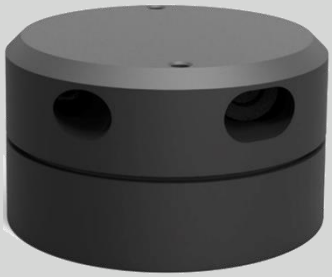
YDLIDAR G4

USER MANUAL



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YDLIDAR G4 DEVELOPMENT KIT

The development kit of YDLIDAR G4 (hereafter abbreviated as G4) is an accessory tool provided to facilitate the performance evaluation and early rapid development of the G4. Through the G4 development kit, and with the matching evaluation software, you can observe point cloud data scanned by G4 on your environment or development on the SDK.

Development kit

The G4 development kit has the following components:

G4 Lidar

USB Type-C Cable

USB board

FIG 1 YDLIDAR G4 DEVELOPMENT KIT

CHART 1 YDLIDAR G4 DEVELOPMENT KIT DESCRIPTION

Item	Qty	Description
G4 Lidar	1	Standard version of the G4 Lidar. The G4 has an integrated motor drive for motor control.
USB Type-C cable	1	Use with USB adapter board to connect G4 and PC. USB cable is both a power supply cable and a data cable.
USB adapter board	1	This component can realize USB to UART function, facilitating G4, PC fast interconnection. At the same time, support serial port DTR signal to G4 motor stop control. A USB Type-C Power Interface (PWR) for auxiliary power supply is also provided.

Note: USB adapter board has two USB Type-C interfaces: USB_DATA, USB_PWR.

USB_DATA: Data-powered multiplex interface. In most cases, this interface can be used to meet power and communication requirements.

USB_PWR: Auxiliary power supply interface. The USB interface of some development platforms has weak current drive capability. At this time, auxiliary power supply can be used.

USAGE UNDER WINDOWS

Device connection

When G4 is evaluated and developed under windows, G4 and PC need to be interconnected. The specific process is as follows:

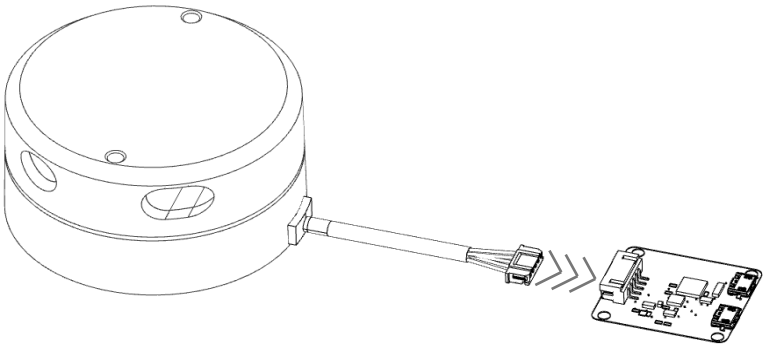

FIG 2 YDLIDAR G4DEVICE CONNECTION STEP 1

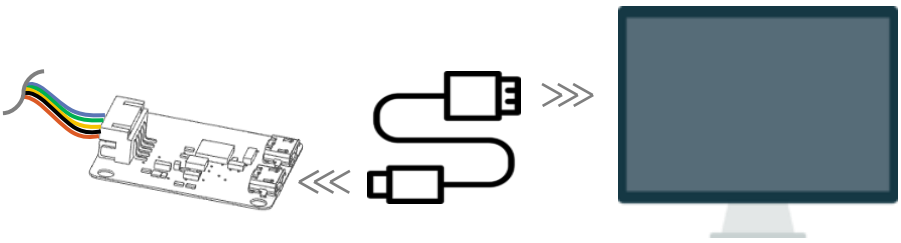

FIG 3 YDLIDAR G4DEVICE CONNECTION STEP 2

Connect the adapter board and G4 first, and then connect the USB cable to the USB port of the adapter board and the PC. Note that the Type-C interface of the USB cable is connected to the USB_DATA of the USB interface board, and the idle mode is used after G4 is powered on. The motor does not rotate.

Part of the development platform or PC USB interface drive current is weak, G4 need to access the +5 V auxiliary power supply, otherwise the lidar will work abnormal.

