YD LiDAR TG30

By : N Sai Pranay Kumar

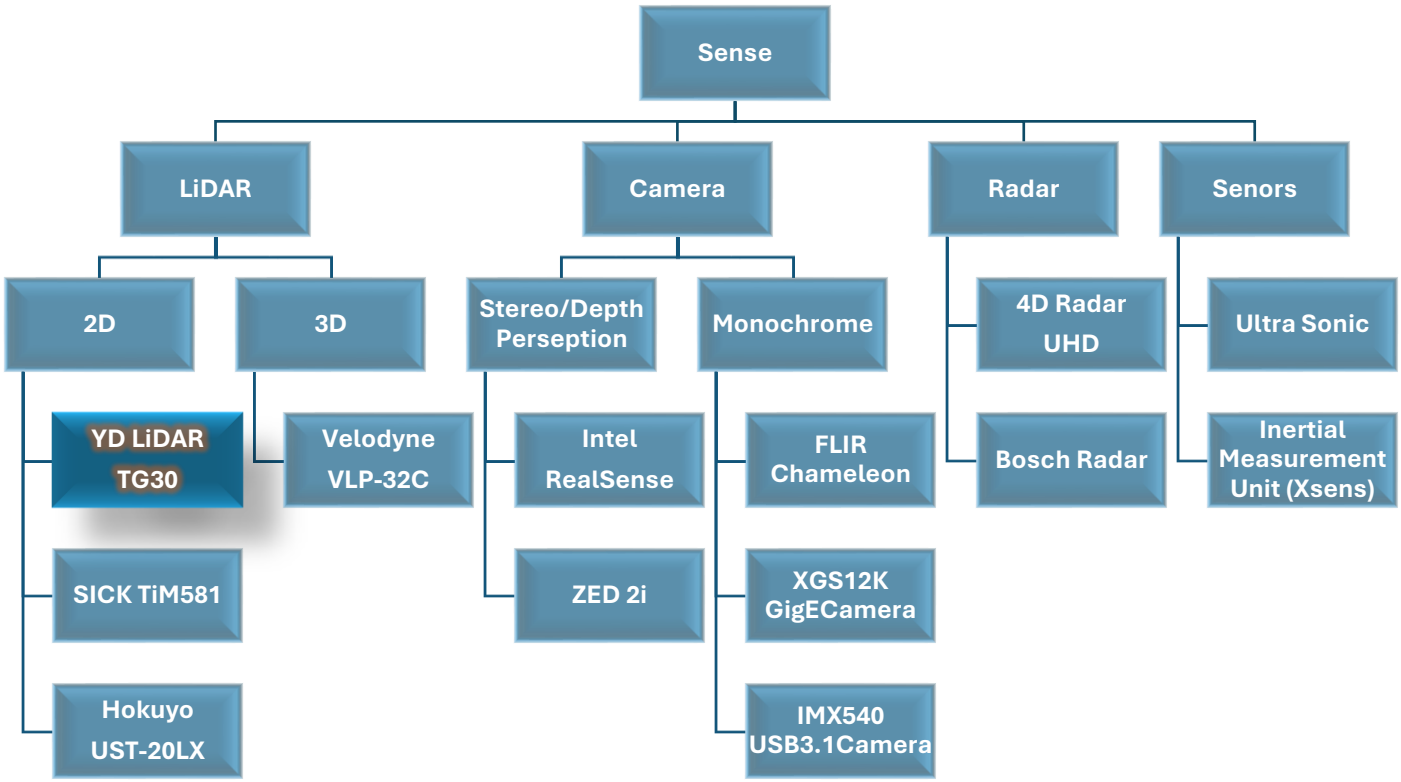
Version : 1

Version Control

Version	Summary	Created by	Reviewed by	Date
1	Starter Guide for YD LiDAR TG30	N Sai Pranay Kumar	G Nithish Chandra Reddy	

Contents

Sense Segment



I. Introduction to LiDAR

LiDAR (Light Detection and Ranging) is a remote sensing technology that uses laser light to measure distances. By emitting laser pulses and measuring the time it takes for the light to return after hitting an object, LiDAR can create precise, high-resolution 3D maps of the environment.

