0.1 Introduction

The goal of this lab project work is to have a deeper knowledge about SLAM (Simultaneous Localization and Mapping). The emphasis on this project is on creating a map of a virtual simulation of a house using SLAM. We've used trutleBot3 model name waffel and gazebo house world to simulate a navigation throughout an office compound. The layout of this report lists questions from the main lab document followed by answer and practical discussions that arises during the lab work.

0.1.1 Task 1

Using the house world available in the virtual box supplied, teleoperate the Turtlebot around the house. You can use the teleoperation package from Turtlebot.

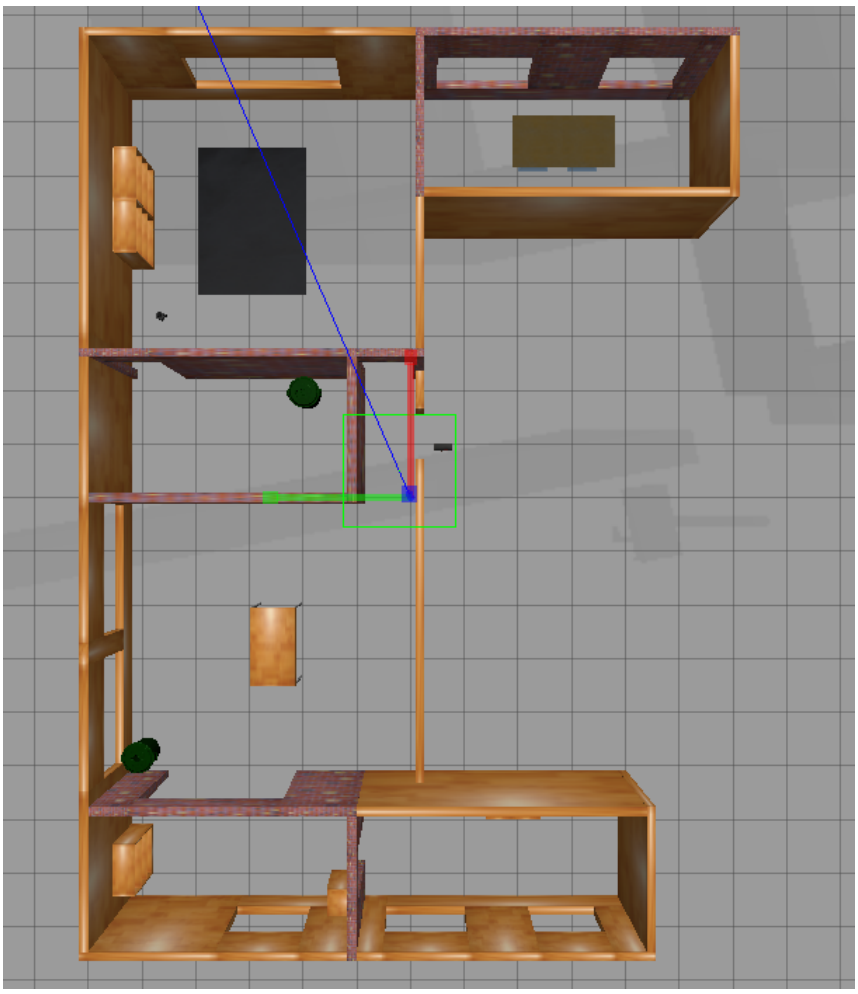

Figure 1: View of Gasebo house-world in the virtual box

Using the teleoperater node as a controller, the bot3 managed to move and explore unknown areas through the compound. The bot3 model is a burger. I was unable to use a waffel model especially implementing SLAM. One best practice I've learned in this task is to set the source with model/setup.bash eventually avoiding to enter model of the robot several times.

0.1.2 Task 2

Create a map of the house. (Grade level I) There is no need to map the whole house, but at least three different rooms should be in the map.

A,

Try different SLAM Methods. Which topics does gmapping subscribe and which does hector-mapping subscribe? Map was created using both SLAM Methods, Hector and