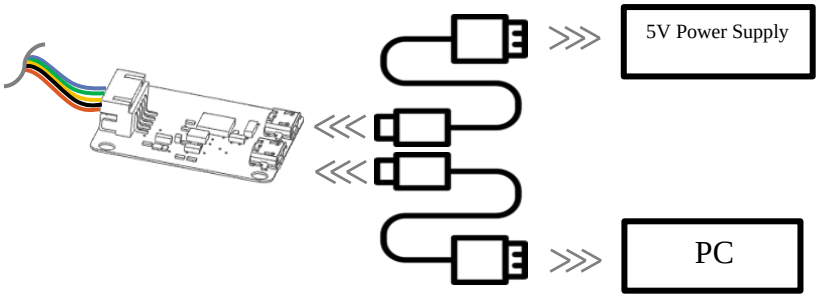

FIG 4 YDLIDAR G4 AUXILIARY POWER SUPPLY

Driver Installation

To evaluate and develop the G4 under Windows, you need to install the serial port driver of the USB adapter board. The USB adapter board of this kit adopts CP2102 chip to realize serial port (UART)

to USB signal conversion. Its driver can be downloaded from our official website or downloaded from the official website of Silicon Labs.

http://ydlidar.com/

http://cn.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers

After decompressing the driver package, run the CP2102's Windows driver installation file (exe file under CP210x_VCP_Windows). Please select the 32-bit version (x86) or 64-bit version (x64) installation program according to the version of the windows operating system.

FIG 5 YDLIDAR G4 DRIVER VERSION SELECTION

Double-click the exe file and follow the prompts to install it.

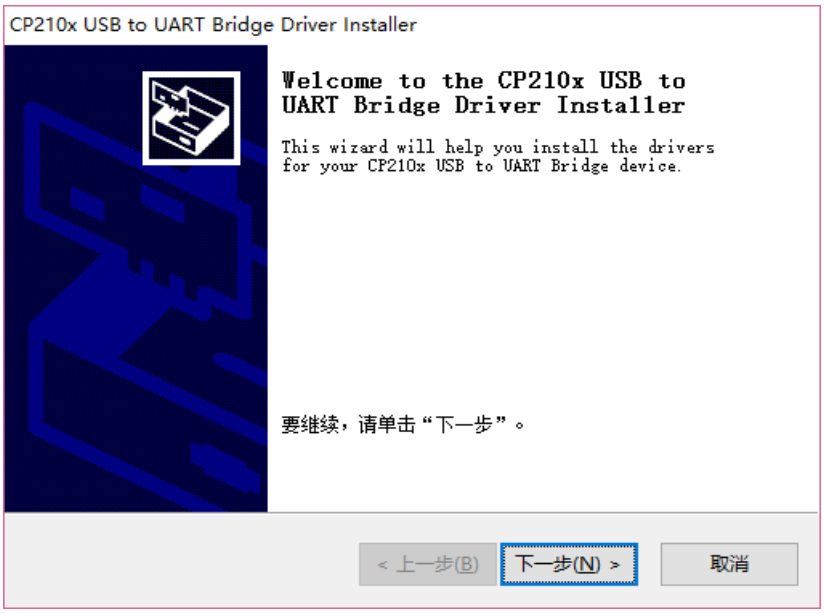

FIG 6 YDLIDAR G4 DRIVER IS INSTALLING

After the installation is complete, you can right-click on My Computer and select Properties. On the Open System screen, select Device Manager from the left menu to access the Device Manager. Expand [Port] to see the serial port name corresponding to the identified USB adapter, that is, the

driver installation is successful. The following figure shows COM3. (Note that the port must be checked in case of G4 and PC interconnection).