○ History of LiDAR

LiDAR technology has its roots in the 1960s, developed shortly after the invention of the laser. Initially, it was used for meteorological purposes, such as measuring atmospheric particles. Over the decades, advances in technology and computing power have significantly expanded LiDAR's applications, making it a crucial tool in geology, forestry, and, more recently, autonomous vehicles and robotics.

○ Types of LiDARs

2D LiDAR:

This type of LiDAR scans in a single plane, creating a two-dimensional map of the surroundings. It's commonly used in applications where a flat representation is sufficient, such as in industrial automation settings or simple obstacle detection systems.

3D LiDAR:

By rotating or using multiple beams, 3D LiDAR captures data in multiple planes, resulting in a three-dimensional map of the environment. This type of LiDAR is essential for more complex applications requiring a comprehensive spatial understanding, such as autonomous driving, advanced robotics, and detailed topographical mapping.

○ Applications of LiDAR

1. **Autonomous Vehicles:** LiDAR is critical in self-driving cars, providing detailed 3D maps that help the vehicle navigate and avoid obstacles.
2. **Geospatial Mapping:** Used for creating high-resolution topographic maps, LiDAR helps in urban planning, flood modeling, and forestry management.
3. **Archaeology:** LiDAR can penetrate forest canopies to reveal hidden structures and landscapes, aiding in archaeological discoveries.
4. **Environmental Monitoring:** It helps in tracking changes in vegetation, coastline erosion, and other environmental changes over time.
5. **Agriculture:** Precision farming uses LiDAR for crop assessment, field mapping, and soil analysis.
6. **Infrastructure Inspection:** LiDAR is used to inspect power lines, bridges, and other infrastructure for maintenance and safety assessments.

LiDAR's ability to produce accurate and high-resolution data quickly makes it invaluable across various industries, driving innovation and efficiency in multiple fields.

II. YD LiDAR TG30 Introduction

- **Product Overview :**

  YDLIDAR TG30 is a 360-degree 2D LiDAR (now referred to as TG30) developed by the EAI team. Based on the principle of ToF (Time of Flight), it is equipped with related optics, electricity, and algorithm design to achieve high-frequency and high-precision distance measurements. The mechanical structure rotates 360 degrees to continuously obtain the angle information and output the point cloud data of the scanning environment while ranging.

- **Key Features :**
  - 360 degrees omnidirectional scanning and 5-12Hz frequency
  - Ranging frequency up to 20kHz
  - High accuracy, stable performance
  - Strong resistance to ambient light interference

- **Applications :**
  - Robot Navigation and Obstacle Avoidance
  - Smart Transportation
  - Environmental Scanning and 3D reconstruction
  - Robot ROS teaching and research.

