
SECOND ROBOTICS PROJECT

ROBOTICS



POLITECNICO
MILANO 1863

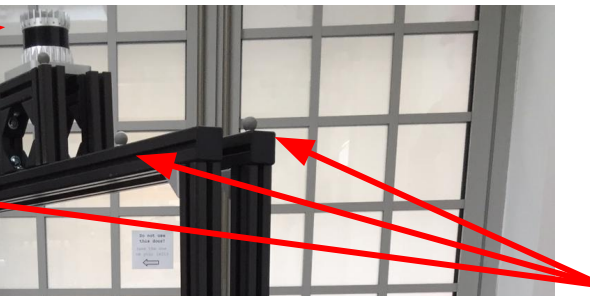
THE ROBOT



Oyster 64 plane lidar



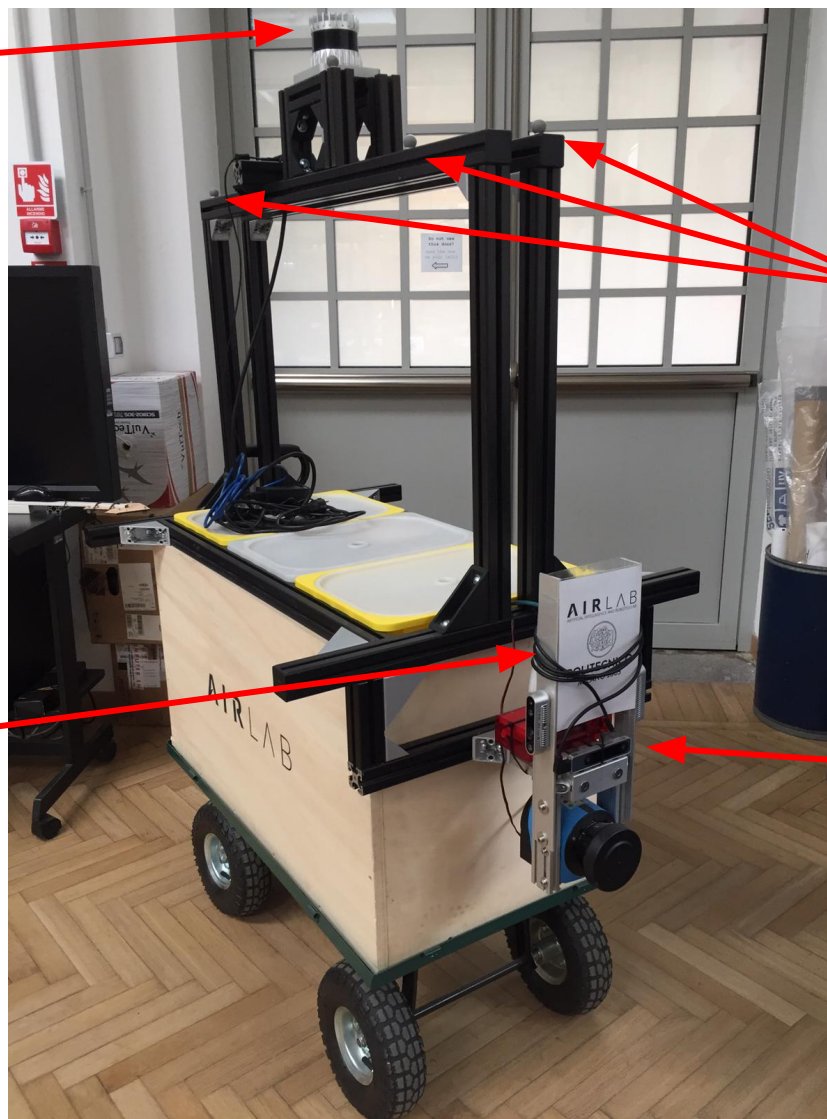
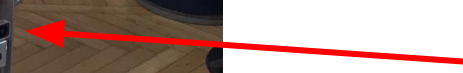
Optitrack Markers



STM IMU



Intel T265



DATA



Format: ROS Bag file

Data: **Two** bag file

Topics:

- Pointcloud (/os1_cloud_node/points)
- Visual Odometry (/camera/odom/sample)
- Optitrack Odometry (/Robot_1/pose)
- IMUs (/mavros/imu/data_raw, /os1_cloud_node/imu)
- tf (/tf)

THE PROJECT



- Choose **one bag**
- use the data to create maps using gmapping

- Configure move_base with amcl and the computed map
- Test the navigation stack with the **second bag**

Map Creation



- Convert 3D PointCloud to laserscan to use with gmapping:
http://wiki.ros.org/pointcloud_to_laserscan
- Configure the correct tf tree to work with gmapping
- Create one map using the Optitrack odometry (Robot_1/base_link)
- Create a second map with the visual odometry (camera_pose_frame)



move_base configuration

- Setup the navigation stack to work with the provided data
correct tf-tree, topics, parameters
use the **visual odometry**, not the optitrack odometry
- Utilize the **map created with the visual odometry** for localization



- tf-tree is not complete from the bag
- yaw offset from **optitrack** to **lidar (os1_sensor)**: 3.14 rad
- x offset from **camera** to **lidar (os1_sensor)**: -0.675 m
- y offset from **camera** to **lidar (os1_sensor)**: -0.008 m
- z offset from **camera** to **lidar (os1_sensor)**: +0.96 m



Optional (improve visual odometry)

Improve the visual odometry (both for map creation process and navigation):

- visual odometry is noisy

Fuse visual odometry with IMUs data

- use the robot pose ekf (http://wiki.ros.org/robot_pose_ekf)
- or the robot localization package
(http://wiki.ros.org/robot_localization)

Tips for map creation



gmapping **does not use** odometry topic but tf

Use the turtlebot3 example as a reference for correct tf-tree configuration

start with optitrack data, which has no drift, but works only for a small part of the bag file (stop the map creation process when optitrack data are not available)

You can monitor the map creation process subscribing to \map inside rviz (and also compare the results with the pointcloud data from lidar to check how accurate it is)

THE FILES



https://polimi365-my.sharepoint.com/:f:/g/personal/10458351_polimi_it/EtF6L7pw5odBsRbZi1QfWFMBKpHX7DNw1J5054WK5C7Wlg?e=YERns5



Deadlines and requested files

- Send **only** a tar.gz file (put the .txt file with info inside the archive)
- Send via e-mail both to Simone Mentasti and Matteo Matteucci
- name the e-mail “SECOND ROBOTICS PROJECT 2020”
- Inside the archive:
 - txt file (details next slide)
 - folders of the nodes you created (with inside CmakeLists.txt, package.xml, etc...)
 - folder with the two created map (optitrack and visual odom)
 - do not send** the entire environment (with build and devel folders)



Requested launch files

- Launch file for gmapping to compute the map with optitrack data
- Launch file for gmapping to compute the map with visual odometry data
- Launch file for move_base/amcl

I should be able to create a map and start the navigation stack with the launch file, include everything in there (i.e., static tf, use_sim_time, etc.).

You can assume I will start:

- the bag file in a new terminal
- the map server to save the png image (for the gmapping task)



Deadlines and requested files

File txt must contain (at least):

- ID, name, surname of all team members
- small description of the files inside the archive
- structure of the tf tree
- name of the bag used to create the map and bag to test move_base
- description of how to start/use the nodes
- 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

Name the archive with your ID

Don't use absolute path

DO NOT SEND THE BAG FILE



Deadlines and requested files

Deadline: 5 July

Max 3 student for team

Questions:

- write to me via mail (simone.mentasti@polimi.it)
- do not write only to Prof. Matteucci
- ask on Teams/Slack