**ASSIGNMENT 7 - Map, Localize, & Navigate**

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**Description of the problem**

The goal of this assignment is to map, localize, and navigate an environment with our robot using its Jetson Nano and ROS Controller. We have setup our JN and ROS Controller, tested and calibrated the robot and its’ LIDAR and properly interfaced all of the components. This report will demonstrate all of the parts in sections between Mapping, Localization, and Navigation.

**Tasks**

1. Demonstrate Mapping
2. Demonstrate Localization
3. Demonstrate Navigation

**Task Source Code Directory**

DesignAssignments/da7/

**Task 1 (Mapping)**

To complete this task we configured the JN to properly run the yahboom\_nav package for running the LIDAR, generating the GMAP, and reading the GMAP on the computer. We found this step to be fairly simple, we just encountered a problem with the LIDAR being read in from the wrong USB Port. However, we fixed this problem and found ease in completing the rest of the assignment.

To execute this task you must run the following steps

These steps are described assuming that you have a properly configured JN and are running our da7 package on your laptop

(Laptop)

Terminal 1

1. roscore

Terminal 2

1. Cd DesignAssignments/da7/
2. catkin\_make
3. Source DesignAssignments/da7/devel/setup.bash
4. roslaunch yahboomcar\_nav view\_map.launch

(Jetson Nano via SSH)

Terminal 1

1. roslaunch yahboomcar\_nav laser\_bringup.launch

Terminal 2

1. roslaunch yahboomcar\_nav yahboomcar\_map.launch use\_rviz:=false map\_type:=gmapping

View the generated data in RVIZ and use your joystick to navigate the robot.

Video: <https://youtu.be/Lk2DEVCysIA>

**Task 2 (Localization)**

To complete this task we first saved the map generated in the previous step. Upon completion of saving this map theres several changes that need to be made. First, we had to transfer the map to the JN and then ensure that the pathing in the file was built off of the JN and not off of the Host Laptop. Once this is complete, we can cease map generation and begin reading from the map.

To execute this task you must run the following steps

These steps are described assuming that you have a properly configured JN and are running our da7 package on your laptop

Leave all nodes from the previous step running, but close the gmapping node on the JN.

(Laptop)

Terminal 1

1. Should already be running roscore
2. rosrun map\_server map\_saver -f ~/DesignAssignments/da7/src/yahboomcar\_nav/maps/"QuinnsBedroom"
   1. Transfer this file to JN
   2. Edit it’s pathing to appropriately match the JN pathing
3. Should already by running roslaunch yahboomcar\_nav view\_map.launch
4. View map with rover on it in RVIZ

(Jetson Nano via SSH)

1. Should already be running roslaunch yahboomcar\_nav laser\_bringup.launch
2. Cease the roslaunch yahboomcar\_nav yahboomcar\_map.launch use\_rviz:=false map\_type:=gmapping node
3. roslaunch yahboomcar\_nav yahboomcar\_navigation.launch use\_rviz:=false map:="QuinnsBedroom"

(Final Steps)

1. Use 2D pose estimation in RVIZ to help the robot in Localization. You may also drive it manually to help it gather more data about its environment in relation to the map.

Video: <https://youtu.be/k4om3ObFKOc>

**Task 3 (Navigation)**

To complete this task we finished localizing the robot as described in Task 2. Then, we used the RVIZ software to properly plot waypoints for the Robot to follow.

To execute this task you must run the following steps

These steps are described assuming that you have a properly configured JN and are running our da7 package on your laptop

Leave all nodes from the previous step running

(Laptop)

1. Use 2D Pose Navigation to plot waypoints for the robot to navigate to. You may choose pose in terms of location and orientation.

Video: <https://youtu.be/mtPreaCFD74>