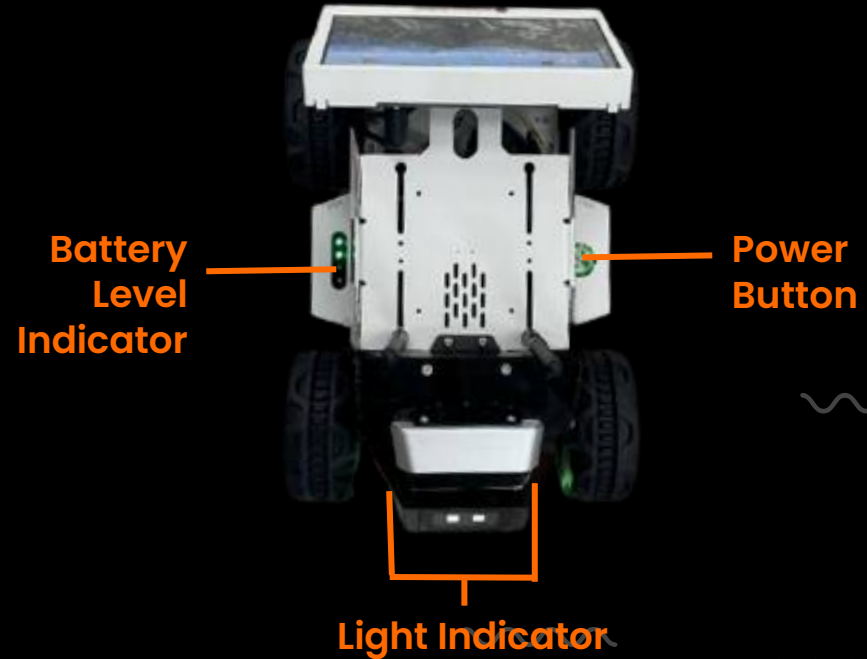
Four-Wheel Differential Mode

Four-wheel drive, which can realize on the spot auto-rotation, but it will cause serious tire wear; please do not auto-rotate on the spot for a long time.

Switching On the Robot

- How to
 - Do a long press on the power button
- Light Indicator

Color	Status
Red flashing	Low battery/master control alarm
Red	Software shut down
Green	Ackermann mode
Yellow	Four-wheel differential/track mode
Blue	Mecanum wheel mode



