CONTENTS

1 YDLIDAR G1 LIDAR DEVELOPMENT KIT ................................................. 1
  1.1 Development Kit ........................................................................ 1

2 USAGE UNDER WINDOWS .................................................................... 2
  2.1 Device Connection ...................................................................... 2
  2.2 Driver Installation ....................................................................... 3
  2.3 Evaluation Software Usage ............................................................... 5
    2.3.1 Start Scanning ....................................................................... 6
    2.3.2 Data Storage .......................................................................... 6
    2.3.3 Scan Frequency ...................................................................... 6
    2.3.4 Display Mean and Standard Deviation ...................................... 7
    2.3.5 Play and Record ..................................................................... 7
    2.3.6 Debug .................................................................................... 8
    2.3.7 Filter ..................................................................................... 9

3 LINUX ROS OPERATION .................................................................... 9
  3.1 Device Connection ...................................................................... 9
  3.2 Compile and Install YDLidar-SDK .................................................. 9
  3.3 ROS Driver Installation ................................................................. 10
  3.4 Run the ydlidar_ros_driver ........................................................... 10
  3.5 RVIZ View Scan Results ............................................................... 11
  3.6 Modify Scan Angle ....................................................................... 11

4 CAUTION .......................................................................................... 13
  4.1 Ambient Temperature .................................................................. 13
  4.2 Ambient Lighting ......................................................................... 13
  4.3 Power Supply .............................................................................. 13

5 REVISE ........................................................................................... 14
1 YDLIDAR G1 LIDAR DEVELOPMENT KIT

The development kit of YDLIDAR G1 lidar (hereinafter referred to as G1) is an accessory tool provided for performance evaluation and early development of the G1. Through the G1 development kit, and with the evaluation software, users can observe point cloud data scanned by G1 on your environment or development on the SDK.

1.1 Development Kit

The G1 development kit has the following components:

G1 Lidar | USB Type-C Cable | USB Adapter Board
---|---|---

**FIG 1 YDLIDAR G1 DEVELOPMENT KIT**

<table>
<thead>
<tr>
<th>Item</th>
<th>Qty.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1 Lidar</td>
<td>1</td>
<td>Standard version of the G1 Lidar, with internal integrated motor drive, which can realize motor stall control and motor control</td>
</tr>
<tr>
<td>USB Type-C Cable</td>
<td>1</td>
<td>Use with USB adapter board to connect G1 and PC. USB cable is both a power supply cable and a data cable</td>
</tr>
<tr>
<td>USB Adapter Board</td>
<td>1</td>
<td>Realize USB to UART, convenient for G1 and PC to quickly interconnect. Meanwhile, it supports serial port DTR signal to control G1 motor rotation and stop. In addition, a Micro USB power interface (PWR) for auxiliary power supply is provided.</td>
</tr>
</tbody>
</table>

Note: USB Adapter board has two USB TYPE C interface: USB_DATA、USB_PWR.
- USB_DATA: Data power supply multiplexing 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.
2 USAGE UNDER WINDOWS

2.1 Device Connection

When G1 is evaluated and developed under windows, G1 and PC need to be interconnected. The specific process is as follows:

Connect the adapter board with G1 first, 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 G1 is powered on. The motor does not rotate.

The drive current of the USB interface of some development platforms or PC is not sufficient. G1 need to be connected to the auxiliary power supply of +5V, otherwise the lidar will be abnormal.
2.2 Driver Installation

To evaluate and develop the G1 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.

https://www.ydlidar.com/dowfile.html?id=97


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.

Double-click the exe file and follow the prompts to install it.
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 G1 and PC interconnection).
2.3 Evaluation Software Usage

YDLIDAR provides G1 real-time scanning point cloud data visualization software LidarViewer. Using this software, users can intuitively observe the scanning effect of G1. YDLIDAR provides G1 real-time point cloud data and real-time scanning frequency. At the same time, G1 version information can be read, and the scanned data can be saved offline to an external file for further analysis. Visualization software download link: https://www.ydlidar.com/Public/upload/download/TOOL.zip

Before using the YDLIDAR software, make sure that the G1 USB adapter board serial port driver is installed successfully, and interconnect the G1 with the USB port of the PC. Run the evaluation software: LidarViewer.exe, select the corresponding serial port number and model number. Meanwhile, users could choose language on the top right corner.

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

Click 🕹️ to start scanning and display the environment point cloud, the upper left corner displays the angle & distance information of the red line position (unit: mm). Click 🍎 to stop it, as shown below:

![FIG 10 LIDAR SCANNING POINT CLOUD DISPLAY](image)

2.3.2 Data Storage

During lidar scanning, click [File] in the main menu, select [Export to Excel], and save point cloud data according to the prompts. Then the system will save the point cloud information scanned in a circle in Excel format.

![FIG 11 SAVE DATA](image)

2.3.3 Scan Frequency

=is used to adjust the scanning frequency (motor speed) of the lidar. Click this control, the system will pop up a frequency setting bar, which can be automatically adjusted according to requirements. When the lidar is in the scan state, you need to click the scan control again after adjusting the scan frequency. The speed can be adjusted by dragging the control, the control of scanning frequency is shown in the figure below
2.3.4 Display Mean and Standard Deviation
Click [Tools] in the main menu, then select [Mean And STD] - [View].

