Team F: FALCON EYE

Individual Lab Report 2

Progress Review 1

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1 Individual Progress

My primary contribution for the progress was the debugging of husky AGV, procurement of necessary accessories needed to make the AGV work. Also, I was figuring out the working of Hokuyo LiDAR for mapping.

1.1 Husky Debugging

Husky is a rugged, outdoor-ready unmanned ground vehicle (UGV), suitable for research and rapid prototyping applications. It has several nodes such as husky_navigation, husky_odometry, husky_diagnostics and many more which are essential for the robot's operation. All these nodes are run intuitively by the husky upon its power ON.

The husky diagnostics node gives info on the input voltage of the battery, voltage and current supplied to the motor drivers, temperature of the drivers and the working status of all the other nodes. Upon careful review and comparison of these values with the specifications mentioned on clearpath's website, the initial conclusion was that there is a problem with the driver on passing the voltage onto the motors. This was because the input voltage of battery was 25V but upon sending commands to move the husky, the voltages to the left and right motors were still zero.

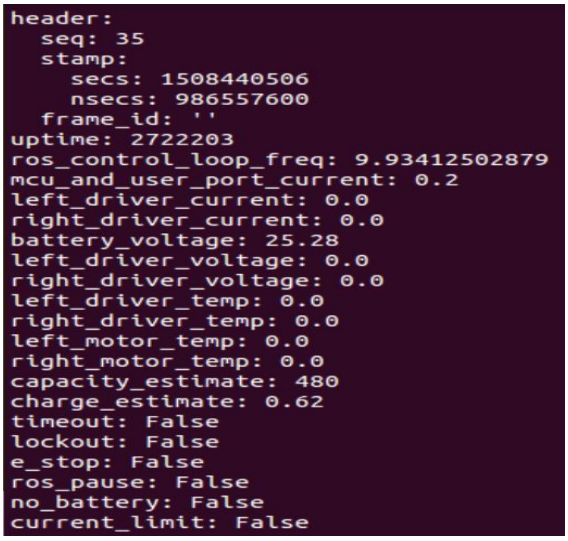

Fig.1. Message published by the husky AGV

Hence, we tried opening the husky and checked out the circuitry to see if the fuses were intact. All the fuses were intact. We wanted to check the motor drivers but they were sealed in a compact case. We had to ask permission from George before opening it up which we couldn't before PR1.