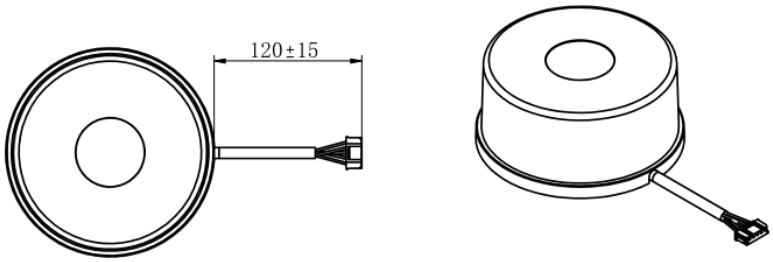


Figure 1 YD LiDAR Top View & Side View

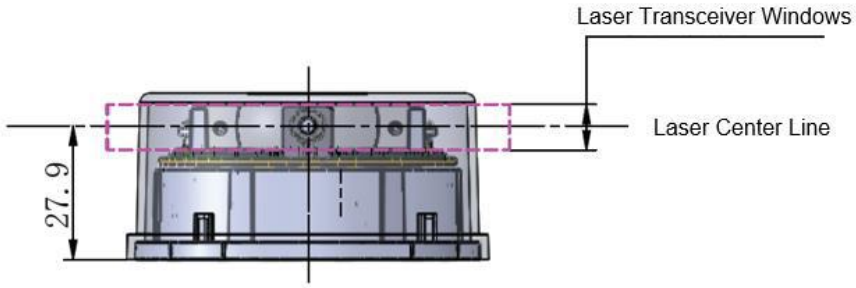


Figure 2 YD LiDAR Mechanism

Note : Lidar is a precision device, please avoid using Lidar under high or low temperatures or strong vibration situations, the systematic error parameter index will be relatively larger, and it may exceed the typical value.

[1]

Official Website : https://www.ydlidar.com/index.html

III. Prerequisites

Linux Version : Ubuntu 20.04 and before versions

Ubuntu Installation : https://robocademy.com/2020/05/17/best-4-ways-to-install-ubuntu-for-ros/

YouTube Link : https://youtu.be/mXyN1aJYefc?si=XJbUZmC5jgrDRQQF (Dual Boot)

ROS : Noetic and before versions

ROS Installation : https://wiki.ros.org/noetic/Installation/Ubuntu (noetic version)

Complete ROS tutorials to get familiar with ROS.

https://robodev.blog/series/ros101 (ROS Basics)

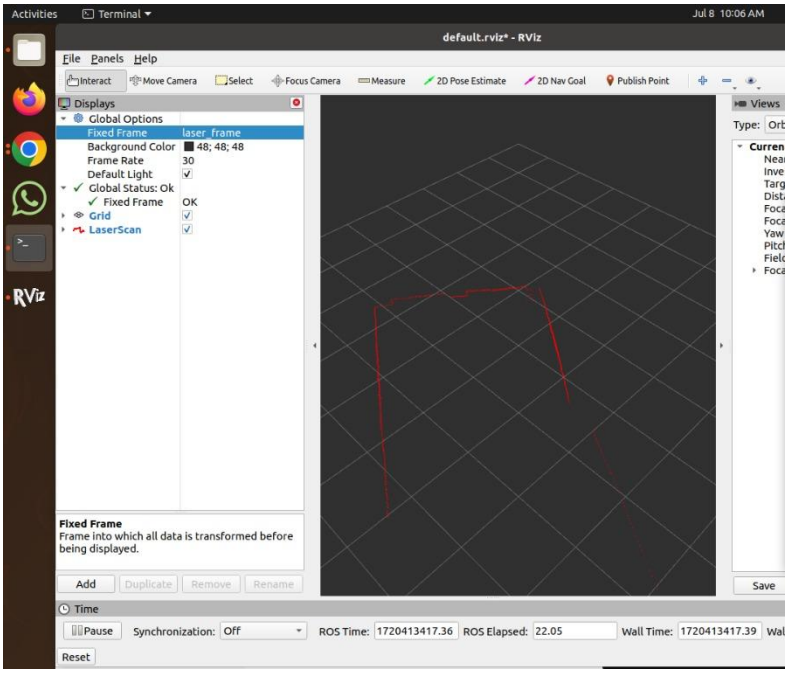
Before moving to the Hardware interface execute the .bag file and visualize the data… from the following link

Activity :

Dataset : https://drive.google.com/drive/folders/1mP5sizC77ARcK9fO5BmCwU82d5yzVs6Y?usp=sharing

- Instead of recording a .bag file. First, visualize the data with the bag file by following the steps.