Choose one according to your needs, move the mouse to the test position, right-click the pop-up menu, and select [Lock Mouse Tracking].

2.3.5 Play and Record
Click [Tools] in the main menu, then select [Record and Play].
The main window is displayed as follows:

To record lidar data, click to start recording, and click to stop recording.

In non-scanning mode, click to start play.

The play process is as follows:

2.3.6 Debug
Click [Tools] in the main menu, and then select [DebugON] to output the raw lidar data to the "viewer_log.txt" and "viewer_log_err.txt" files.
2.3.7 Filter

Click [Tools] in the main menu, and then select [Filter] to add Lidar data filtering algorithm.

![Filter Setting](image)

FIG 18 FILTER SETTING

Note: For more functions of LidarViewer, please click [Help], select [More Information], and learn more about how to use it.

### 3 LINUX ROS OPERATION

There are many Linux versions, this article only uses Ubuntu 18.04, Melodic version ROS as an example.

SDK driver address:

https://github.com/YDLIDAR/YDLidar-SDK

ROS driver address:

https://github.com/YDLIDAR/ydlidar_ros_driver

#### 3.1 Device Connection

Under Linux, the G1 and PC interconnect processes are consistent with those under Windows. See Device Connection under Window.

#### 3.2 Compile and Install YDLidar-SDK

ydlidar_ros_driver depends on the YDLidar-SDK library. If you have never installed the YDLidar-SDK library, or it has expired, you must first install the YDLidar-SDK library. If you have the latest version of YDLidar-SDK installed, please skip this step, then go to the next step.
3.3 ROS Driver Installation

1) Cloning GitHub's ydlidar_ros_driver Package:

```
$ git clone https://github.com/YDLIDAR/ydlidar_ros_driver.git
$ cd ydlidar_ws/src/ydlidar_ros_driver
```

2) Build the ydlidar_ros_driver software package:

```
$ cd ydlidar_ws
$ catkin_make
```

3) Package environment Settings:

```
$ source ./devel/setup.sh
```

Note: Add permanent workspace environment variables. It will be very convenient if ROS environment variables are automatically added to your bash session every time you start a new shell:

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

4) Verify that your package path is set, echo the ROS_PACKAGE_PATH variable.

```
$ echo $ROS_PACKAGE_PATH
```

You should see something like this: /home/tony/ydlidar_ws/src:/opt/ros/melodic/share

5) Create Serial Port Alias [Optional].

```
$ chmod 0777 src/ydlidar_ros_driver/startup/*
$ sudo sh src/ydlidar_ros_driver/startup/initenv.sh
```

Note: After completing the previous operation, re-insert the LiDAR again.

3.4 Run the ydlidar_ros_driver

Run ydlidar_ros_driver with startup file, as shown below:
3.5 RVIZ View Scan Results

Run the launch file and open rviz to view the G1 scan results, as shown in the figure below:

$ roslaunch ydlidar_ros_driver G1.launch

Note: G4 lidar is taken as an example by default. If other types of lidars are used, lidar.launch in the lidar_view.launch file needs to be changed to the corresponding **.launch file. (If G1 lidar is used, it needs to be changed to G1.launch)

![FIG 19 YDLIDAR G1 RVIZ](image)

3.6 Modify Scan Angle

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

1) Switch to the directory where the corresponding [launch file] is located, edit the file, and its content is as shown in the figure:

$ vim G1.launch
Note: For more information about the file contents, please refer to

https://github.com/YDLIDAR/ydlidar_ros_driver#configure-ydlidar_ros_driver-internal-parameter

2) The G1 lidar 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.

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FIG 21 YDLIDAR G1 COORDINATES DEFINITION
4 CAUTION

4.1 Ambient Temperature

When the working environment temperature of G1 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 G1 lidar. Avoid use in high temperature (>50 degrees Celsius) and low temperature (<0 degrees Celsius) conditions.

4.2 Ambient Lighting

The ideal working environment of G1 is indoor, and the indoor environment light (including no light) will not affect the work of G1. However, please avoid using strong light sources (such as high-power lasers) to directly illuminate the G1’s vision system.

If you need to use it outdoors, please avoid the G1’s vision system directly facing the sun, which may cause permanent damage to the vision system's photosensitive chip, which will invalidate the range finding.

The G1 standard version will cause interference in the distance measurement under the conditions of outdoor strong sunlight reflection, please pay attention to it.

4.3 Power Supply

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 G1, the external power supply of the +5V to the G1 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 power bank is too large.
## 5 REVISE

<table>
<thead>
<tr>
<th>Date</th>
<th>Version</th>
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<tbody>
<tr>
<td>2019-05-28</td>
<td>1.0</td>
<td>Composing a first draft</td>
</tr>
<tr>
<td>2020-01-15</td>
<td>1.1</td>
<td>Add auxiliary power connection method, document description, configuration description, and power supply requirements</td>
</tr>
<tr>
<td>2020-06-09</td>
<td>1.2</td>
<td>Adapt to PointCloudViewer2.0 client</td>
</tr>
<tr>
<td>2021-08-02</td>
<td>1.3</td>
<td>Adapt LidarViewer client, update SDK and ROS tutorial</td>
</tr>
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</table>