Individual Lab Report

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Team B – Auto Pirates
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1 Individual Progress

We were focusing on the field test and I was working with William on preparing for the field test and analyse for the data we have recorded.

1.1 Preparing for the field test

1. New map with inflated shores and pylons.

   William mainly did this part and he also created a map with a middle line, though we still need time to test it on simulator to follow rules-of-the-road before test it in field test.

2. Prepare for the motion primitives.

   We created 3 different motion primitives. The rough scale for each motion primitive is 4, 6, and 8. There are some trade off to use different primitives. If we set the length for each motion primitive too long, the path will not be that smooth and there will be some sharp turns. On the other hand, if set the length for each motion primitive too short, there will be too many way points for a long path. That's why we faced with the buffer size problem for way points.

3. Figure out which ROS topic to record in the field test.

   As we are running many ROS packages in the same time, it's not possible to record all the ROS topics in the same time. So we chose only some of the ROS topics to record for the field test.

```
/recboat/span_pose: the GPS location and yaw, pitch, roll
/camera/image_raw: image captured by camera on boat
/raw_radar_image: raw radar image
/visualization_marker: filtered radar data, planned path, path has been taken
/recboat/nav_wpt: the way point we are sending
```

   After the field test we found we have missed one important topic, which is the $/recboat/nav_status$, it's basically what the way point that the low level contoller sends to the boat.

2 Challenges

2.1 Analyse the test result

As we mentioned before, we have found mainly two bugs in our system. The first one is because the overload of on board computer and the computer that is running the code. It can be basically demonstrated using figure 1. We can see the topic stops publishing for more than 10 seconds. And in this time because we are not sending new way points to the boat, it will keep the original track, which is dangerous.

We decided to fix it in two ways. First, running the perception and path planning subsystem in different laptops. Second, adding some delay when each message is published. There is no doubt that the increasing size of way points has caused a lot of trouble, as we are using a shorter motion primitive, so we'll try to improve this in the next field test.

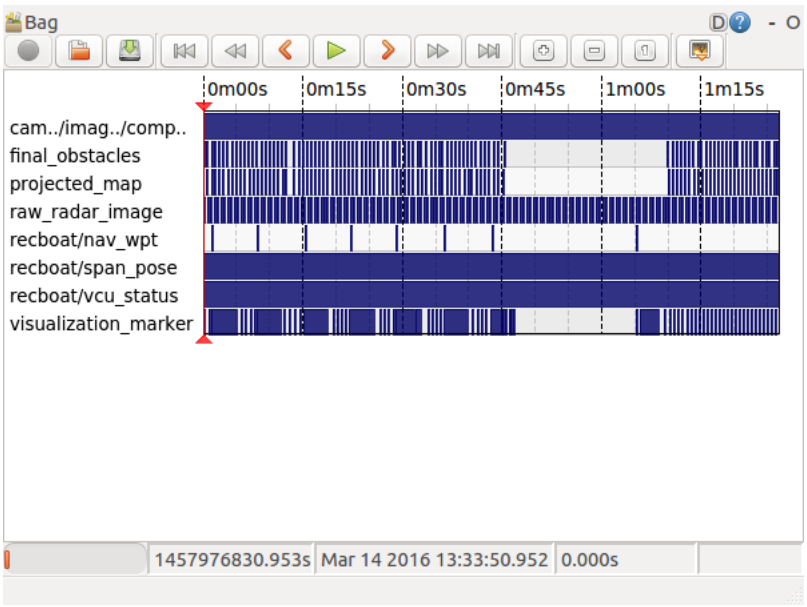

Figure 1: The topics stop publishing

The second bug is mainly about we are sending to many way points so the size of the way points buffer exceeds the maximum number of what the rostopic subscribes. After increasing the buffer size of the ROS subscriber, the problem is almost solved but some time it's still not safe when we are planning a very long path. And now we are thinking to only publish the first few way points, e.g., the first 100 way points. We'll finalize this by analysing the speed of the boat.