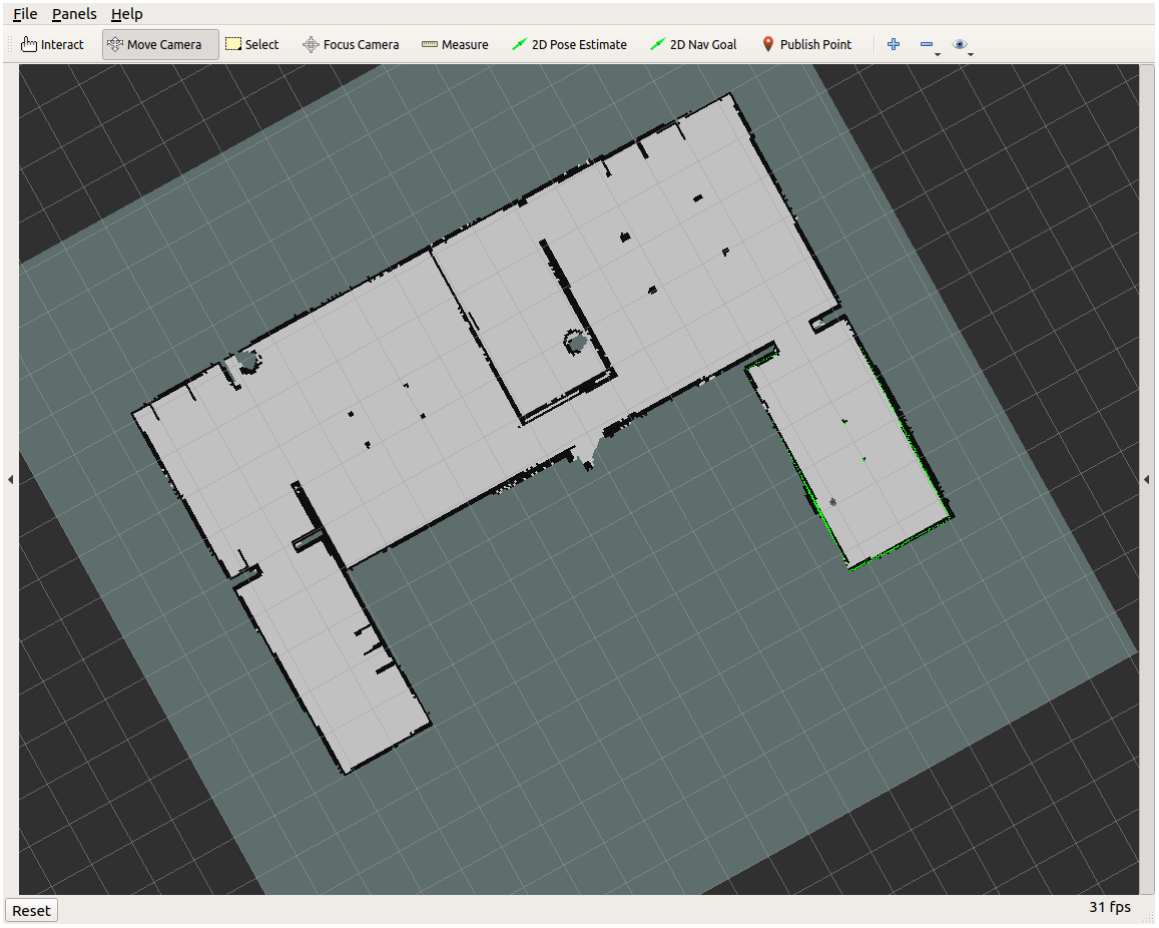

Figure 2: Map created both using Hector and gmapping

gmapping. I think, considering own observation, hector perform way better than the gmapping slam method. It is evident that both subscribe to the topics called /TF and /Map. However, hector seems to use on only the scanner, this is visible using echoing both topics scan and tf. see figure below.

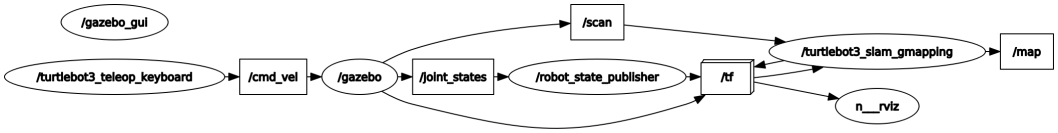

Figure 3: rqt graph gmapping

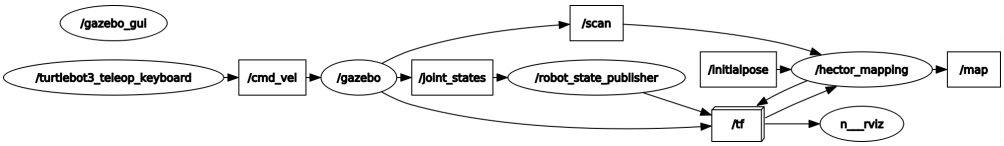

Figure 4: rqt graph Hector

B,

Compare the results obtained with each method. As said above, both work fine but Hector is more intuitive and fast. I think this is mainly based on the topic it consumed during MSG communications between the other nodes for instance TF. Only laser scan is used when hector used whereas in gmapping both odometer and laser are used which makes the computation more complex and time consuming. see msg type and topics below

