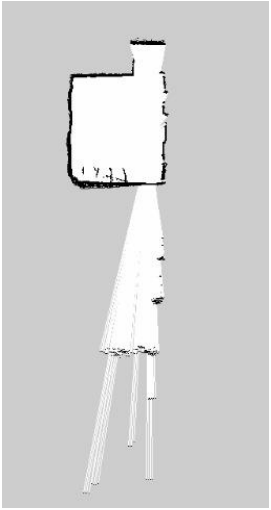
RPLidar:

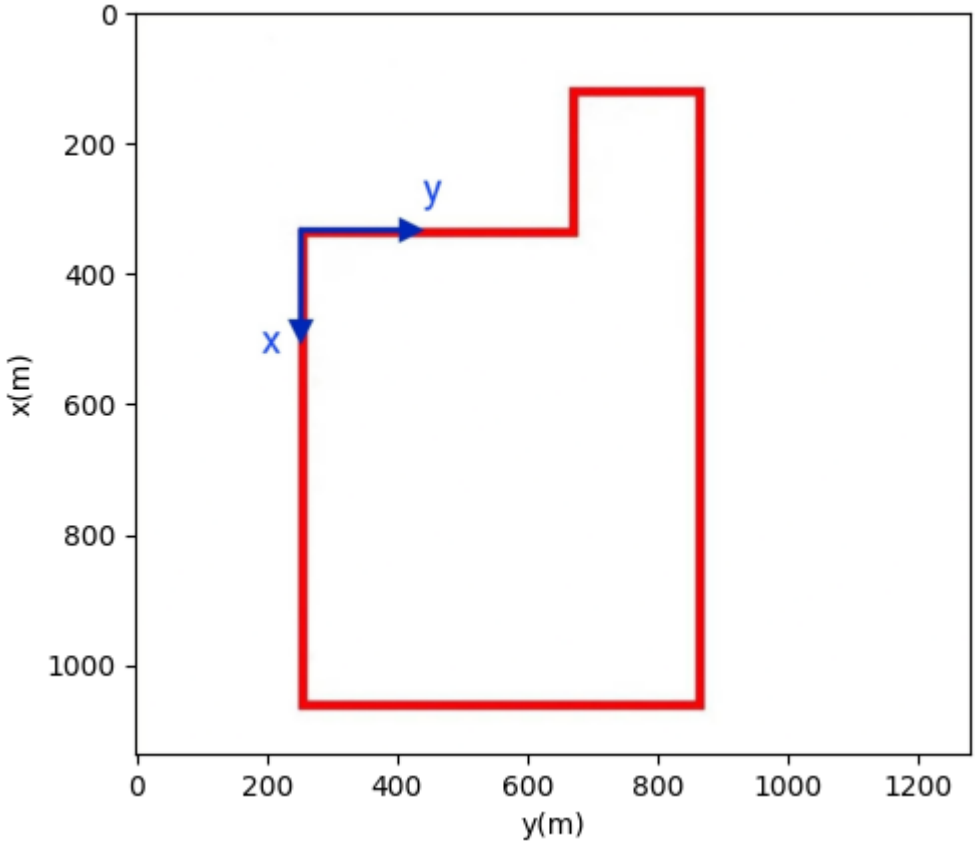
- We are using the RPLidar a1 model.
- Clone the slamtec GitHub repo to your src folder in catkin_ws using the command **git clone https://github.com/Slamtec/rplidar_ros.git** (this is the rplidar_ros package)
- Then do **catkin_make** in catkin_ws and connect the rplidar to your laptop
- Add the authority to write to the USB port using: **sudo chmod 666 /dev/ttyUSB0**
- There are two ways to get the point cloud from the lidar
- 1) using the view_rplidar_a1.launch file
  Just run the command: **roslaunch rplidar_ros view_rplidar_a1.launch**
  You can see the point cloud in rviz.

  2) using the rplidar_a1.launch file
  Run the command: **roslaunch rplidar_ros rplidar_a1.launch**
  In another terminal run: **rosrun rviz rviz**
  Rviz opens and on the left, you can see some settings there click on **add -> laserscan**
  Then set the **topic** as **/scan** and the **frame** as **laser** now you can see the point cloud.