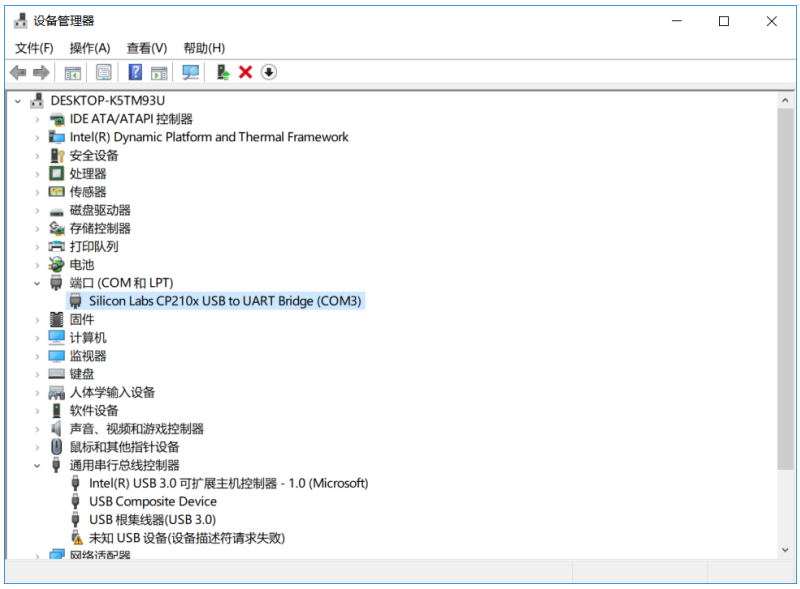

FIG 7 YDLIDAR G4 DRIVE INSTALLATION CHECK

Evaluation software usage

YDLIDAR provides Point Cloud Viewer, a point cloud data visualization software for G4 real-time scanning. Users can intuitively observe the G4 scanning effect chart. GDL real-time point cloud data and real-time scanning frequency are provided on YDLIDAR. At the same time, the version information of G4 can be read, and the scan data can be saved offline to an external file for further analysis.

Before using the YDLIDAR software, make sure that the G4 USB adapter board serial port driver is installed successfully, and interconnect the G4 with the USB port of the PC. Run the evaluation software: PointCloudViewer.exe, select the corresponding serial port number and model number.