Download AgileX App

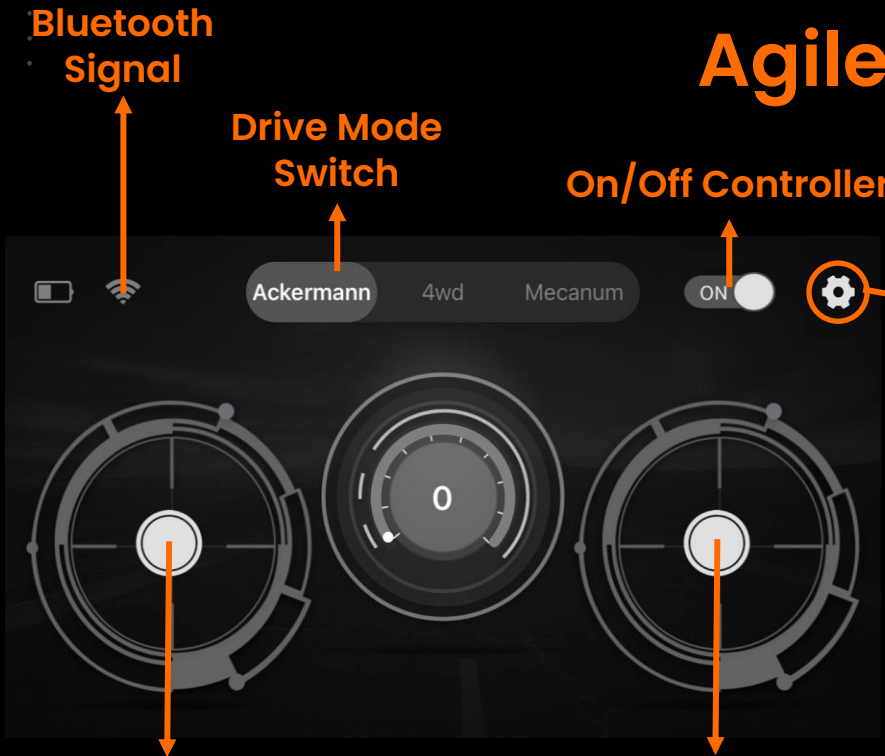


iOS



Android

AgileX App



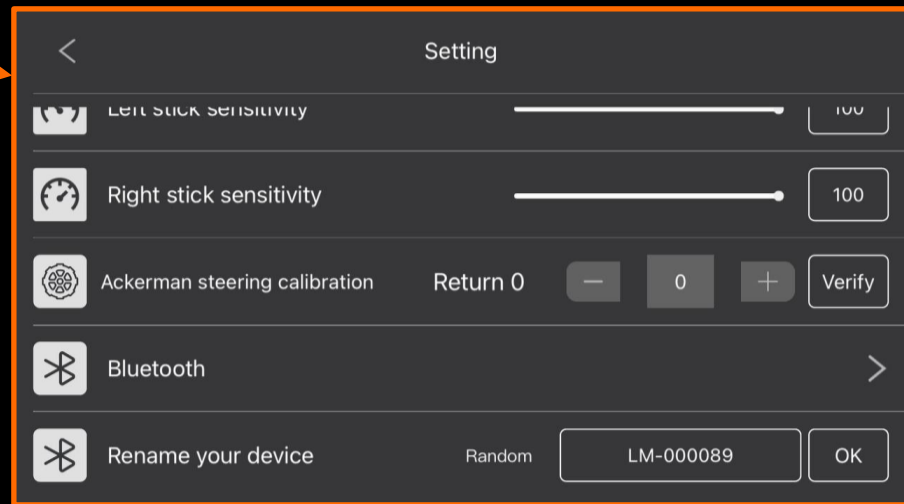
On/Off Controller

Drive Mode Switch

Bluetooth Signal

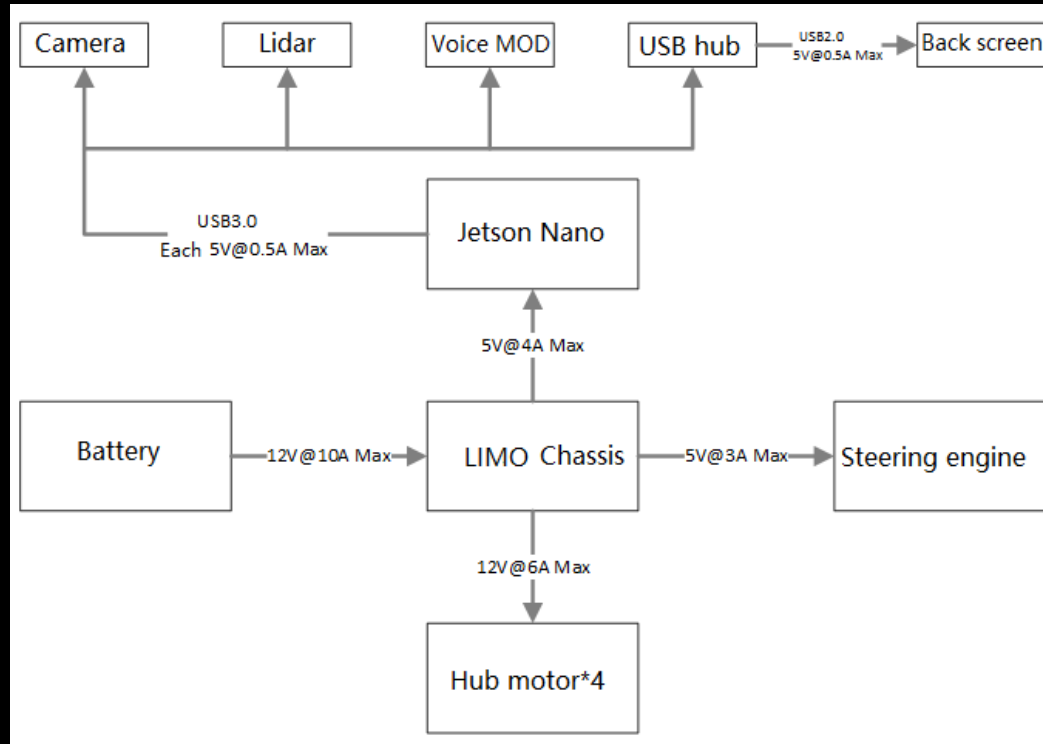
Motion Control

Direction Control

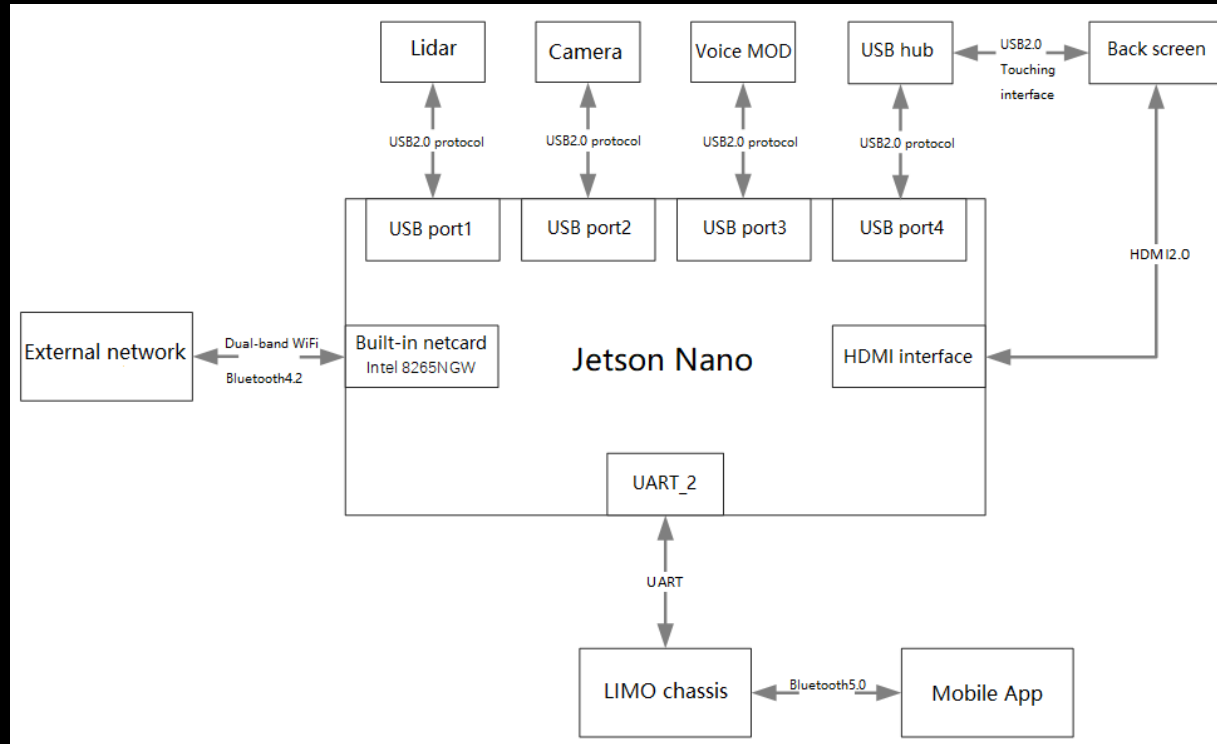


Development

Power Supply Topology

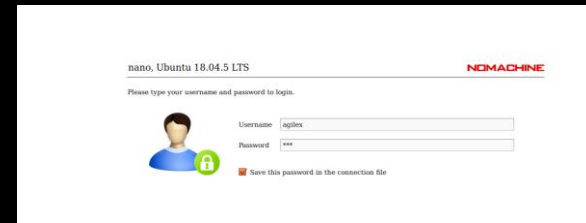
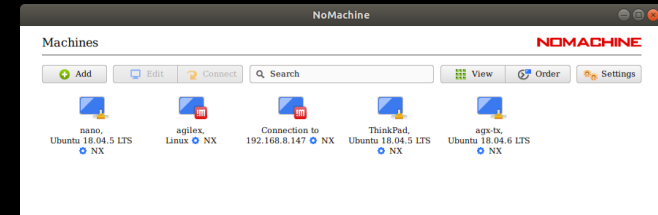
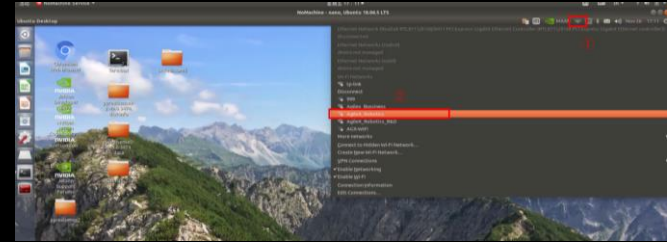


Communication Topology



Remote Desktop Connection

- Download and install NoMachine
 - <https://www.nomachine.com/download>
- Connect to same Wi-Fi on LIMO and Computer
- Start connection
 - Select limo
 - Username: agilex
 - Password: agx



Use of LiDAR (RVIZ)

Commands

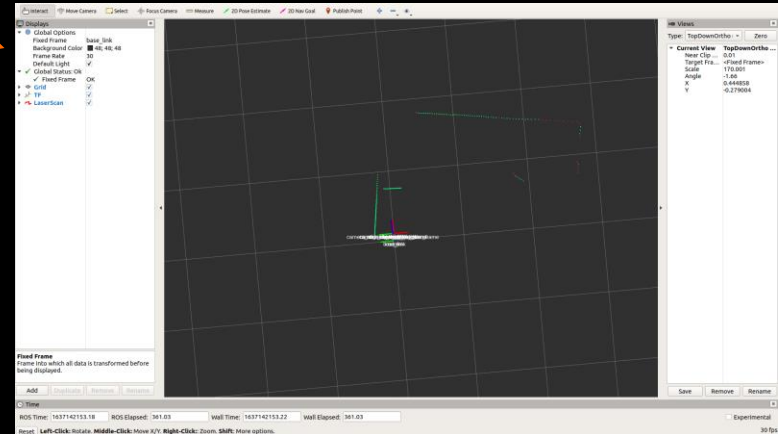
- roslaunch limo_bringup limo_start.launch
pub_odom_tf:=false
- roslaunch limo_bringup lidar_rviz.launch

```

/home/agilex/agilex_ws/src/limo_ros/limo_bringup/launch/limo_start.launch http://localhost:
ROS_MASTER_URI=http://localhost:11311

setting /run_id to 468174c6-46a5-11e1-b281-845cf327eb42
process[rosout-1]: started with pid [12192]
started core service [/rosout]
process[limo_base_node-2]: started with pid [12203]
process[ydlidar_node-3]: started with pid [12210]
process[base_link_to_camera_link-4]: started with pid [12223]

.....
YDLIDAR
.....
process[base_link_to_lmu_link-5]: started with pid [12233]
process[base_link_to_laser_link-6]: started with pid [12245]
[ INFO ] [1637043623.775278668]: open the serial port: /dev/ttyTHS1
[ INFO ] [1637043623.812383353]: [YDLIDAR INFO] Now YDLIDAR ROS SDK VERSION: 1.4.6
