

Progress Review 7

Tae-Hyung Kim (tk1)

Team B / Auto Pirates

Teammates: Tushar Chugh, Shiyu Dong, William Seto,
Bikramjot Hanzra

ILR #06

January 28, 2016

1. Individual Progress

1. Localization simulation on RVIZ

Our team showed integration of improved path planning and radar perception in this progress review. Independently, I explored navigation stack simulation and find some errors in the localization. As a result, I concluded that it's good try to apply robot_localization package to use navigation stack.

1) Localization problem using AMCL (Adaptive Monte Carlo Localization) package.

I worked on simulation using AMCL package. In the simulation, robot needed to be localized and then it could be path planned and navigated autonomously. The AMCL in Turtlebot simulation setting that I used works well in the default map, which is maze one. In the case of wide map considered the size of small boat with ratio of great river, the localization showed working well at first. It showed that particles were converged in the local costmap (Figure 1).

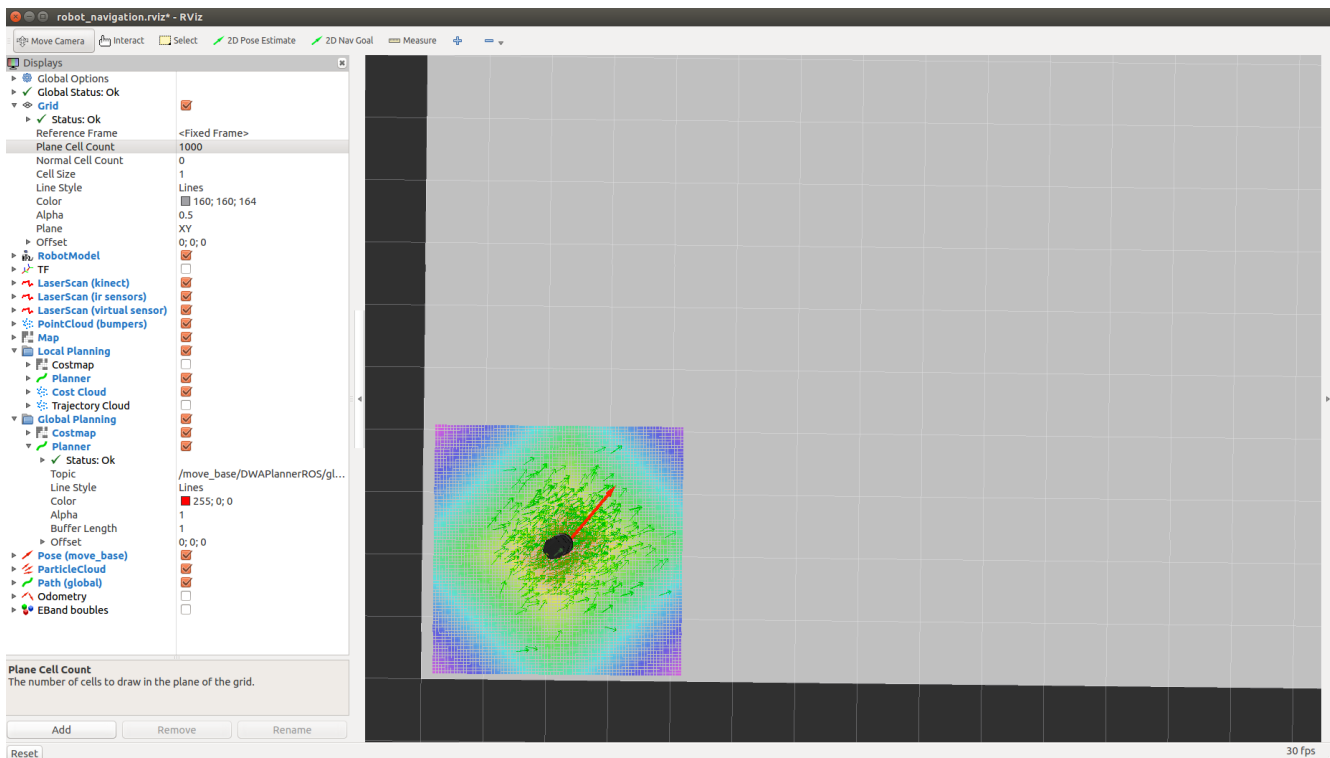


Figure 1. The robot localized with converged particles.

As the robot navigated through path planner, particles started to diverge more. At the certain point, the robot had localization errors. Particles were also beyond the local costmap (Figure 2).

Lastly, it showed that the robot got out of the path which was made by path planner and particle filter didn't work (Figure 3).