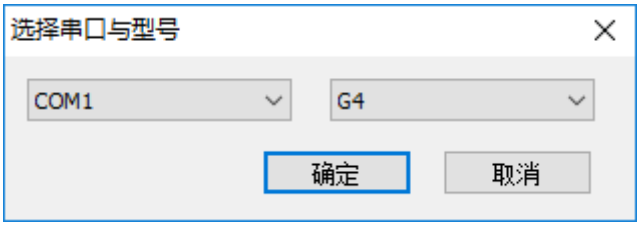

FIG 8 YDLIDAR G4 EVALUATION SOFTWARE

If the connection is correct, you will see the following screen：

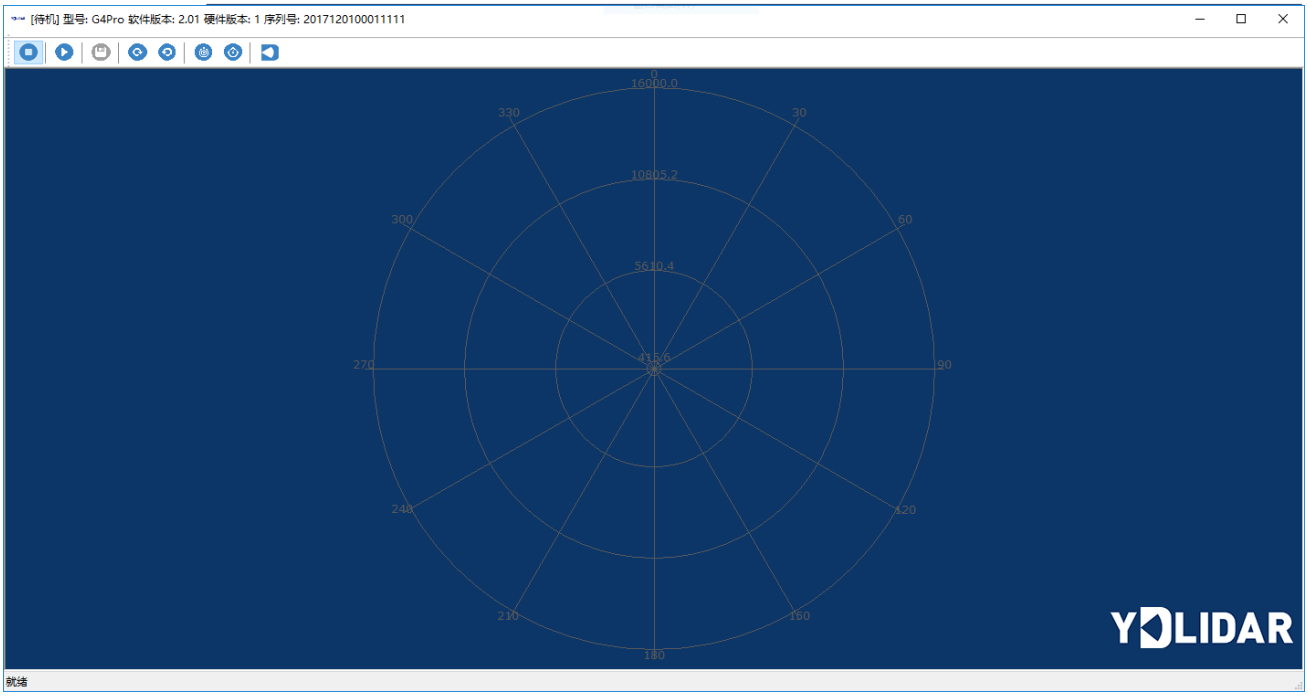

FIG 9 POINTCLOUD VIEWEREVALUATION SOFTWARE STARTUP INTERFACE

The title bar shows the software/hardware version and serial number information for this lidar.

Menu bar: Available when the icon is blue and unavailable when it is gray, where:

：Stop scanning: lidar will switch to idle mode, in this mode, the lidar stalls, in standby mode;

：Start scanning: Lidar will switch to scanning mode. After starting scanning, point cloud data can be observed on the software interface;

：Save the scan data acquired by G4 to a file for easy viewing and analysis;

：Set the G4 rotation clockwise. This control must be used when the lidar is in idle mode;

：Set the G4 rotation counterclockwise. This control must be used when the lidar is in idle mode;

：Increase the scanning frequency of G4. This control must be used when the lidar is in idle mode;

：To reduce the G4 scanning frequency. The control must be used when the radar is in idle mode;

：Ranging frequency switching: Can be switched to 4K, 8K, 9K ranging frequency. This control must be used when the lidar is in idle mode.

Click - start scanning, point cloud data can be observed in the software interface as shown below:

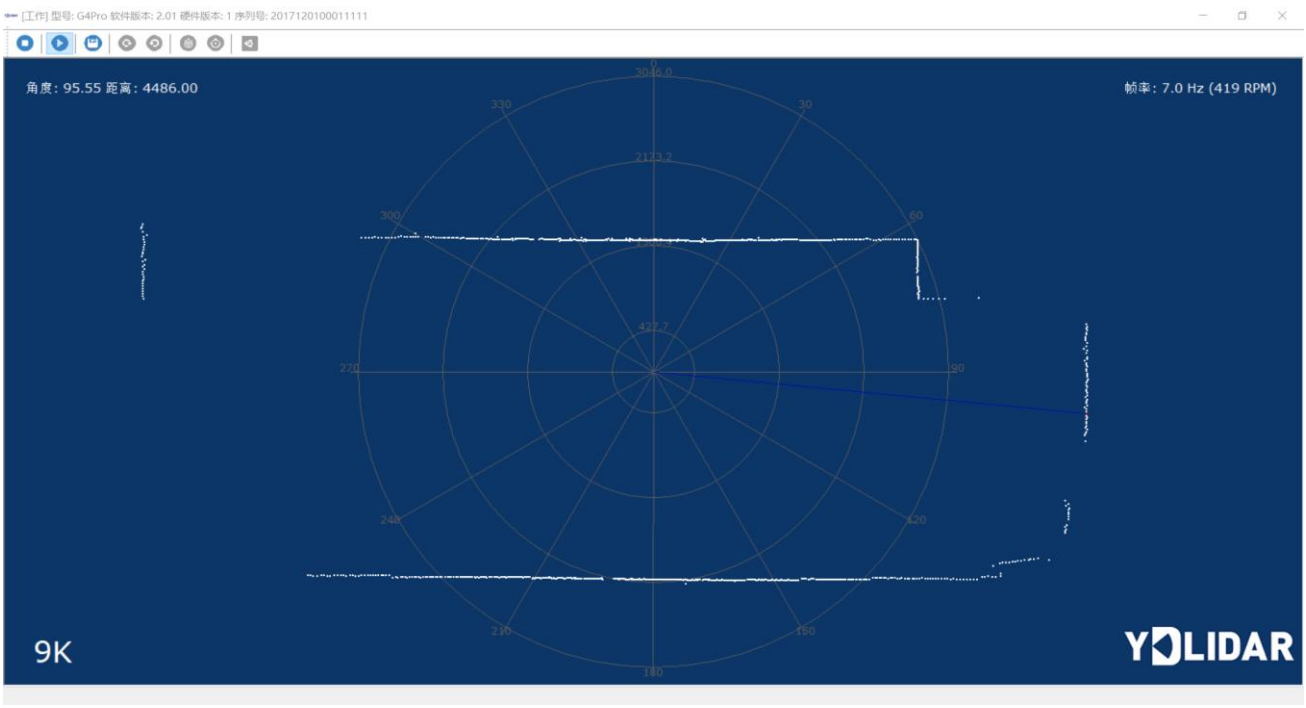

FIG 10 YDLIDAR G4 POINT CLOUD DATA

Move the mouse to any sampling point and you can see the distance value and angle of the point in the red text. The lidar scanning frequency can be read out using the text in the upper right of the screen.

Note: Users can also select Type-C on G4 for fast connection. Use Type-C data cable to connect PC and G4 directly. Download the GCP vcp serial port driver on the official website. After the installation is successful, start PointCloud Viewer to scan the map and observe the point cloud data.

LINUX ROS USAGE GUIDE

There are many Linux distributions. This manual only uses Ubuntu 16.04 and Kinetic version ROS as examples.

File description

Download YDLIDAR's latest ROS driver package on official website http://www.ydlidar.com/download;

After decompression, enter the launch folder. There are the following files in this directory:

CHART 2 LAUNCH FILE DESCRIPTIONS

File	Description
f4.launch	Run the file, F4 Lidar starts scanning, no data, no point cloud display
f4_view.launch	Run the file, Lidar F4 starts scanning and shows the point cloud

g4.launch	Run the file, G4 Lidar starts scanning, no data, no point cloud display
g4_view.launch	Run the file, Lidar G4 starts scanning and shows the point cloud
x4.launch	Run the file, X4 Lidar starts scanning, no data, no point cloud display
x4_view.launch	Run the file, Lidar X4 starts scanning and shows the point cloud
Lidar.launch	Run the file, Lidar (G4, F4 and X4) starts scanning, no data, no point cloud display
Lidar_view.launch	Run the file, Lidar (G4,F4 and X4) starts scanning and shows the point cloud

Note 1: need to select the correct file to run, such as: G4 cannot run f4_view.launch, you can run g4_view.launch and Lidar_view.launch;

Note 2: To run Lidar_view.launch and Lidar.launch, you need to confirm whether the Lidar.launch configuration information is correct. See the configuration instructions for details.

Configuration instructions

The G4 configuration file is saved in g4.launch. When modifying the parameters of Lidar.launch, refer to the configuration in g4.launch. The configuration instructions are as follows:

CHART 3 CONFIGURATION INSTRUCTIONS

File	Descriptions
port	The lidar serial number defaults to ydlidar. When connecting multiple radars, the serial port will have a duplicate name error.
baudrate	Serial port baud rate: G4 default is: 230400
frame_id	Lidar coordinate system: default is laser_frame
angle_fixed	Lidar Angle Correction Settings: Default is true
intensities	Lidar signal strength settings, G4, X4, F4 fixed to false
angle_min	Lidar scan start angle soft setting: direction defaults to clockwise
angle_max	Lidar scan start angle soft setting: direction defaults to counterclockwise
range_min	Lidar minimum range: default is 0.08
range_max	Lidar maximum range: default is 16.0
ignore_array	Lidar scan angle hard setting: Default is not set. The system uses soft settings by default