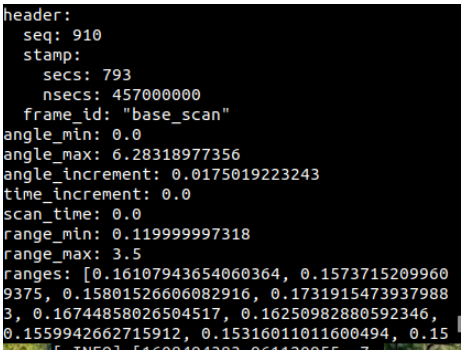

Figure 5: Signal Range Hector + Gmapping

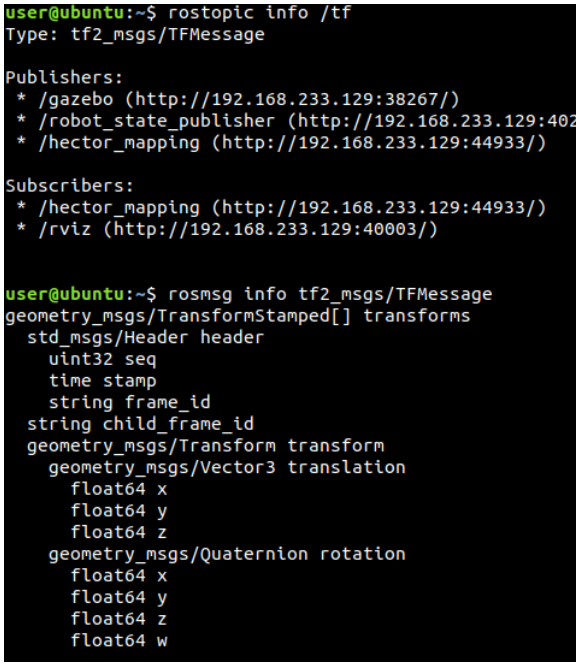

Figure 6: Hector subscription and MSG types

0.1.3 Task 3 Navigation

A, Perform navigation

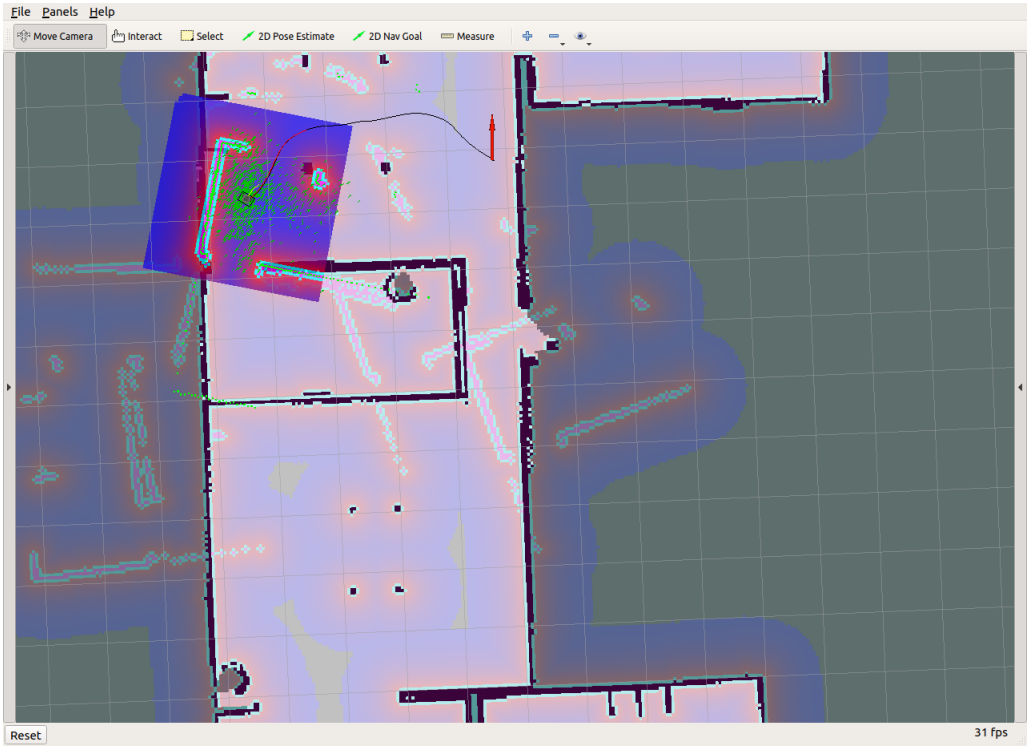

Figure 7: Simple navigation

B, Create a graph showing how nodes and topics work and explain how nodes and topics work

Figure 8: Simple navigation

C, Explain how a TF tree works.

It monitor large set of frames of the bots and it's more like a maintainer. eg view frames, tf monitor,tf echo, roswtf, and static transform publisher. We used a tf node to communicate with thirdparty application like matlab.

D, Change parameters so that the Turtlebot runs further away from objects. Explain the adjustment of the parameters.

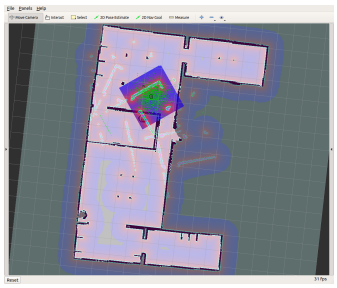

Figure 9: Start Pose estimation with inflation radius 0 .1

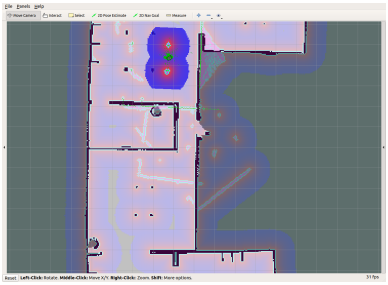

Figure 10: Estimation of pose after a few steps