Sample Output :



Note

- To uninstall Ubuntu (Dual Boot) - https://youtu.be/mQyxtWrUNlE?si=3eXOnEqIGjViTH0D
- If you face a Grub Screen Issue - https://youtu.be/ih2NjlhLLic?si=TEpkIDzkKJVkWzZB

IV. YD LiDAR Interface

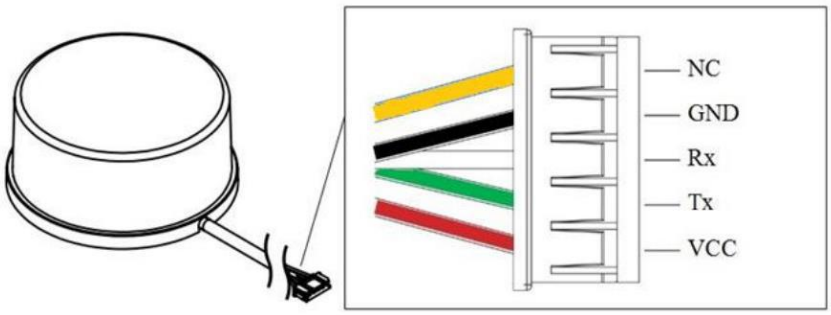


Figure 3 YD LiDAR TG30 Interfaces

Pin	Type	Description	Default	Range	Remarks
Vcc	Power Supply	Positive	5V	4.8V – 5.2V	-
Tx	Output	Serial Output	-	-	Data Stream LiDAR to Peripherals
Rx	Input	Serial Input	-	-	Data Stream Peripherals to LiDAR
GND	Power Supply	Negative	0V	0V	-
NC	Reserve	Reserved Pin	-	-	-

The product has a Type-C USB transfer module to realize a Type-C USB connection.

Type-C USB: Data Communication and Power Supply.