.....
YDLidar SDK initializing
YDLidar SDK has been initialized
[YDLIDAR]:SDK Verston: 1.4.7
LIDAR successfully connected
[YDLIDAR]:lidar running correctly ! The health status: good
LIDAR init success!
[YDLIDAR]:Fixed Size: 440
[YDLIDAR]:Sample Rate: 4K
[YDLIDAR INFO] Current Sampling Rate : 4K
[YDLIDAR INFO] Now YDLIDAR is scanning .....
  
```



LiDAR Mapping (GMapping)

Commands

- roslaunch limo_bringup limo_start.launch
pub_odom_tf:=false

```

/home/agilex/agilex_ws/src/limo_ros/limo_bringup/launch/limo_start.launch http://localh
ROS_MASTER_URI=http://localhost:11311

setting /run_id to 468174c6-46a5-11ec-b281-845cf327eb42
process[rosout-1]: started with pid [12192]
started core service [/rosout]
process[limo_base_node-2]: started with pid [12203]
process[ydlidar_node-3]: started with pid [12210]
process[base_link_to_camera_link-4]: started with pid [12223]

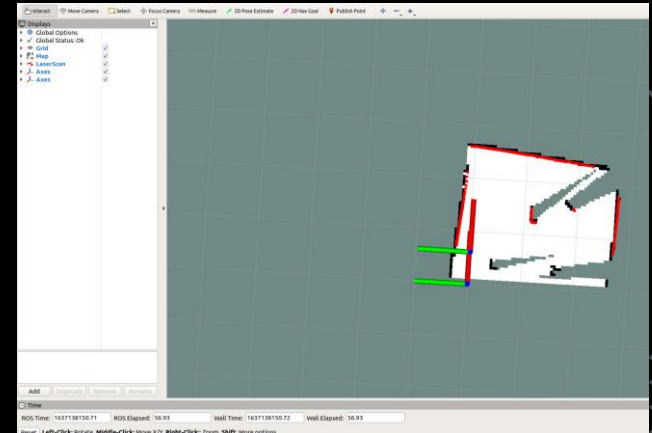
YDLIDAR

process[base_link_to_lm_link-5]: started with pid [12233]
process[base_link_to_laser_link-6]: started with pid [12245]
[ INFO] [1637043623.775278668]: open the serial port: /dev/ttyTHS1
[ INFO] [1637043623.812383353]: [YDLIDAR INFO] Now YDLIDAR ROS SDK VERSION:1.4.6
.....
YDLIDAR SDK initializing
YDLIDAR SDK has been initialized
[YDLIDAR]:SDK Verion: 1.4.7
LIDAR successfully connected
[YDLIDAR]:lidar running correctly ! The health status: good
LIDAR Init success!
[YDLIDAR]:Fixed Size: 440
[YDLIDAR]:Sample Rate: 4K
[YDLIDAR INFO] Current Sampling Rate : 4K
[YDLIDAR INFO] Now YDLIDAR is scanning .....
```