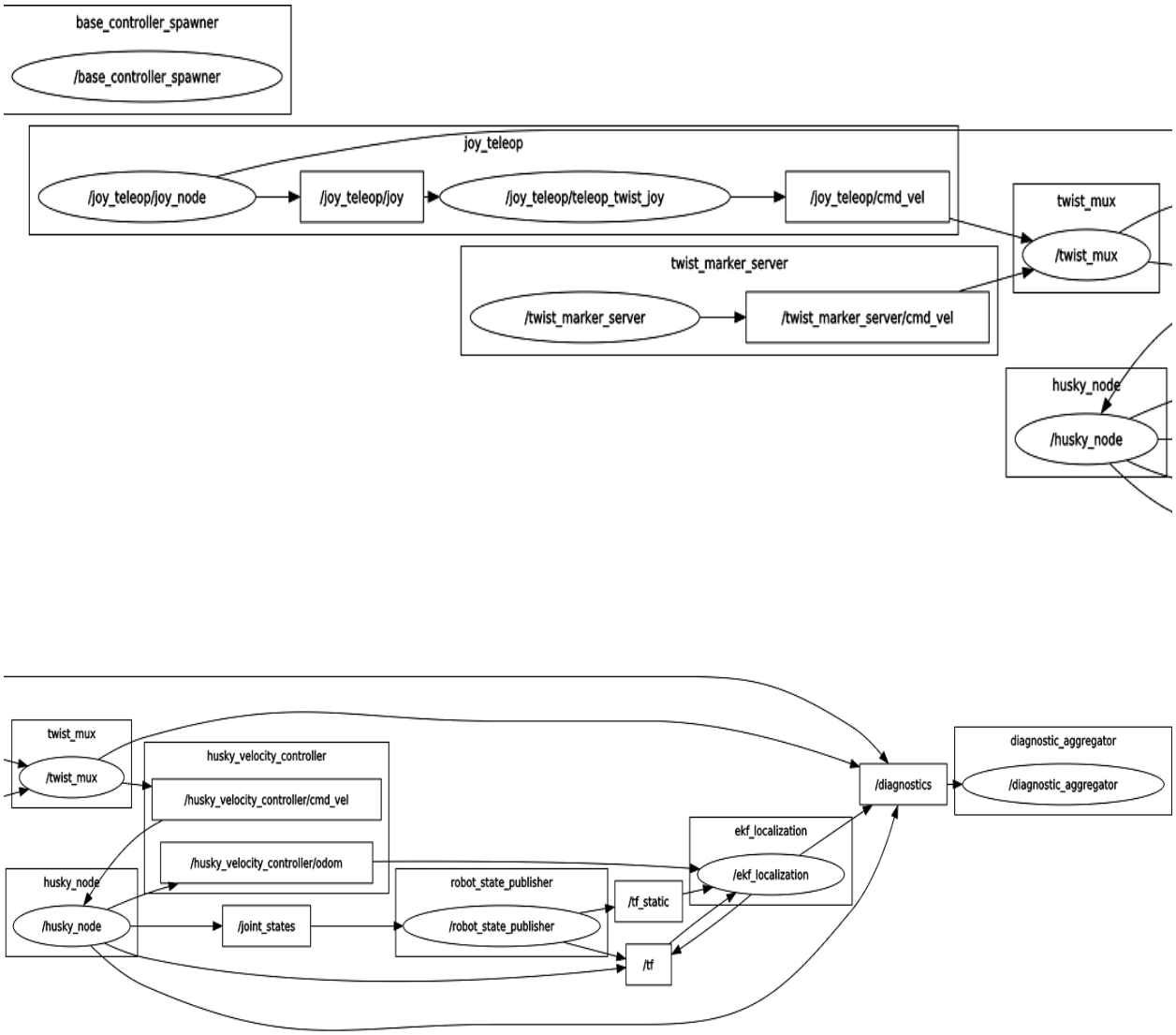

Fig.2. Node graph of the husky AGV

I tried running the husky by directly sending command to husky controller rather than tmux but still it wasn't working. I interfaced Logitech gamepad to ubuntu by installing jstest and made sure that the joystick was working. I tried controlling it

with joystick, but it still wasn't moving. We finally decided to find another husky to work on and asked Dimi about an availability at NREC. We got one yesterday and got that working with ease. With the help of the NREC husky as reference, we debugged each node of our old husky and successfully got that working too. We now have two working husky.

1.2 Procurement of Husky Accessories

When we got the husky from George, it didn't have a proper working battery and we had no way of testing. So, we had to rely on simulation on Gazebo. I looked up online for the right kind of batteries that fits the husky input voltage and current specifications. The husky needed a 24V, 20Ah supply for its functioning. I had several options online on the type of batteries. Upon consultation with George and others who had worked on husky before, I decided to go with the Lithium Iron Phosphate batteries with the same specs. The order was placed, and I kept in constant touch with the vendor until it was delivered. Currently, one of the husky has flat tires and I am figuring out a way to get them fixed with the smallest lead time possible.

1.3 Hokuyo LiDAR

We got a Hokuyo LiDAR (URG 04-lx) from Tim (George's PhD) to finalize on whether it would fit our requirements. I tried visualizing its laser scan on rviz but there were many errors that I needed to debug before I could get the output properly. I had to calibrate the Hokuyo before it could give the positions correctly. From the output I got, I decided that the time taken to build a map would be way higher that we expected and exceeds our requirement. Moreover, it gives a 2D map and its pretty hard to make an arrangement and create a 3D map.

Today, we got a mail from John informing us that we would be getting an Velodyne Puck around next week. As far as our trade study goes, it best fits our requirements and gives us a 3D map.

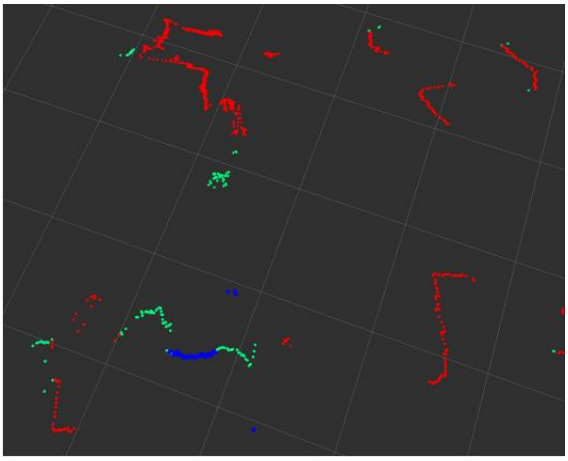

Fig.3. Laser scan data of our lab at FRC

2 Challenges

There were many challenges that we faced both technically and regarding our use case. We were struggling to find a fit between our interests and sponsors requirements. We had meetings with Dimi and John and had decided on keeping the use case specified in the CoDR fixed. But, our sponsor suggested us a different use case and we were again in a fix . We finally had a group meeting among our self and decided to go with the sponsors requirements with minor changes to make it fit with our interest. The final use case being that the UAV is going to survey and assess the path to the disaster area and define a path for the AGV to traverse safely to reach the disaster zone. It's a multimodal navigation system which makes the system better efficient and faster than our earlier one as we were planning to map and traverse using husky.

One other major challenge was to make the husky work. No one in our team was sure about the problem. We even did call Tim to help us with it but neither was he able to get it working. We tried reinstalling the complete software with OS but that didn't give a positive result either. Finally, we got it working with the help of the NREC husky as the reference.

Also, figuring out the node communication for Hokuyo was quite challenging but interesting as I got it working.

3 Teamwork

The work of flying the drone with commands from computer was split between Yuchi and Danendra. Danendra interfaced the drone with ROS while Yuchi did the same using SDK. They controlled the drone in all four directions in addition to take off and landing. Pulkit and Pratibha shared work with me on the debugging of Husky. We took shifts on debugging which gave us more working time as each of us gave up after an hour of continuous debugging. This went on for four days and now as a result we have got two working Husky.

Danendra and Yuchi did the awesome job of making the drone run on commands quick. This gave us the confidence that at least one part of our PR1 goals were complete. The variety of methods we debugged from each other's point of view has given us the confidence that we can overcome any other problem that comes up in the future and made me realize that it's better to have difference of opinions at times.

4 Future Plans

For the next PR, I will look deeper into the navigation stacks of husky and work on its movement. That is, for a given specific distance, making the husky move to that distance. I will also work with Pratibha to interface GPS with Husky and incorporating that data into husky's node in ROS. We are planning to use MediaTek GTPA010 from the MRSD inventory and developing ROS node for reading the GPS data through serial link.