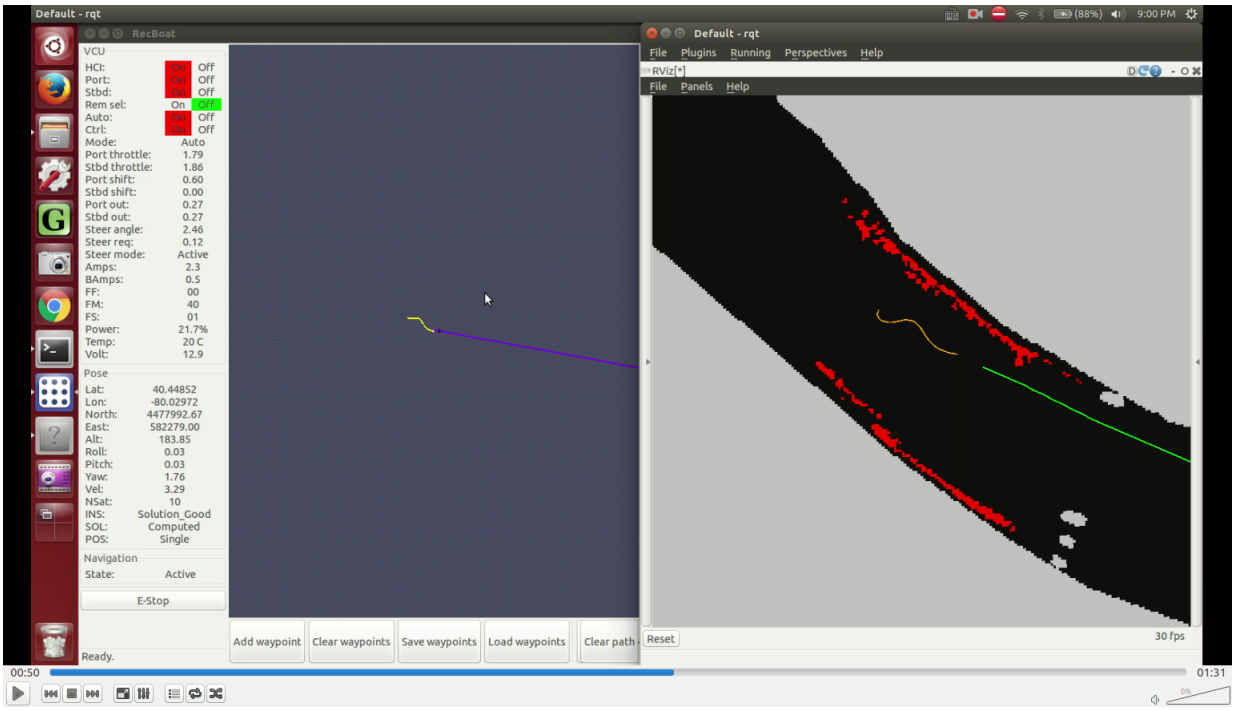

Figure 2: The low level controller is sending a way point far away

3 Teamwork

- Tushar: Tushar improved the path planner to be more robust and fixed the bug by sending only the first 100 way points.
- Tae-Hyung: Tae-Hyung worked on the ROS robot_localization package and helped in planning for the field test.
- Bikram: Bikram worked on improving the simulator by adding the joystick control for fake obstacles.
- William: William worked with me on planning the field test and prepare for the new maps, motion primitives, configure files and launch files. He also worked on finding the bug after the field test.

4 Future Plan

We have a meeting with our sponsor after the field test. Our future plan will be:

We'll work on improving the GUI, basically allow user to specify multiple way points and have a real map rendered in the background. We are not sure how much we can do, but we'll try basic functions in the first

We'll work on improving the path planner and we are expecting the costmap near obstacle and shores to be improved by the next field test. We'll also keep working on the rules-of-the-road.

We'll also coordinate with boat driver to finalize the date for the SVE and SVE encore.