POLITECNICO DI MILANO

ROBOTICS 2020-2021
prof. Matteo Matteucci

Homework 2

TITLE

Second robotics project

SCENARIO

SCOUT 2.0 AgileX Robotics

GROUP

Chicago

Team Members

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1. FILES INSIDE OUR PROJECT

In this section, we present all the files inside our project. To be more clear, we report the tree structure of our project through the command line

`:~$ tree`

```
boston
├── CMakeLists.txt
├── include
│   └── boston
├── launch
│   ├── amcl.launch
│   ├── amcl.launch.xml
│   ├── ekf.launch
│   ├── gmapping.launch
│   ├── gmapping.launch.xml
│   ├── imu_tools.launch
│   └── localization.launch
├── maps
│   ├── map.pgm
│   ├── map.png
│   ├── map.world
│   └── map.yaml
├── package.xml
├── rviz
│   └── localization.rviz
└── src
```

Our project directory is called "boston".

In the boston directory, we can find the package.xml file with all the imports needed to run the project and the usual CMakeLists.txt.

We structured the project with the main folders: maps, launch, rviz.

Particularly, maps contain all the files related to the mapping as shown by the figure above.

Launch contains the two main launch files, that are gmapping.launch and localization.launch.

gmapping.launch performs mapping and the localization.launch performs localization based on the map in output from the gmapping.

2. TF TREE structure
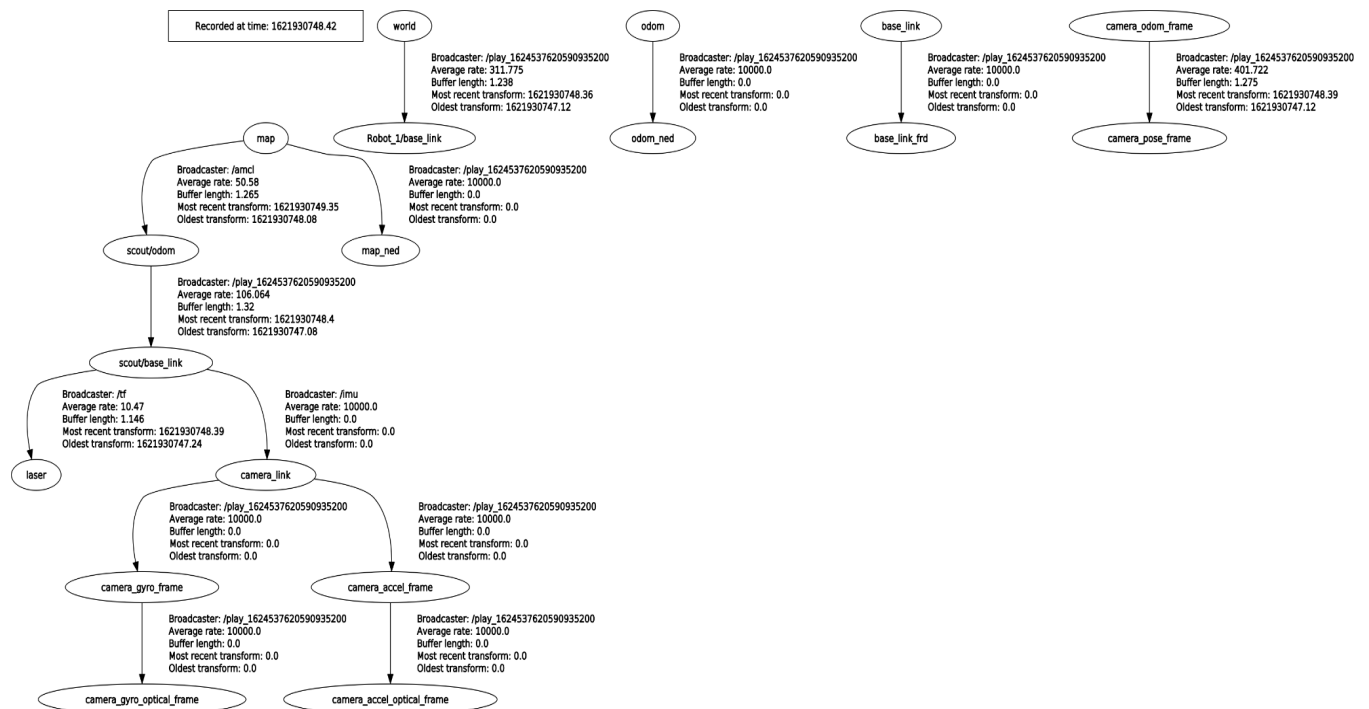
Our project involves just the left part of the tree, the one which has the map frame as root for the reasons we'll explain further on.

3. BAGS

Mapping: bag 1
Localization: all the other bags

4. START NODES

We structured our project in two main launch files:
- gmapping.launch performs mapping;
- localization.launch performs localization based on the map generated by gmapping.

Both launch files:
- start a tf static transform publisher to compensate for the rotation between the odometry and the laser;
- set the use_sim_time parameter to true.

The localization.launch files include other launch files necessary to perform the localization task:
- the ekf node;
- the imu tools node;
- the amcl node;
- map server with loaded map;
- rviz configuration.

5. SENSORS CHOICE

We decided for gmapping to use the odometry published by the scout because using *plotjugger* we realized that the odometry of the scout and the one given by the camera were very similar.

For the localization task, we opted again for the odometry of the scout fused in the ekf with the imu data (obtained via imu_filter_madgwick) to obtain a filtered odometry to use during amcl.