- roslaunch limo_bringup limo_gmapping.launch

Save Map

- cd
~/agilex_ws/src/limo_ros/limo_bringup/maps/
- roslaunch map_server map_saver -f map1



LiDAR Mapping (Cartographer)

Commands

- `roslaunch limo_bringup limo_start.launch pub_odom_tf:=false`
- `roslaunch limo_bringup limo_cartographer.launch`

Save Map

- `rosservice call /finish_trajectory 0`
- `rosservice call /write_state "{filename: '${HOME}/agilex_ws/src/limo_ros/limo_bringup/maps/mymap.pbstream'"}`
- `roslaunch cartographer_ros cartographer_pbstream_to_ros_map -map_filestem=${HOME}/agilex_ws/src/limo_ros/limo_bringup/maps/mymap.pbstream -pbstream_filename=${HOME}/agilex_ws/src/limo_ros/limo_bringup/maps/mymap.pbstream -resolution=0.05`

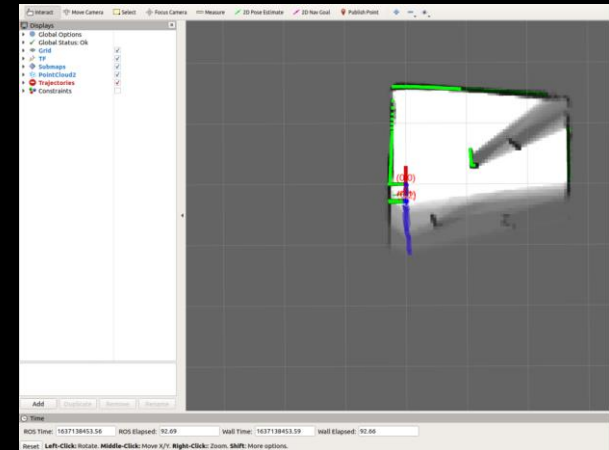
```

/home/agilex/agilex_ws/src/limo_ros/limo_bringup/launch/limo_start.launch http://localhost:11311
ROS_MASTER_URI=http://localhost:11311

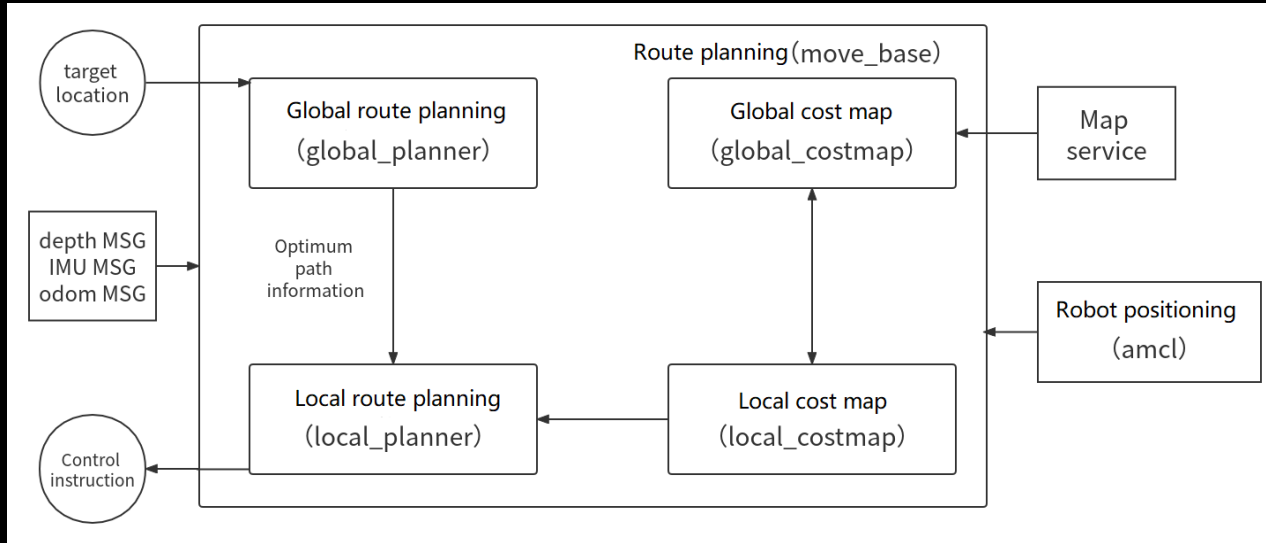
setting /run_id to 468174c6-46a5-11ec-b281-845cf327eb42
process[rosout-1]: started with pid [12192]
started core service [/rosout]
process[limo_base_node-2]: started with pid [12203]
process[ydlidar_node-3]: started with pid [12210]
process[base_link_to_camera_link-4]: started with pid [12223]

YDLIDAR

process[base_link_to_lmw_link-5]: started with pid [12233]
process[base_link_to_laser_link-6]: started with pid [12245]
[ INFO] [1637043623.775278668]: open the serial port: /dev/ttyTHS1
[ INFO] [1637043623.812383353]: [YDLIDAR INFO] Now YDLIDAR ROS SDK VERSION:1.4.6
.....
YDLIDAR SDK initializing
YDLIDAR SDK has been initialized
[YDLIDAR]:SDK Verston: 1.4.7
LIDAR successfully connected
[YDLIDAR]:lidar running correctly ! The health status: good
LIDAR init success!
[YDLIDAR]:Fixed Size: 440
[YDLIDAR]:Sample Rate: 4K
[YDLIDAR INFO] Current Sampling Rate : 4K
[YDLIDAR INFO] Now YDLIDAR is scanning .....
  