In general, G4 can be configured as below:

```
<launch>
  <node name="ydlidar_node"  pkg="ydlidar"  type="ydlidar_node" output="screen">
    <param name="port"         type="string" value="/dev/ydlidar"/>
    <param name="baudrate"     type="int"    value="230400"/>
    <param name="frame_id"     type="string" value="laser_frame"/>
    <param name="angle_fixed"  type="bool"   value="true"/>
    <param name="intensities"  type="bool"   value="false"/>
    <param name="angle_min"    type="double" value="-180" />
    <param name="angle_max"    type="double" value="180" />
    <param name="range_min"    type="double" value="0.08" />
    <param name="range_max"    type="double" value="16.0" />
    <param name="ignore_array" type="string" value="" />
  </node>
  <node pkg="tf" type="static_transform_publisher" name="base_link_to_laser4"
    args="0.2245 0.0 0.2 0.12 0.0  0.0 /base_footprint /laser_frame 40" />
</launch>
```

FIG 11 G4.LAUNCHDEFAULT CONFIGURATIONS

Device connection

Under Linux, the G4 and PC interconnect processes are consistent with those under Windows. See Device Connections under Windows.

ROS Driver installation

Before doing the following, make sure that the Kinetic version ROS environment is installed correctly.

Specific steps are as follows:

（1） Use the command to create the ydlidar_ws workspace and copy the ROS driver package ydlidar in the G4 package to the ydlidar_ws/src directory. Switch to the ydlidar_ws workspace and compile again.

```
$ mkdir -p ~/ydlidar_ws/src
$ cd ~/ydlidar_ws
$ catkin_make
```

（2） After the compilation is complete, add the ydlidar environment variable to the ~/.bashrc file and make it effective.

```
$ echo "source ~/ydlidar_ws/devel/setup.bash" >> ~/.bashrc
$ source ~/.bashrc
```

（3） Add a device alias /dev/ydlidar to the G4 serial port.

```
$ cd ~/ydlidar_ws/src/ydlidar/startup
$ sudo chmod +x initenv.sh
$ sudo sh initenv.sh
```

RVIZ Installation

（1） Installation.

```
$ sudo apt-get install python-serial ros-kinetic-serial g++ vim \
 ros-kinetic-turtlebot-rviz-launchers
```

（2） If there is a problem with the installation, update the source cache and reinstall it.

```
$ sudo apt-get update
```

RVIZ Check the scan results

Run the launch file and open rviz to see the G4 scan results, as shown in the following figure:

```
$ roslaunch ydlidar  g4_view.launch
```