Mapping using Hector SLAM:

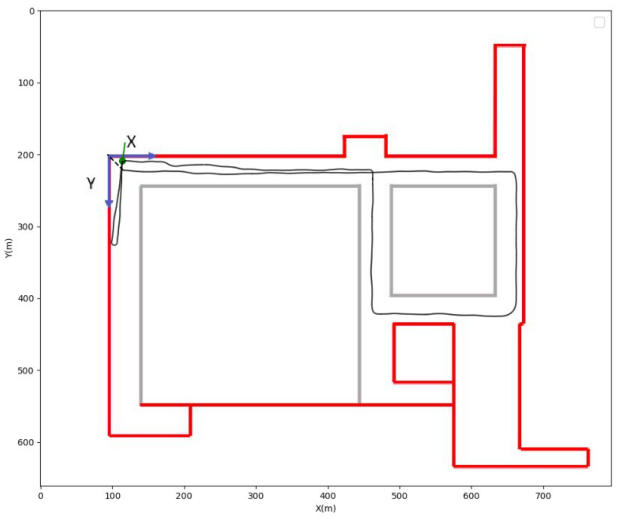
- Clone the GitHub repo below to your src in catkin_ws
  https://github.com/tu-darmstadt-ros-pkg/hector_slam.git
- Then you need to make some changes in the launch files to use Hector Slam without odometry data
- catkin_ws/src/rplidar_hector_slam/hector_slam/hector_mapping/launch/mapping_default.launch
- replace the second last line with
- <node pkg="tf" type="static_transform_publisher" name="base_to_laser_broadcaster" args="0 0 0 0 0 0 base_link laser 100" />
- the third line with <arg name="base_frame" default="base_link"/>
- the fourth line with <arg name="odom_frame" default="base_link"/>
- In catkin_ws/src/rplidar_hector_slam/hector_slam/hector_slam_launch/launch/tutorial.launch
- replace the third line with <param name="/use_sim_time" value="false"/>
- Do catkin_make, connect the rplidar
- Run: **sudo chmod 666 /dev/ttyUSB0**
- Run: **roslaunch rplidar_ros rplidar_a1.launch**
- Run: **roslaunch hector_slam_launch tutorial.launch**
- Rviz will open with the map, now move the lidar to get the map
- To save the map :
  sudo apt-get install ros-noetic-map-server
  mkdir ~/catkin_ws/maps
  cd ~/catkin_ws/maps
  rosrun map_server map_saver -f my_map
- Reference: RPLidar and Hector SLAM for Beginners | ROS Tutorial #8
- Map of the aeroclub workspace:



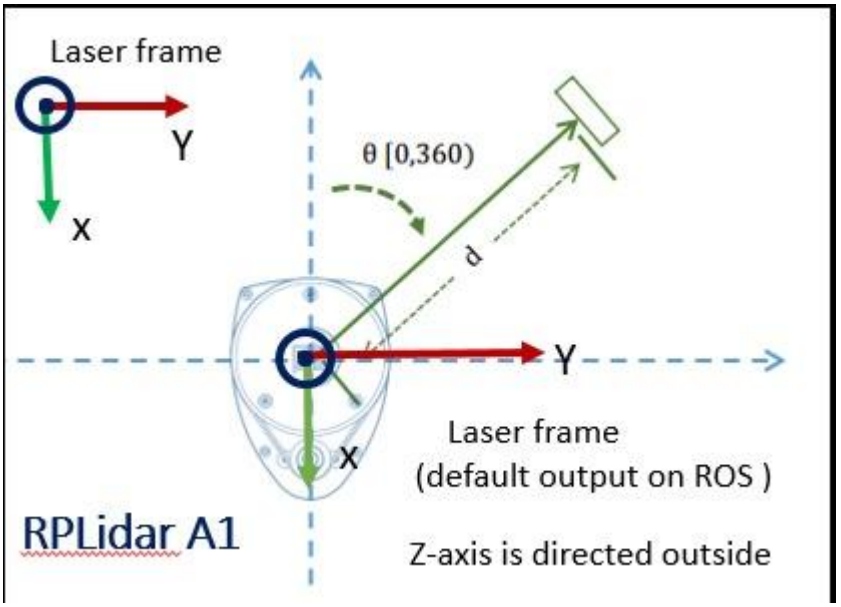


- Visualize the movement of the robot in this map

- Indoor mobile robot : Localization



- example map
- Indoor mobile robot: Path planning



- https://atsushisakai.github.io/PythonRobotics/modules/localization/localization.html
- https://mdpi-res.com/d_attachment/sensors/sensors-22-06903/article_deploy/sensors-22-06903-v2.pdf?version=1663136000
- https://pypi.org/project/pymap2d/
- https://github.com/SteveMacenski/slam_toolbox

- https://github.com/BijoSebastian/indoor_mobile_robot
- Get the lidar data and convert it into the coordinates of lidar and publish it to a topic; to visualization subscribe the data from this topic and use it to draw the path on the map

ndimage.gaussian_filter