MRSD Project 1

Individual Lab Report #02

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PhoeniX
Teammates:
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Individual Progress

My personal task this week was to make the Husky (UGV) do a very simple mission (basically a state machine).

To achieve this, I started by making husky move using manual control. While we had achieved manual control of Husky a month ago. I was having some issue achieving the same. The major issue was communication between ZOTAC (Single board computer on husky) and the husky. I fixed the issue by reinstalling husky core service and getting stable manual control.

After that I parallely started working on creating ZED camera mount on the husky and getting IMU to work with ZoTac since it was essential for the mission for getting precise orientation. IMU was in pretty bad shape and was not working when I connected with the ZOTAC computer. Creating mount for ZED camera went relatively straight compare to IMU. IMU required further work in installing driver and ros package so that it can publish IMU data to proper channel. Finally I got the IMU to publish data in proper rostopics.

I also wrote the simple task of controlling husky in our ROS action server framework which can give control command for husky. Steve was given the task to writing ROS listener to the IMU data and creating a high level state machine. He was having trouble doing the same. Together we got the state machine working which was listening to IMU Data and was providing control signals for husky.

When everything was working properly, the ROS tree looked like figure 1. ZOTAC required power supply, monitor and keyboard to control. Clearly, controlling Husky with those peripherals connected is not a good idea. I started using ssh into ZOTAC but everyday IP used to change, so I had to connect monitor and keyboard to see the IP. With the help of Akshit, I was able to create static IP using CMU Device Wifi. I also had to figure out way to run SSH server and Wifi Connection without login in. Because by default without login in neither worked. Once both of them were fixed. I was able to login using ssh as soon as I power up ZOTAC.

Challenges

The major challenge this week was getting IMU to work properly. As I mentioned above, inherited IMU was in pretty bad shape and we were not sure if there was hardware issue or software issue. Also, we were not sure what kind of IMU we had since it looked like custom built. While connected port on ZOTAC was detected but it was giving information about the Chip that was used to create serial communication. We searched what kind of IMU were used in Husky. We were able to narrow it down to UM6 and UM7. I installed and tried both the ros packages and successfully able to get IMU working with UM7 ros package.

Creating mount had challenges like finding parts from the MRSD lab. While it would have been pretty easy if I precisely had all the parts from the start but I had to make best of what was available in the lab. Luckily, I was able to find all the required parts from MRSD lab and Cage. Final mount can be seen in figure 2.

Figure 2: Husky with Zed Camera mounted

Getting into ROS action server framework was tricky. But with certain abstraction in mind and looking at various example code. I was able to figure out required parts to run the system. Akshit and Shubham reported the problem present in Zed Stereo camera. I also tried my hand i figuring out the problem. I was able to determine that problem was with USB 3.0 and there was data corruption when high data rate was used in USB 3.0. Probable reason for such corruption

would be faulty cable connection. Finally Akshit and I ran diagnostic tool and Akshit initiated the process for returning the ZED camera since we can't fix internal USB 3.0 connections.

Teamwork

Apart from the small collaboration mentioned above. Major teamwork was required when Steve was unable to get into our code and add ros listener to the IMU data. He is also very new to the ROS which made the task even harder. I helped him understand the code as well as some ROS basics. He was still having trouble getting started. We sat together for couple of hours and got him started on how to go about writing code and where to look for when we get stuck. He was finally able to contribute to the code and hopefully would be able to pick up new tasks quickly.

Akshit and Shubham also were having issues with axis frame transformations from tag to camera to UAV frame. I helped them in figuring out minor functions such as converting rotation matrix to quaternion angles and vice versa.

Plan

Shubham and I will start working on getting ORB SLAM 2 start up and running for both UAV and UGV. Compiling ORB SLAM in both the system is first and second part is to integrate that SLAM with our code framework. While we are committed to finishing the former, we will see how far we can get with second part. SLAM would allow us to make significant progress in doing elaborate mission plan especially indoor since GPS doesn't work indoor. Akshit and Steve would start working on the thermal camera to identify high heat area using classical method or machine learning.

Hopefully faulty ZED camera would get replaced in time otherwise we would need to do away with other ZED camera for the time being. Creating mount for the IMU is also on our task list and we need to figure out PCB for the husky since we need to power ZOTAC, LiDAR and water deploying motor.