Micro USB: Only Power Supply

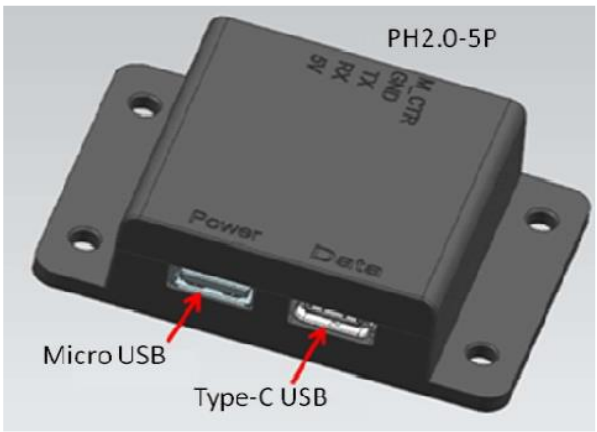


Figure 4 YD LiDAR TG30 Power Adapter

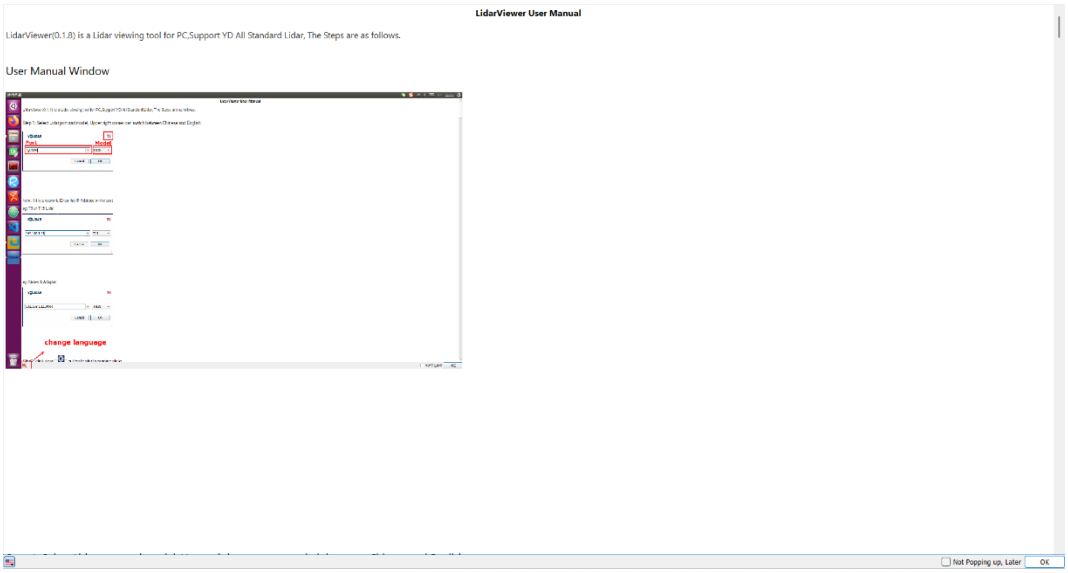
V. Visualization using SDK

Download the Tool Kit from https://www.ydlidar.com/service_support.html

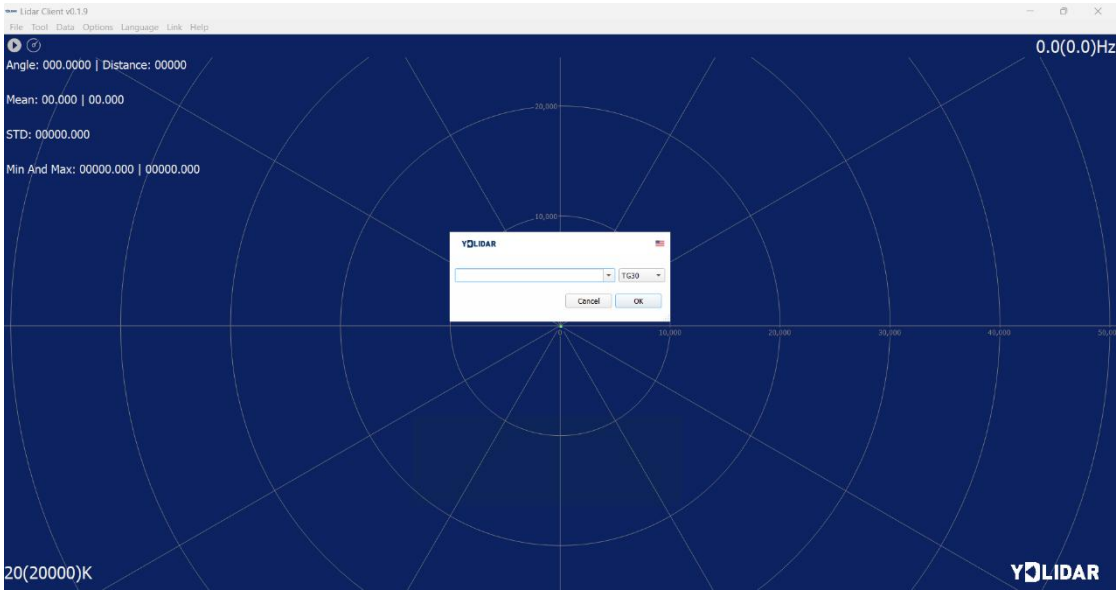
In the Tool folder, you will find an application '*LidarViewer_V0.1.9.exe*'

Open the application you will get the screen as shown below…

Supports in both Windows & Linux



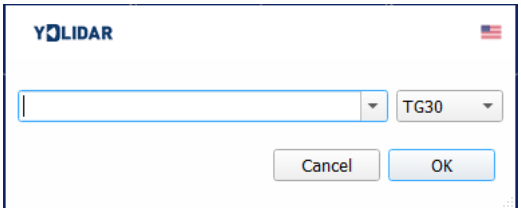
Click OK at the below right corner you will encounter a screen as shown…



Connect your YD LiDAR to the System.