```

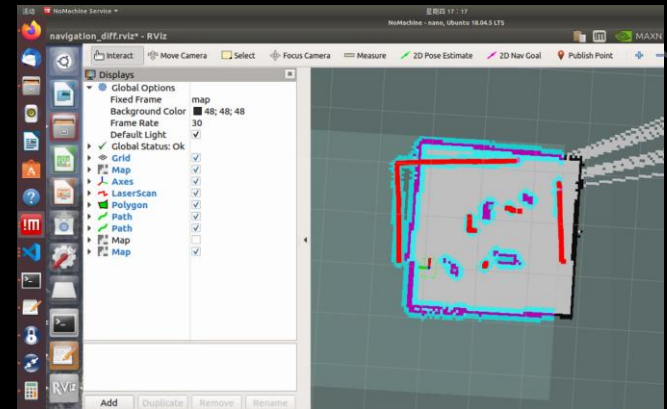


Navigation Framework



Navigation

- Bringup LIMO
 - roslaunch limo_bringup limo_start.launch pub_odom_tf:=false
- Launch Differential Mode Navigation
 - roslaunch limo_bringup limo_navigation_diff.launch
- Launch Ackermann Mode Navigation
 - roslaunch limo_bringup limo_navigation_ackerman.launch



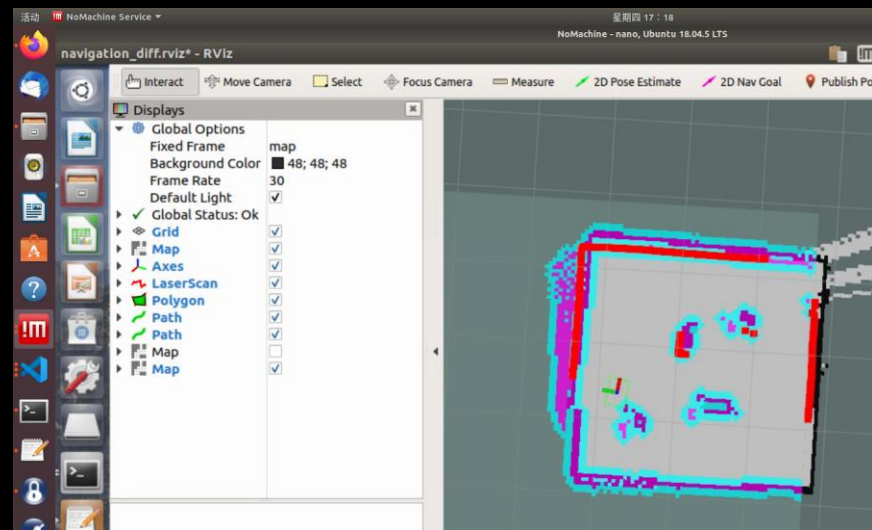
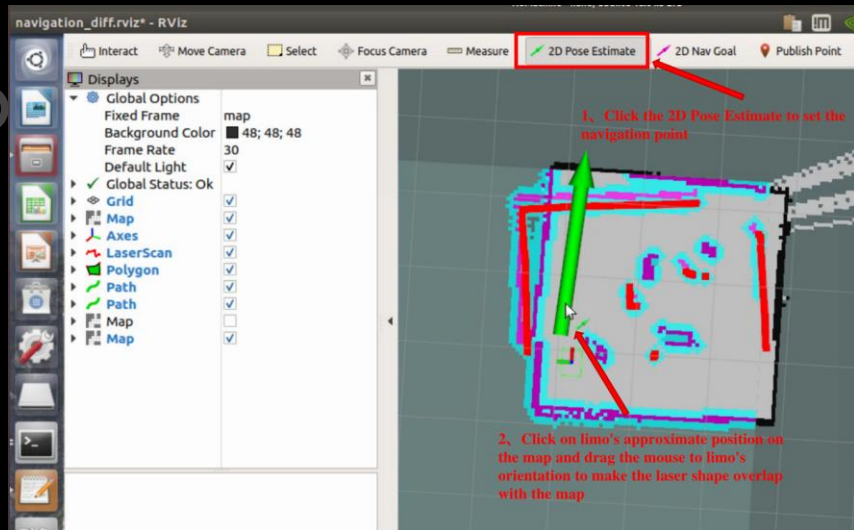
Navigation Map