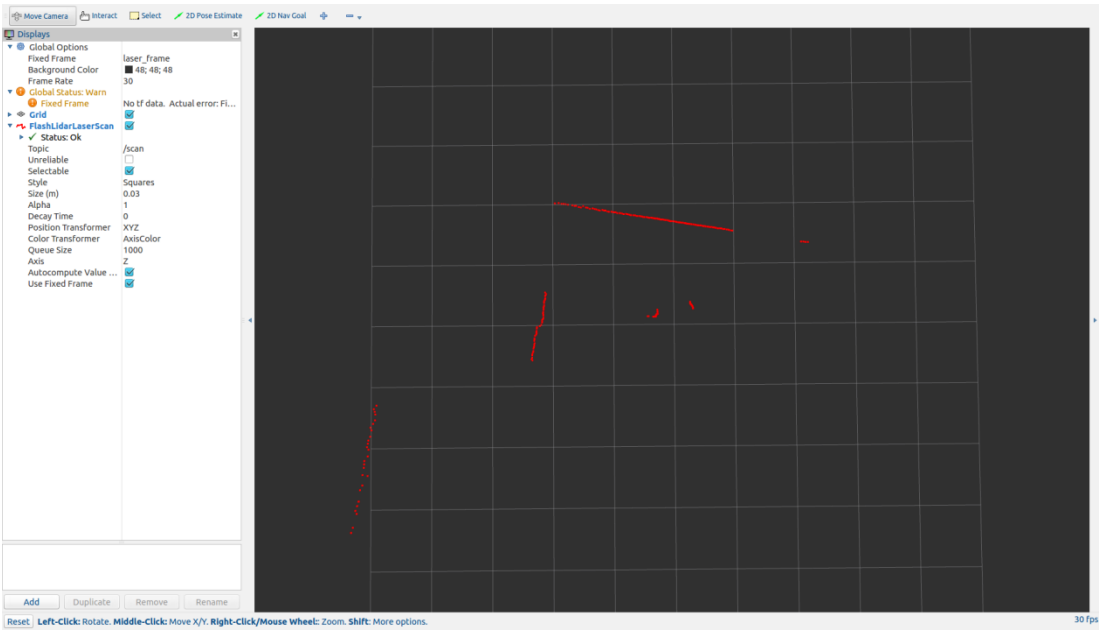

FIG 12 YDLIDAR G4 RVIZ

Modify the scan angle problem

The scanning data seen by running the launch file is displayed by default with 360-degree data. If you want to modify the display range, modify the configuration parameters in launch. The specific operation is as follows:

（1） Switch to the directory where g4.launch is located and use vim to edit g4.launch. The contents are as follows:：

```
$ roscd ydlidar/launch
$ vim  g4.launch
```

```
<launch>
  <node name="ydlidar_node"  pkg="ydlidar"  type="ydlidar_node" output="screen">
    <param name="port"         type="string" value="/dev/ydlidar"/>
    <param name="baudrate"     type="int"    value="230400"/>
    <param name="frame_id"     type="string" value="laser_frame"/>
    <param name="angle_fixed"  type="bool"   value="true"/>
    <param name="intensities"  type="bool"   value="false"/>
    <param name="angle_min"    type="double" value="-180" />
    <param name="angle_max"    type="double" value="180" />
    <param name="range_min"    type="double" value="0.08" />
    <param name="range_max"    type="double" value="16.0" />
    <param name="ignore_array" type="string" value="" />
  </node>
  <node pkg="tf" type="static_transform_publisher" name="base_link_to_laser4"
    args="0.2245 0.0 0.2 0.12 0.0  0.0 /base_footprint /laser_frame 40" />
</launch>
```

FIG 13 LIDAR.LAUNCH FILE

（2） The G4 radar coordinates follow the right-hand rule within ROS, with an angle range of [-180, 180]. "angle_min" is the start angle, and "angle_max" is the end angle. The specific scope needs to be modified according to actual use.

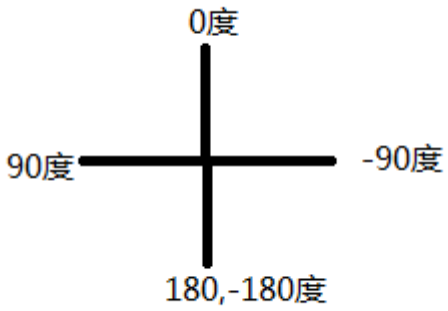

FIG 14 YIDAR G4 COORDINATE ANGLE DEFINITION

USE CAUTION

Ambient temperature

When the working environment temperature of G4 is too high or too low, it will affect the accuracy of the distance measuring system. It may also damage the structure of the scanning system and reduce the life of the G4 lidar. Avoid use in high temperature (>50 degrees Celsius) and low temperature (<0 degrees Celsius) conditions.

Ambient lighting

The ideal working environment for the G4 is indoor, indoor lighting (including no light) will not affect the G4 work. However, avoid using a strong light source (such as a high-power laser) to directly illuminate the G4's vision system.

If you need to use it outdoors, please avoid that the G4's vision system is directly facing the sun. This may cause permanent damage to the vision system's sensor chip, thus invalidating the distance measurement.

Please note that the G4 standard version is subject to interference in outdoor strong sunlight reflection environments.

Power demand

During the development process, since the drive current of the USB interface of each platform or the USB interface of the computer may be too low to drive the G4, the external power supply of the +4V to the G4 needs to be provided through the USB_PWR interface of the USB interface board. It is not recommended to use mobile phone power bank because the voltage ripple of some brands of power bank is too large.