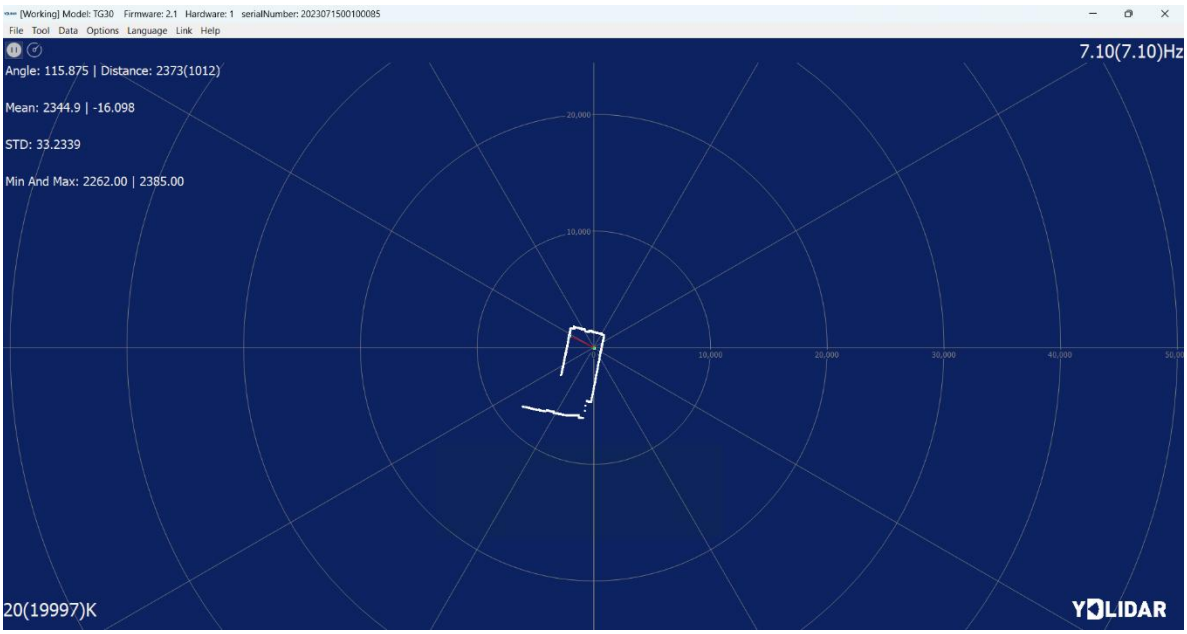
Select the COM Port of the LiDAR.

Select your YD LiDAR Series (TG30) and click on OK.



Click the play button at the top left corner to start the LiDAR.

You can visualize the data in 2D as shown…



You can record and play the captured environment using the options available in the menu bar (Tool).

VI. Integrating with ROS

The Installation Procedure supports Ubuntu 20.04/18.04/16.04/14.04 LTS and respective ROS versions.

YD LiDAR SDK requires CMake 2.8.2+ as dependencies.

To install these packages, use the below command in your terminal…

```
$ sudo apt install cmake pkg-config
```

if you want to use Python API, you need to install Python and Swig (3.0 or higher):

```
$ sudo apt-get install python swig
$ sudo apt-get install python3-pip
```

○ Build YD LiDAR SDK

Create a directory in Home with the name YDLiDAR SDK.

Run the following commands in the YDLiDAR SDK directory to compile the project.

```
$ git clone https://github.com/YDLIDAR/YDLidar-SDK.git
$ cd YDLidar-SDK
$ mkdir build
$ cd build
$ cmake ..
$ make
$ sudo make install
```

○ Build YD LiDAR ROS Driver

1. Clone ROS driver package from GitHub :

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

2. Build ROS driver package :

   ```
   $ cd ydlidar_ws
   $ mkdir build
   $ catkin_make
   ```

3. Package Environment setup :

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

Note : Add permanent workspace environment variables. It's convenient if the ROS environment variables are automatically added to your bash session every time a new shell is launched.

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

$ source ~/.bashrc
```

4. To Confirm that your package path has been set use

```
$ echo $ROS_PACKAGE_PATH
```

It would help if you got something similar to

```
/home/nagella/ydlidar_ws/src:/opt/ros/noetic/share
```

5. Create a Serial Port Alias

```
$ chmod 0777 src/ydlidar_ros_driver/startup/*

$ sudo sh src/ydlidar_ros_driver/startup/initenv.sh
```

Note : If you encounter any by executing the above commands. Run the commands in their respective path as mentioned.

Connect your YD LiDAR with the System.

- **Run YD LiDAR ROS Driver**

You can run the driver using the launch file

The Command format is