- Please modify map02 to the name of the map that needs to be replaced

```
Open ▾ limo_navigation_diff.launch
~/agilex_ws/src/limo_ros/limo_bringup/launch
1 <?xml version="1.0"?>
2 <launch>
3   <!-- use robot pose ekf to provide odometry -->
4   <node pkg="robot_pose_ekf" name="robot_pose_ekf" type="robot_pose_ekf">
5     <param name="output_frame" value="odom" />
6     <param name="base_footprint_frame" value="camera_link" />
7     <remap from="imu_data" to="imu" />
8   </node>
9
10  <node pkg="amcl" type="amcl" name="amcl" output="screen">
11    <roscppparam file="$(find limo_bringup)/param/amcl_params_diff.yaml" command="load" />
12  <!--
13  <roscppparam file="$(find limo_bringup)/param/amcl_params_omni.yaml" command="load" />-->
14    <param name="initial_pose_x" value="0" />
15    <param name="initial_pose_y" value="0" />
16    <param name="initial_pose_a" value="0" />
17  </node>
18
19  <!-- ***** map server ***** -->
20  <node pkg="map_server" type="map_server" name="map_server" args="$(find limo_bringup)/maps/map02.yaml" output="screen" >
21    <param name="frame_id" value="map"/>
22  </node>
23  <!-- ***** Navigation ***** -->
24  <node pkg="move_base" type="move_base" respawn="false" name="move_base" output="screen">
25    <roscppparam file="$(find limo_bringup)/param/diff/costmap_common_params.yaml" command="load" ns="global_costmap" />
26    <roscppparam file="$(find limo_bringup)/param/diff/costmap_common_params.yaml" command="load" ns="local_costmap" />
27    <roscppparam file="$(find limo_bringup)/param/diff/local_costmap_params.yaml" command="load" />
28    <roscppparam file="$(find limo_bringup)/param/diff/global_costmap_params.yaml" command="load" />
29    <roscppparam file="$(find limo_bringup)/param/diff/planner.yaml" command="load" />
30
31    <param name="base_global_planner" value="global_planner/GlobalPlanner" />
32    <param name="planner_frequency" value="1.0" />
33    <param name="planner_patience" value="5.0" />
34    <param name="base_local_planner" value="base_local_planner/TrajectoryPlannerROS" />
35    <param name="controller_frequency" value="5.0" />
36    <param name="controller_patience" value="15.0" />
37    <param name="clearing_rotation_allowed" value="true" />
38  </node>
39
40  <!-- ***** Visualisation ***** -->
41  <node name="rviz" pkg="rviz" type="rviz" args="-d $(find limo_bringup)/rviz/navigation_diff.rviz" />
42 </launch>
```

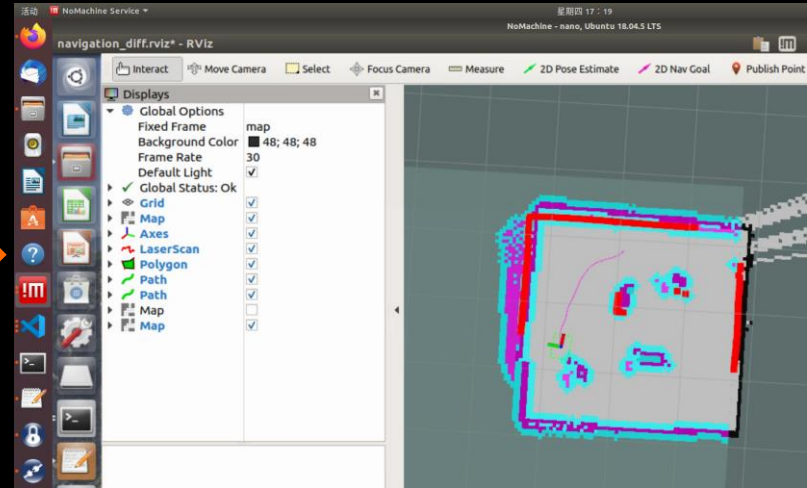
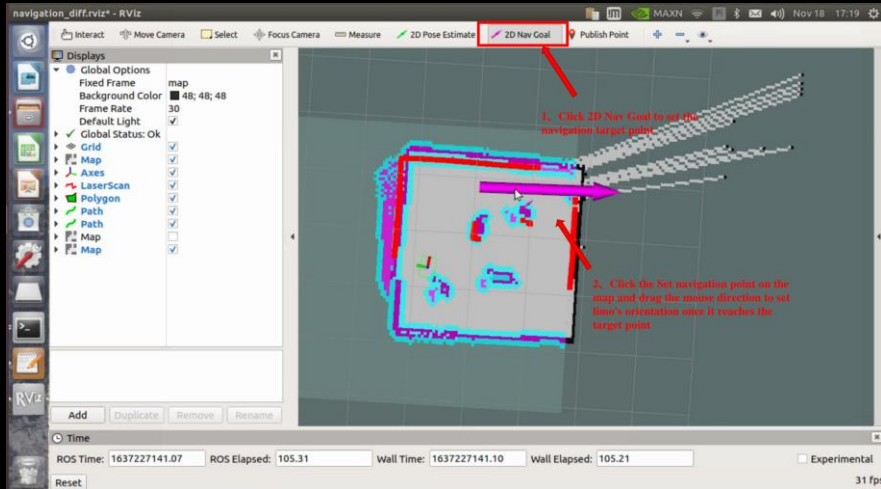
Correct Position in RVIZ

- Correct the actual position of the chassis in the scene on the map displayed in rviz



