Exploration of Mapping Algorithms on a TurtleBot

Heather Boortz

April 2015

1 Introduction

Using a TurtleBot, I explored 2D mapping algorithms with various conditions. The mapping algorithms were evaluated for their effectiveness given these various conditions.

2 Interfacing with TurtleBot

2.1 How to get it up and running

I used a TurtleBot with a Kobuki base running Ubuntu 14.04 and ROS Indigo. All of the hardware was left unmodified. Setting up the software involves several steps. The ROS TurtleBot tutorials [4] provide instructions for the basic setup of the TurtleBot.

I set up the onboard TurtleBot computer as both the TurtleBot and PC workstations. The network configuration worked to some extent but was not efficient to use without having a fixed IP for both machines. I set up a fixed IP for the TurtleBot and used basic SSH to teleop from a remote machine.

In order to get data from the Kinect, OpenNI drivers must be installed. Specific instructions can be found on the wiki [2].

2.2 Pitfalls

1. Deprecated software — The TurtleBot initially had a lot of old software running on it. Installing Ubuntu 14.04 and ROS from scratch solved many of those problems. Starting with a fresh install is highly recommended.

2. Kinect Drivers — Since the Kinect is a Microsoft product, the Ubuntu drivers are somewhat finicky. The support for 14.04 is also still not very good. I ended up using a 3rd party fork of the PrimeSense drivers which can be downloaded from the avin/SensorKinect GitHub repository [3].

3. Simulation Time vs. Real Time — TODO

4. Hector slam — TODO

3 Mapping Algorithms

3.1 GMapping

3.2 Hector SLAM

- results pending

3.3 Comparison

- at least qualitatively looking at the maps and looking at which method performed better under which circumstances. Possibly also quantitative comparison based on blueprint.

References

[1] https://github.com/hboortz/TurtlebotMapping

[2] https://github.com/hboortz/TurtlebotMapping/wiki

[3] https://github.com/downloads/avin2/SensorKinect/SensorKinect093-Bin-Linux-x64-v5.1.2.1.tar.bz2