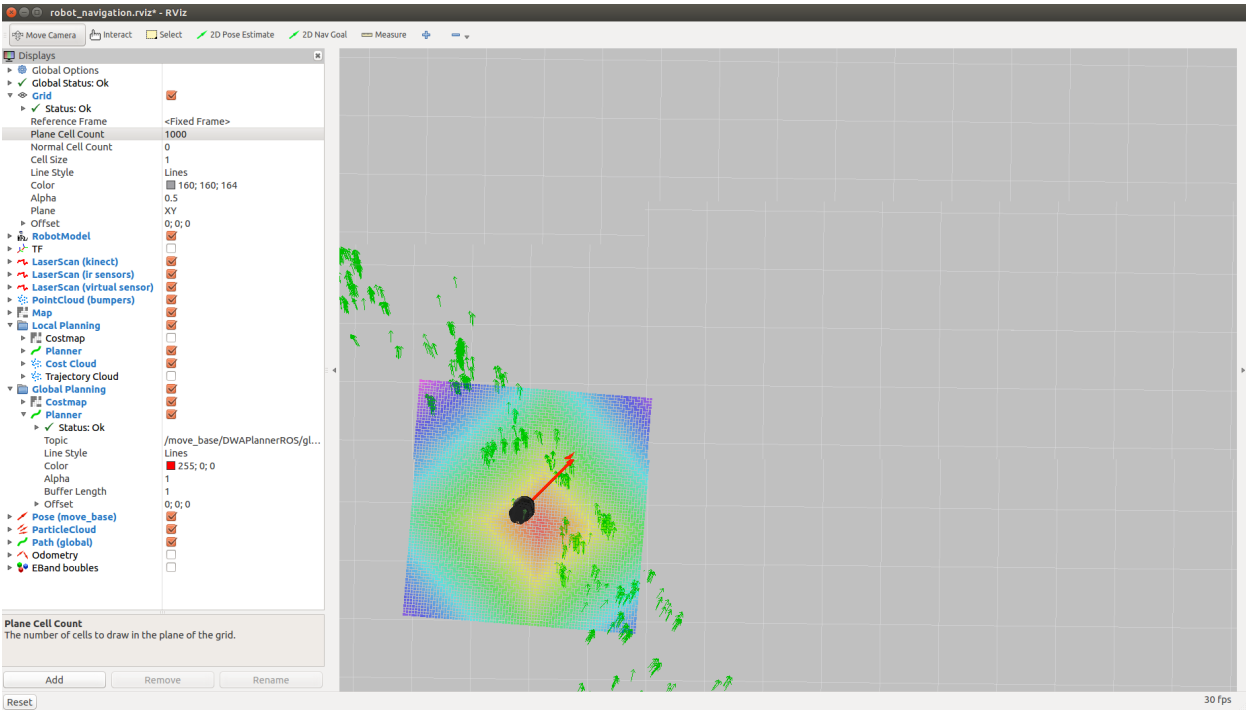


Figure 2. The robot with particles started to diverge

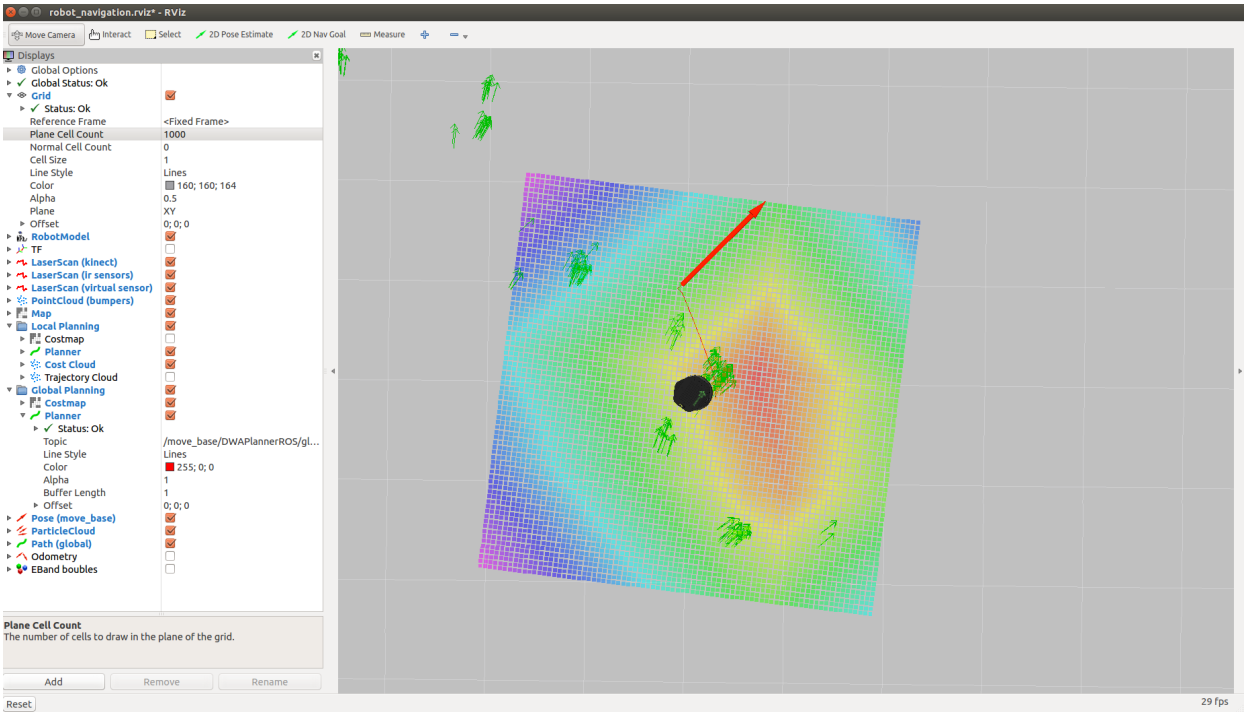


Figure 3. The robot failed to localize

2. The alternative to AMCL package, robot_localization package

The robot_localization package provides nonlinear state estimation through sensor fusion of an arbitrary number of sensors. Most of the packages in the navigation stack aims for indoor robots but robot_localization package could be used for outdoor robot with navigation stack (Figure 4). In the robot_localization package, navsat_transform_node allows users to easily transform geographic coordinates of GPS (latitude and longitude) into the robot's world frame (map or odom). Additionally, ekf_localization_node makes IMU data fusing into state estimate and generates odometry. If the robot is localized exactly, I assume that navigation stack could be worked into our boat.

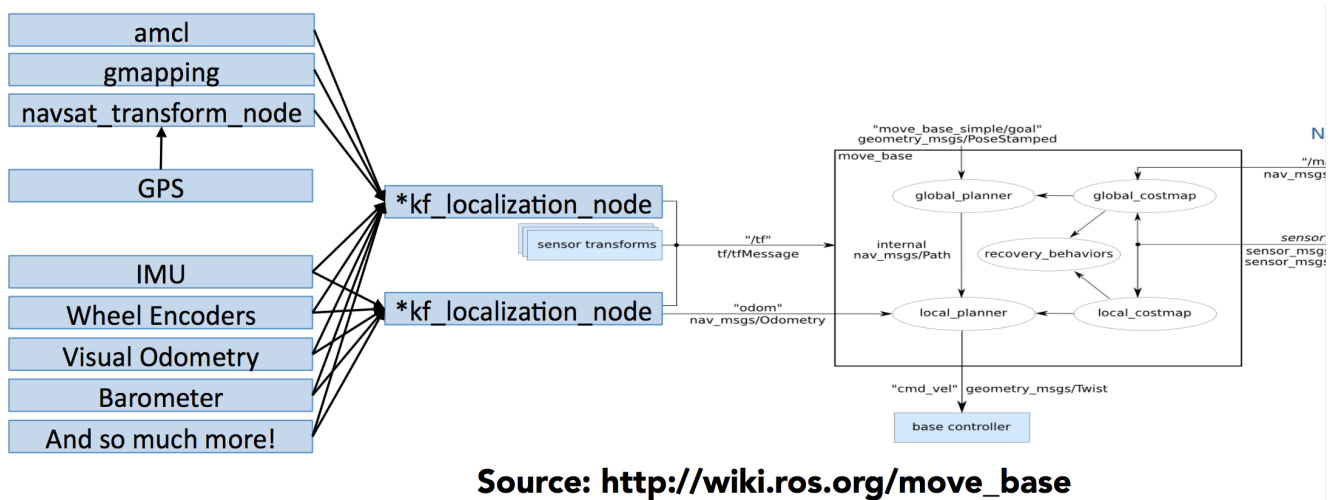


Figure 4. Navigation Package with robot_localization

2. Challenges

In the simulation, when I observed that robot did not localize and particles were diverged, I couldn't find how to debug this one. Through discussion with teammates, we could conclude that the robot wasn't localized with divergent particles because there were few landmark in wide map.

Next, robot_localization package has been announced recently. So there are not enough application story to use this one for outdoor robot's localization. I guess that we would get troubled with debugging and I should resolve that through ROS Q/A. But I think that it's worth for trying this one.

3. Teamwork

- 1) Shiyu Dong: When our team implemented the integration of several modules, they consumed lots of time to launch several packages from a bunch of terminals in the ineffective way. Shiyu created the launch file for running all of these modules. Due to his launch file, teammates didn't waste their time from repetitive tasks
- 2) Bikram Hanzra: Bikram made the program to support fake obstacles with interactive markers in RVIZ. This function enabled us to observe how path planner made its path reacted by fake obstacles.
- 3) William Seto: William implemented considerable code to work path planning and contributed to progress review's goal. He was collaborating with Tushar working with several sensitive memory issues. He also worked on modifying the map with pylons.
- 4) Tushar Chugh: Tushar worked on making the path planning code more robust and modular, integration of radar data to path planner and adding continuous re-planning option to the path planner

4. Future Plans

At first, I plan to work on test the robot_localization package using sensor log data provided by this package.

Secondly, I plan to modify the robot_localization code to work in the boat because the Single Board Computer in the boat processes the INS data packed into ROS topic message.

Lastly, we make plan to do field test on next Wednesday. So I'm supposed to help other teammates working on the field test.