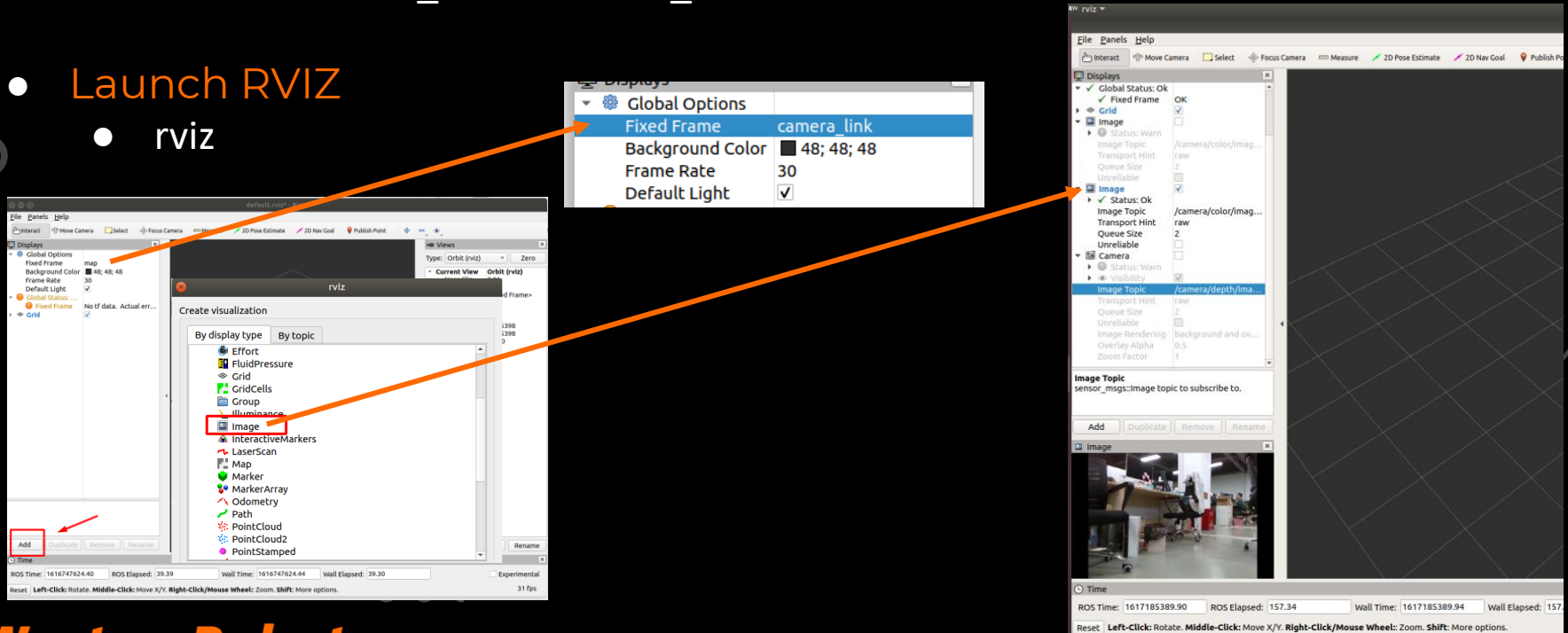
Set Navigation Goal

- Set the navigation goal point through 2D Nav Goal.



Vision Module

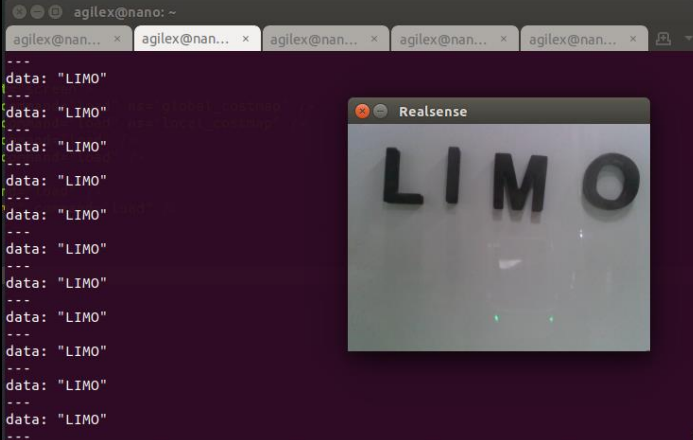
- Launch Camera
 - roslaunch astra_camera dabai_u3.launch
- Launch RVIZ
 - rviz



Text Recognition

Note: Before running the command, please make sure that the programs in other terminals have been terminated. The termination command is: Ctrl+c.

- Run roscore
 - roscore
- Start text recognition function
 - rosruntime vision detect_node.py
- Execute rostopic echo /detect_word_result to view the recognized results
 - rostopic echo /detect_word_result



The screenshot shows a terminal window with the following output:

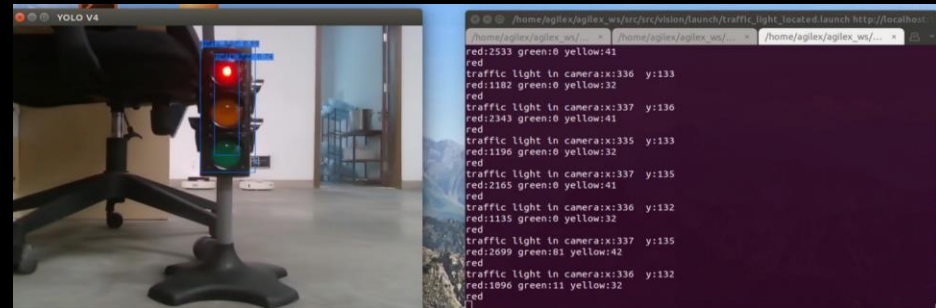
```
---  
data: "LIMO"  
---  
data: "LIMO"  
---  
data: "LIMO"  
---  
data: "LIMO"  
---  
data: "LIMO"  
---  
data: "LIMO"  
---  
data: "LIMO"  
---  
data: "LIMO"  
---  
data: "LIMO"  
---  
data: "LIMO"  
---  
data: "LIMO"  
---
```

Overlaid on the terminal is a Realsense camera window showing the word "LIMO" on a white surface.

Identify Traffic Lights

Note: Before running the command, please make sure that the programs in other terminals have been terminated. The termination command is: Ctrl+c.

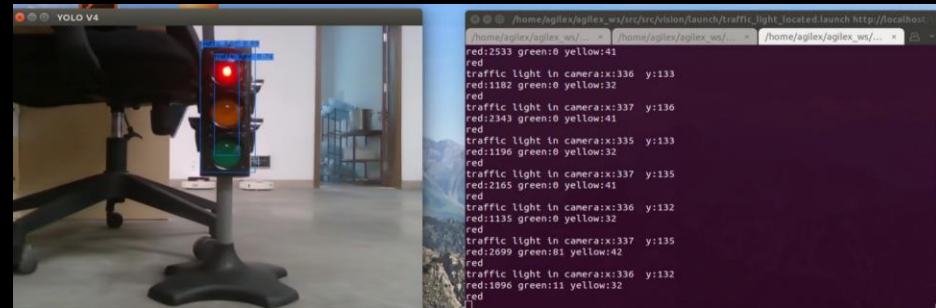
- Run camera
 - roslaunch astra_camera dabai_u3.launch
- Launch yolo_v3
 - roslaunch darknet_ros yolo_v3_tiny.launch
- Launch traffic light recognition function
 - roslaunch vision traffic_light_located.launch



Identify Traffic Lights

Note: Before running the command, please make sure that the programs in other terminals have been terminated. The termination command is: Ctrl+c.

