William Seto

Team B: Auto Pirates

Teammates: Bikramjot Hanzra, Shiyu Dong, Tae-Hyung Kim, Tushar Chugh

ILR09

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Individual Progress

For this progress review, I focused on integrating the new perception code (with filtering) with the path planner and getting ready for the field test.

Although we had previously integrated the radar data with the path planner, there were still a few unresolved issues. Since we previously had been reinitializing our costmap and planner after every iteration, we didn't consider how we would take in radar data over a period of time if we don't clear the costmap. I decided to take the latest filtered radar data as the obstacles which would be considered by the planner. The reason we don't take an average or anything is because we assume that the octomap package is already integrating all the information and should be giving us the maximum likelihood estimate at every instance. Implementation-wise, we maintain a list of positions that correspond to obstacle locations as determined by the perception subsystem. Then right before replanning, the costmap is updated. After replanning, the costs are reset back to 0. In the Figure below, the orange markers illustrate the filtered output of the perception subsystem. The red markers show what the path planner has received and is planning on. Note the slight lag between the marker locations since the path planner runs quite slow.

In preparation for the field test, I worked on creating several different costmaps, in which the costs around the shores and pylons were varied by different amounts. Additionally, I also included a few variants with the "middle line" as described a few PRs ago (to try and keep the boat on one side of the river).

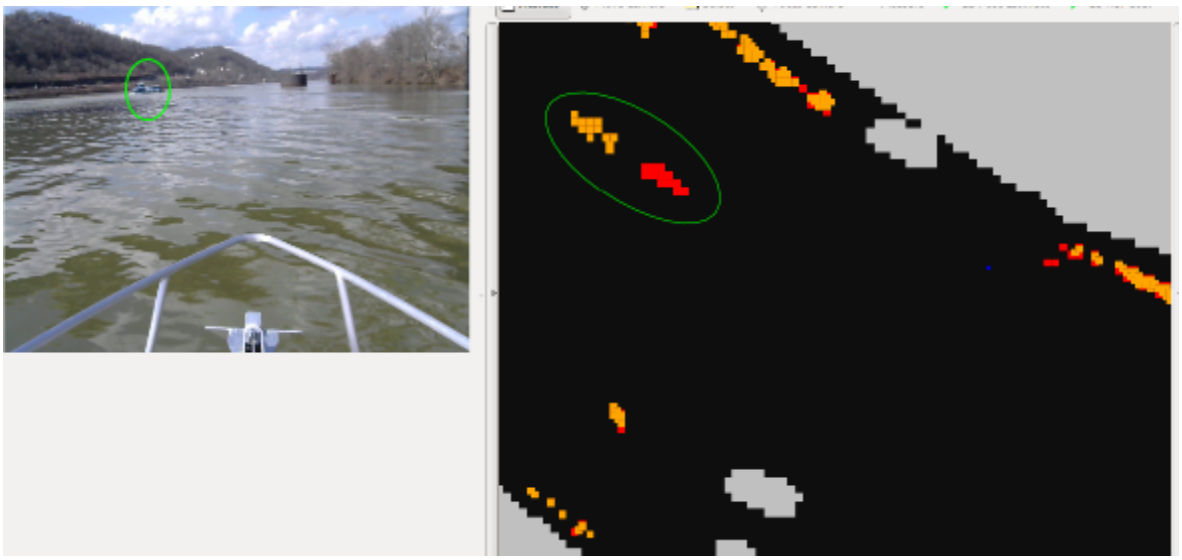

Figure 1: Due to time spent path planning, the obstacle has traveled further

Challenges

Since it had been a while before our field test, there were not much challenges encountered in preparing for it. Most of the challenges came during the field tests, in which there was some unexpected behavior and we had to spend time after the field test to debug the issues.

In the beginning of the field test, we first experienced issues with the navigation computer not responding and the radar not starting. We don't know the root cause, but after restarting the power system a few times, both systems came up at the same time. After that, it took us sometime to set up our own software. As mentioned during the Progress Review, we recorded an instance where messages were dropped for a period of time. This happened in the beginning of the test as well where packages were running but several messages weren't popping up, such as the perception output. It could be because we introduced several new packages that are heavy message publishers, so this is something to keep watch of. Additionally, we were unable to get our "middle line" map to work. It could be because we didn't test it in enough locations, because we didn't see any good plans based on where we were in the river at the time.

Moreover, the other issue we faced was also mentioned during the PR, in which the navigation computer was ignoring some of the waypoints. We had initially mentioned that this was because the navigation node's callback queue was set too small. While this is the major problem, after further testing, we also added a small delay in between each waypoint message. ROS doesn't seem to be perfect and random things such as network effects can cause messages to be lost every now and then.

Teamwork

Shiyu Dong

Shiyu worked on creating the test plan for the field test. I worked with him in preparing the different maps and motion primitives. He also created the videos depicting the successes and failures of the field test.

Bikramjot Hanzra

Bikram added the joystick control for simulating the fake obstacles and integrated it with the path planner.

Tae-Hyung Kim

Tae-hyung worked on capturing and creating videos of the field test. He also made progress on figuring out how to integrate the robot_localization package with our project.

Tushar Chugh

Tushar worked on making the fixes to the path planner after we identified the problem that it was ignoring some of the waypoints the path planner sent.

Plans

The next step for us is to improve our costmap functionality so that we maintain a reasonable distance from all obstacles. Also, after our meeting with our sponsor, who encouraged us add more functionality to the GUI, we will be looking into seeing if it's possible to overlay some Google Maps/Earth-like imagery to our existing map. Additionally, we will also add a few predefined destinations to the GUI, to provide a more "water taxi"-like experience.