SECOND ROBOTICS PROJECT

ROBOTICS
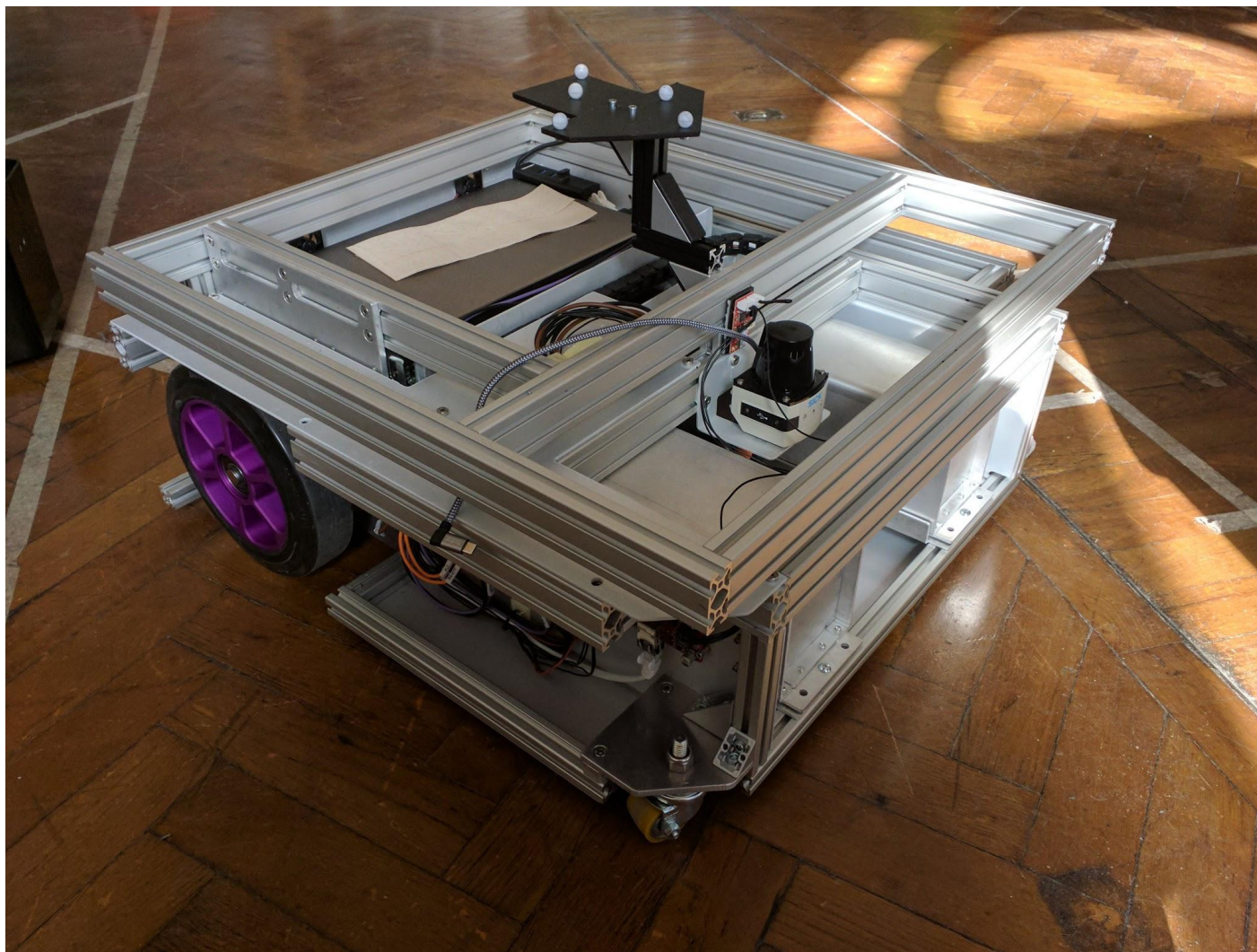
-Compute odometry (2 sources) and publish as tf

-Use a parameter to switch between different odometry

-Publish a custom message with odometry value and type od source

-Create a map using gmapping and one bag of the corridor

-Localize inside the map, using amcl and the other corridor bag

https://goo.gl/GonArW
Project_2 folder

Odometry

You have to compute two odometry, the first one using the encoder readings; the second one using the encoder plus the gyroscope data from the IMU to get a better angular speed.

Sensors are noisy, you can't simply compute odometry, but you need to estimate some parameters to properly tune your algorithm.

To test your odometry node you can use the first_bag and second_bag files for the "only encoder" part and the imu_bag file to add the gyroscope data.

Those files provide you the robot data and the exact position of the robot using OptiTrack.

How to use first and second bag

/vel topic is the velocity of the robot computed by the encoders

/robot_markerset topics are the position of the robot using Optitrack (you have bot the 3D and 2D position, for the project you can use the groud_pose topic which is the 2D position)

to properly use the optitrack data you need first to add some tf:

-tf from the initial position of the robot(from OptiTrack) to the computed odometry, because the robot will not start moving in (0,0)

-tf from the base link of the robot (the centre of the robot, also the position given from OptiTrack) to the odometry center, which is between the two wheels of the robot; 17 centimeters back and 3.4 centimeters up

Suggestion on "How to use first and second bag"

You can directly visualize the topic published by the OptiTrack inside rviz, but the rotation value might be wrong; you are not interested in this value because you only have to compute the proper position.

So you can write a node which subscribe to the OptiTrack data and republish it as a maker to better visualize inside rviz (visualization_msgs/Marker)

You also have a third bag file called square; if the robot parameters are good the robot should be moving around a square

rqt_bag may not work, use command line

you may need to use the command "rosparam set use_sim_time true" to properly visualize all the data inside rviz (if you get error regarding the timestamp of the messages)

Switch and Custom Message

Once you have both odometry you will use a parameter to dynamically switch between the two values. Only one odometry will be published, based on the parameter value it'll be the one from the imu or the one from the encoders.

Then you will create a custom /odometry message which contains:

-the position of the robot

-the type of the source "imu" or "encoders" as a std_string

Map and Localization

Next you will choose one of the corridor bag file and create a map using gmapping and the best odometry source

Last you will write a navigation stack launch file, with all the proper parameters, to localize inside the map using the second bag file

Deadlines and requested files

-Send **only** a tar.gz file (put the .txt file with info inside the archive)

-Send both to Mentasti Simone and Matteo Matteucci

-Inside the archive:

  -txt file (details next slide)

  -map file you created

  -folders of the nodes you created (with inside Cmake, package, etc...)

  -root folder of the launch file with all the settings files used to launch gmapping

  -root folder of the launch file and all the parameters file used to start the navigation stack and localize inside the map

Deadlines and requested files

File txt must contain (at least):

-ID, name, surname of both team members

-small description of the files inside the archive

-name of the parameter to change odometry source

-description of the procedure used to create the map (which odometry, which bag file, specific gmapping settings)

-description of the navigation launch file parameters

-info you think are important/interesting

Some more requests

Insert in the archive all the file you think are important, i should be able to properly recreate your workflow from the odometry estimation to the map localization

Name the archive with your ID

Don't use absolute path

Deadlines and requested files

Deadline: 27 June (3 weeks)

Questions:

    -write to me via mail (simone.mentasti@polimi.it)

    -write to the #general channel on Slack group

    -write directly to me on the Slack group