- Run camera
 - roslaunch astra_camera dabai_u3.launch
- Launch yolo_v3
 - roslaunch darknet_ros yolo_v3_tiny.launch
- Launch traffic light recognition function
 - roslaunch vision traffic_light_located.launch



Voice Module

Note: Before running the command, please make sure that the programs in other terminals have been terminated. The termination command is: Ctrl+c.

- Enter the following command in the terminal. When “recording” appears in the terminal, start to record the voice. After 3 seconds, the recording is complete, and “Done” will appear on the terminal

- `roslaunch voice_demo_record_voice.py`

- After the voice is recorded, enter the command in the terminal:

- `roslaunch voice_demo_voice2word.py output.wav`

```
agilex@nano:~$ roslaunch voice_demo_voice2word.py output.wav
hello
agilex@nano:~$
```

```
agilex@nano: ~
ALSA lib conf.c:5007:(snd_config_expand) Evaluate error: No such file or directory
ALSA lib pcm.c:2495:(snd_pcm_open_noupdate) Unknown PCM spdif
ALSA lib conf.c:1281:(snd_func_refer) Unable to find definition 'cards.tegra-hda-pcm.iec958.0:CARD=0,AES6=4,AES1=130,AES2=0,AES3=2'
ALSA lib conf.c:4528:(_snd_config_evaluate) Function snd_func_refer returned error: No such file or directory
ALSA lib conf.c:5007:(snd_config_expand) Evaluate error: No such file or directory
ALSA lib pcm.c:2495:(snd_pcm_open_noupdate) Unknown PCM spdif
ALSA lib pcm.c:2495:(snd_pcm_open_noupdate) Unknown PCM cards.pcm.modem
ALSA lib pcm.c:2495:(snd_pcm_open_noupdate) Unknown PCM cards.pcm.modem
ALSA lib pcm.c:2495:(snd_pcm_open_noupdate) Unknown PCM cards.pcm.phoneline
ALSA lib pcm.c:2495:(snd_pcm_open_noupdate) Unknown PCM cards.pcm.phoneline
ALSA lib pcm_dmix.c:990:(snd_pcm_dmix_open) The dmix plugin supports only playback stream
ALSA lib pcm_dmix.c:1052:(snd_pcm_dmix_open) unable to open slave
ALSA lib pcm_params.c:2162:(snd1_pcm_hw_refine_slave) Slave PCM not usable
ALSA lib pcm_params.c:2162:(snd1_pcm_hw_refine_slave) Slave PCM not usable
ALSA lib pcm_params.c:2162:(snd1_pcm_hw_refine_slave) Slave PCM not usable
ALSA lib pcm_params.c:2162:(snd1_pcm_hw_refine_slave) Slave PCM not usable
ALSA lib pcm_dmix.c:1052:(snd_pcm_dmix_open) unable to open slave
recording...
done
```

Voice Module

Note: Before running the command, please make sure that the programs in other terminals have been terminated. The termination command is: Ctrl+c.

- Enter the following command in the terminal. When “recording” appears in the terminal, start to record the voice. After 3 seconds, the recording is complete, and “Done” will appear on the terminal

- `roslaunch voice_demo_record_voice.py`

- After the voice is recorded, enter the command in the terminal:

- `roslaunch voice_demo_voice2word.py output.wav`

```
agilex@nano:~$ roslaunch voice_demo_voice2word.py output.wav
hello
agilex@nano:~$
```

```
agilex@nano: ~
ALSA lib conf.c:5007:(snd_config_expand) Evaluate error: No such file or directory
ALSA lib pcm.c:2495:(snd_pcm_open_noupdate) Unknown PCM spdif
ALSA lib conf.c:1281:(snd_func_refer) Unable to find definition 'cards.tegra-hda-pcm.iec958.0:CARD=0,AES6=4,AES1=130,AES2=0,AES3=2'
ALSA lib conf.c:4528:(snd_config_evaluate) Function snd_func_refer returned error: No such file or directory
ALSA lib conf.c:5007:(snd_config_expand) Evaluate error: No such file or directory
ALSA lib pcm.c:2495:(snd_pcm_open_noupdate) Unknown PCM spdif
ALSA lib pcm.c:2495:(snd_pcm_open_noupdate) Unknown PCM cards.pcm.modem
ALSA lib pcm.c:2495:(snd_pcm_open_noupdate) Unknown PCM cards.pcm.modem
ALSA lib pcm.c:2495:(snd_pcm_open_noupdate) Unknown PCM cards.pcm.phoneline
ALSA lib pcm.c:2495:(snd_pcm_open_noupdate) Unknown PCM cards.pcm.phoneline
ALSA lib pcm_dmix.c:990:(snd_pcm_dmix_open) The dmix plugin supports only playback stream
ALSA lib pcm_dmix.c:1052:(snd_pcm_dmix_open) unable to open slave
ALSA lib pcm_params.c:2162:(snd1_pcm_hw_refine_slave) Slave PCM not usable
ALSA lib pcm_params.c:2162:(snd1_pcm_hw_refine_slave) Slave PCM not usable
ALSA lib pcm_params.c:2162:(snd1_pcm_hw_refine_slave) Slave PCM not usable
ALSA lib pcm_params.c:2162:(snd1_pcm_hw_refine_slave) Slave PCM not usable
ALSA lib pcm_dmix.c:1052:(snd_pcm_dmix_open) unable to open slave
recording...
done
```

- LIMO User Manual

[https://github.com/agilexrobotics/limo-doc/blob/master/Limo%20user%20manual\(EN\).md](https://github.com/agilexrobotics/limo-doc/blob/master/Limo%20user%20manual(EN).md)

- LIMO Quick Start Guide

<https://github.com/agilexrobotics/limo-doc/blob/master/Limo%20Quick%20Start%20Guide%20%EF%BC%88APP%20%26%20Operations%EF%BC%89.pdf>

NoMachine Download

<https://www.nomachine.com/download>