```
roslaunch ydlidar_ros_driver [launch file]
```

For YD LiDAR TG30 use

```
roslaunch ydlidar_ros_driver TG.launch
```

This opens an RViz terminal.

In the terminal select the global frame as *laser_frame* and click ADD to add the topic.

Go to the By topic option select */Scan*, and click OK.

Now you can visualize the real-time data in the RViz terminal.

Note : If you get the error as shown while launching the file…

```
nagella@nagella:~/catkin_ws$ roslaunch ydlidar_ros_driver TG.launch
RLException: [TG.launch] is neither a launch file in package [ydlidar_ros_driver
] nor is [ydlidar_ros_driver] a launch file name
The traceback for the exception was written to the log file
```

source your environment using the following command

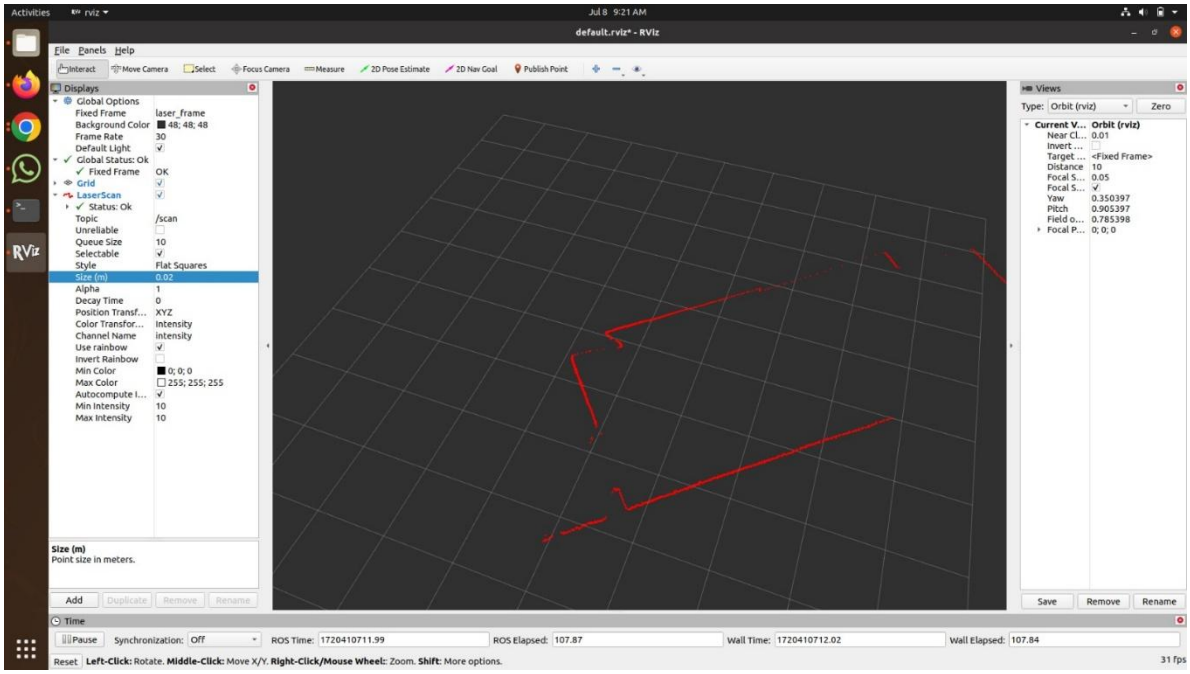
```
$ source ./devel/setup.sh
```

Now again launch the file to power up the lidar and visualize it in RViz…

If you haven't installed RViz in your system, use the following command

