Autonomous Mobile Robots Homework

Roberto Mendieta

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1 ROS tools for debugging

For debugging a group of nodes, ROS gives us different tools:

- rqt_graph

  This command is usefull to visualize a schematic of the relationship between nodes. It shows in ovals the node names, in small boxes the topics and in big boxes the namespaces containgin each node. This tool makes it easier to detect the relationship between nodes and messages.

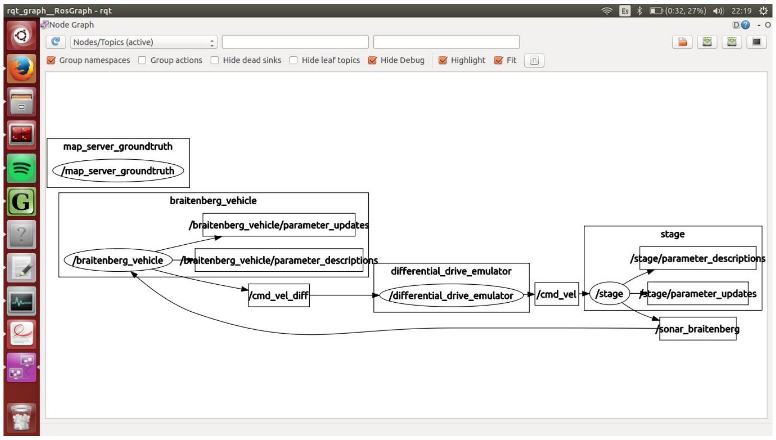


Figure 1: Example of rqt_graph

For this example, we have three nodes: braitenberg_vehicle , differential_drive_emulator and stage. Along with three topics being published/subscribed: /cmd_vel_diff, /cmd_vel and /sonar_braitenberg.

The arrow coming out of the node braitenberg_vehicle means this node is publishing to the /cmd_vel_diff, which is being subscribed by the node differential_drive_emulator. Just by following arrows gives a clear idea of publisher and subcribers running.

- rqt_console

  Rqt_console works as a log for debug info. In the node's code we can log text messages and variable data to this debugger using *rospy.logdebug* and visualize those msgs in a structured format.

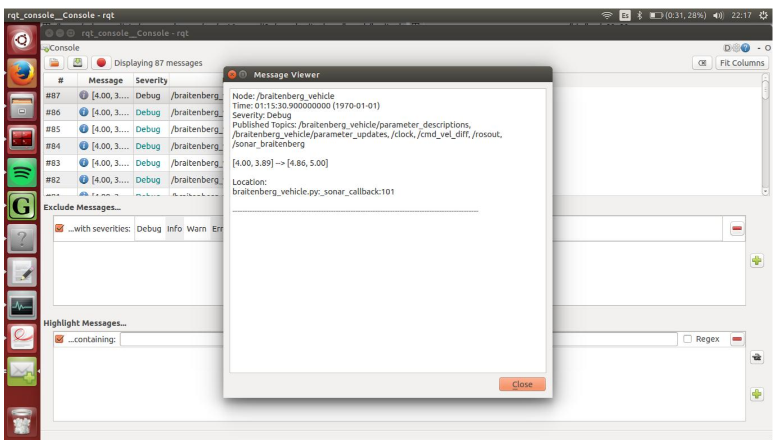


Figure 2: Example of rqt_console.

  The advantage of Rqt_console is that it gives access to a big range of logging messages, which are stored through time, making possible to search for a specific topic, node or timestamp.

- rqt_plot

  Rqt_plot is a tool designed for ploting data from topics being published in ROS. For this example, it is used to visualize the sensor input, wheel speeds, linear and angular speeds.

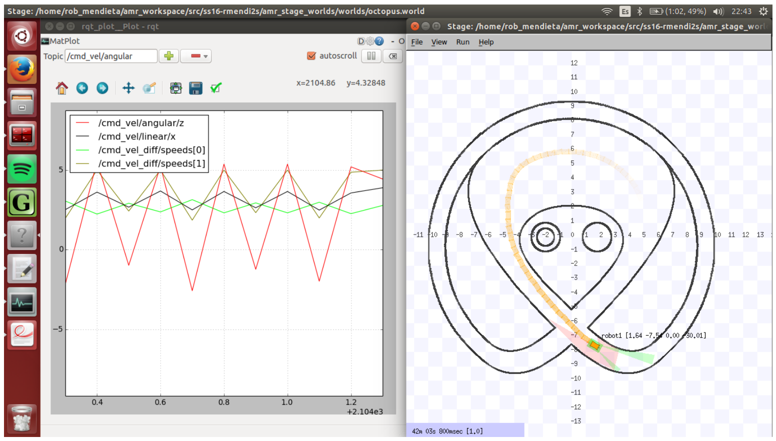
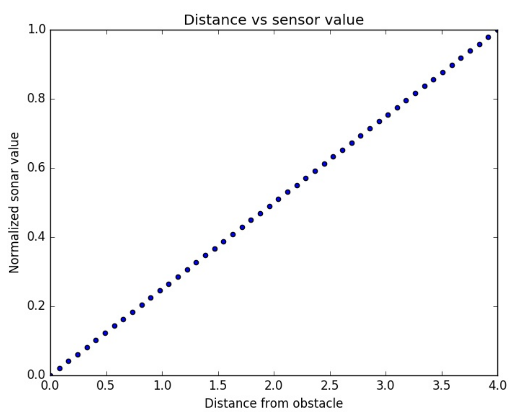


Figure 3: Example of rqt_plot.

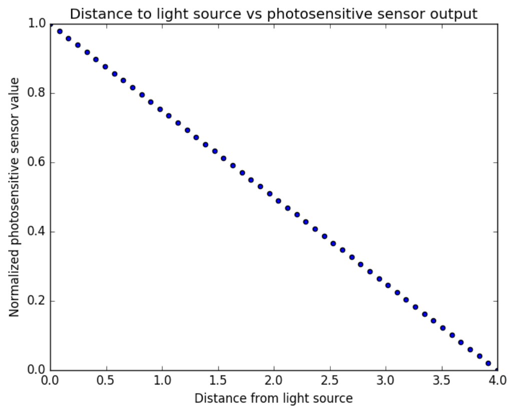
2 Graphs

In a Braitenberg vehicle the output of the sensors is wired directly to the input of the wheels, making the wheel speed proportional to the sensor output.



Since the sensor output is proportional to the distance from the obstacle, it is expected that the robot will move towards the obstacle (Asuming configuration A, right sensor to right wheel, left sensor to left wheel).

On the other hand, if we use a sensor like a light sensor (photosensitive cells), and asume the obstacle is a light source. The behaviour will be the opposite, since the sensor values are inverse proportional to the distance to the obstacle , or light source.



With this configuration, using Braitenberg vehicle configuration A will make it avoid the light source, and configuration B will make it go towards the light. This behavior can be generalized for any sensors output depending on wether it is proportional or inverse to the distance.