[4] http://wiki.ros.org/turtlebot/Tutorials/indigo/Turtlebot%20Installation

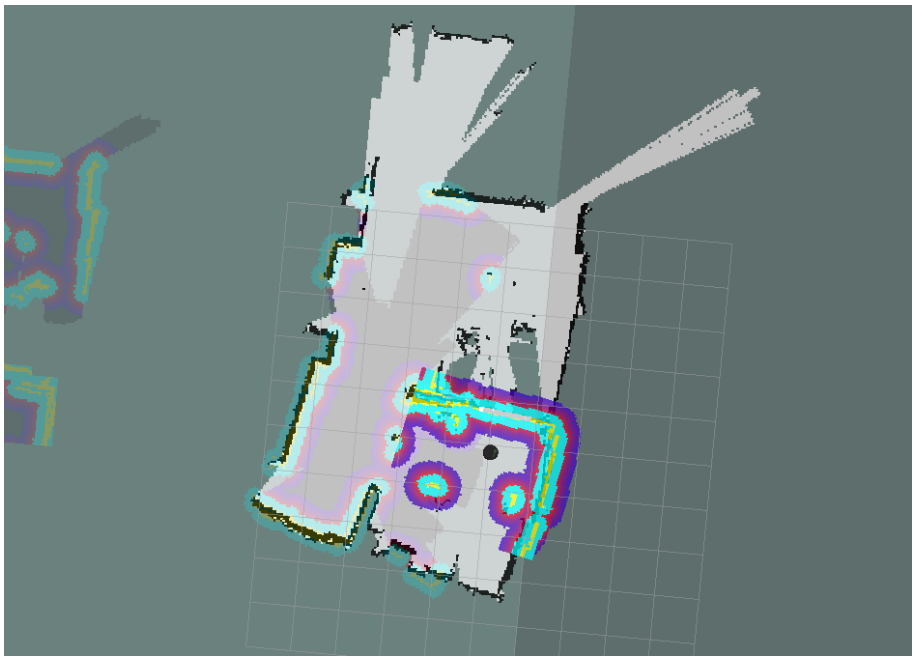

Figure 1: Gmapping Fast Run

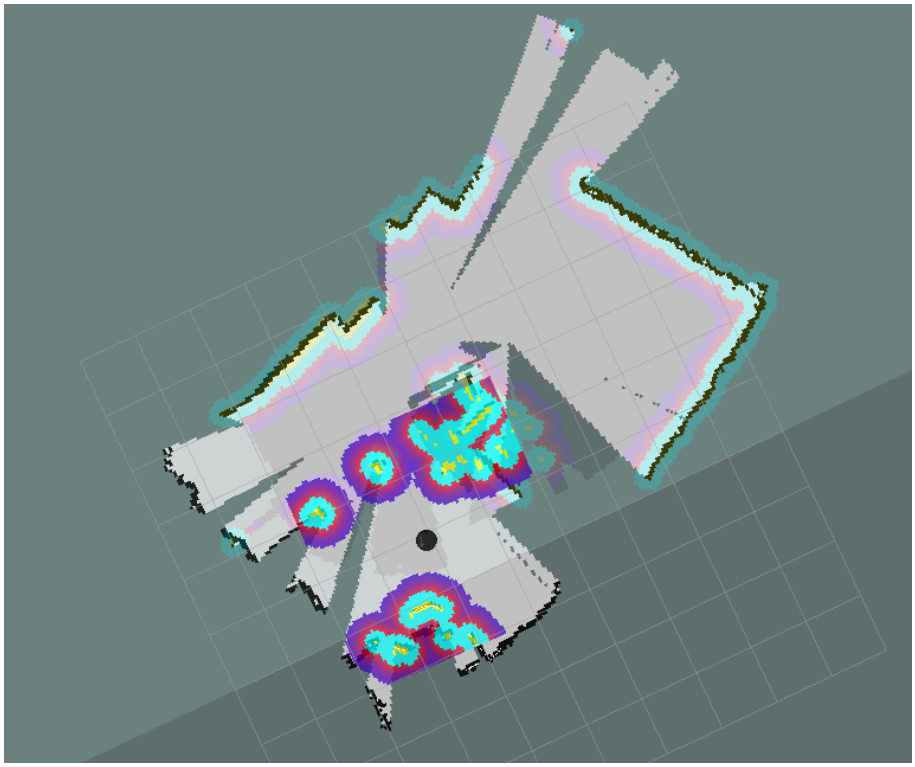

Figure 2: Gmapping Very Fast Run

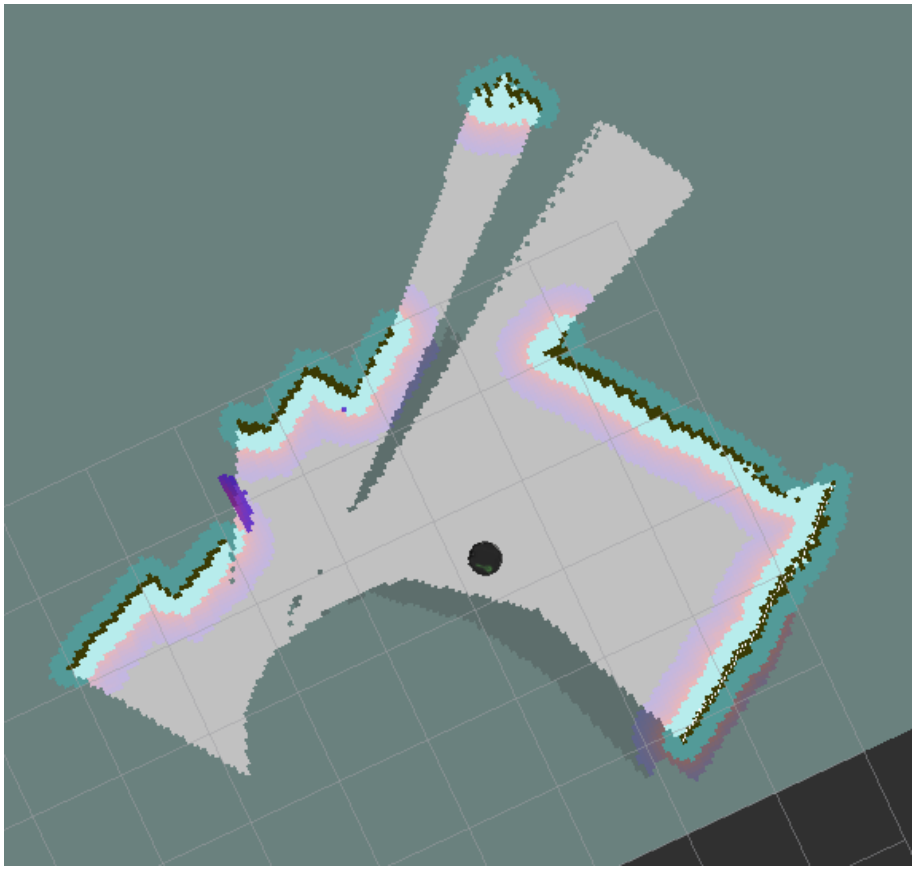

Figure 3: Gmapping Walkthrough