```
sudo apt-get install ros-noetic-rviz
```

Now, you can visualize the data as shown below



Refer to the following links if you face any issues

- https://github.com/YDLIDAR/ydlidar_ros_driver/tree/master
- https://github.com/EAIBOT/ydlidar/tree/master
- https://github.com/YDLIDAR/YDLidar-SDK/tree/master

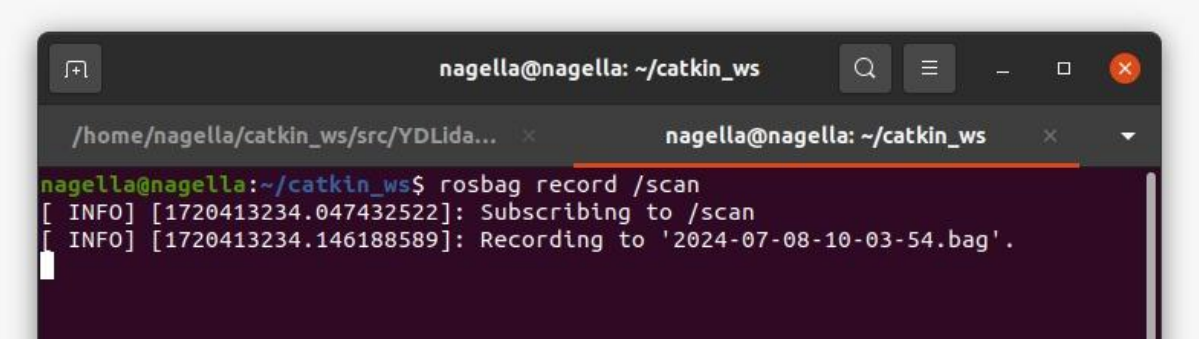
Till Now, we have visualized the data in real time. Now let us record the data and use it for various applications.

○ Recording the data into a .bag file :

To record the data firstly you have to connect the LiDAR to your system and launch it in the terminal…

```
roslaunch ydlidar_ros_driver TG.launch
```

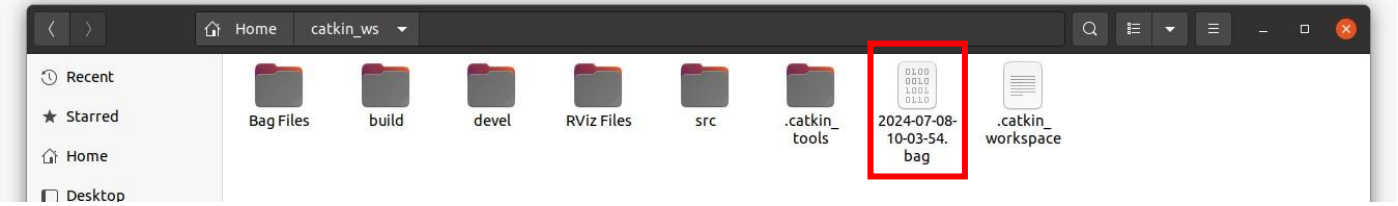
open another terminal and use the following command to record the data



/scan is used because it is the topic that YD LiDAR publishes.

To stop the recording use Ctrl+C in the terminal.

This stores the .bag file in your workspace as shown



○ Visualizing .bag file :

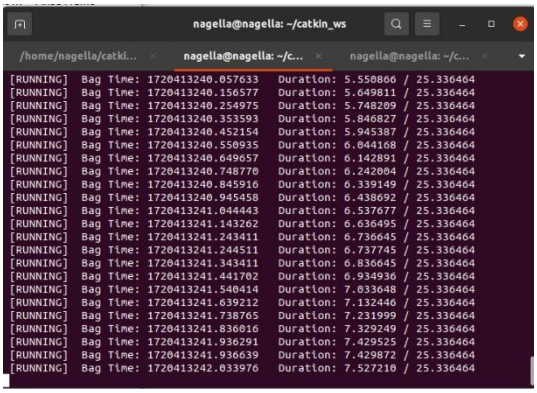
Disconnect the YD LiDAR if you are connected to the system.

To play the .bag file that you recorded. Open the terminal and run *roscore*.

Open one more terminal, use the following command

```
$ rosbag play 'Path_to_your_bag_file'
```

This will play the bag file as shown



To visualize it open RViz using another terminal.

Set the global frame as *laser_frame* and add the topic */scan.*

Now you can visualize the recorded data as shown below…