

FIRST ROBOTICS PROJECT

ROBOTICS



POLITECNICO
MILANO 1863

THE PROBLEM



Provided data:

- Odometry from the robot
- GPS data
- Laserscan



DATA



Format: ROS Bag file

play the bag with the command:

```
roslaunch play --clock robotics.bag
```

Data:

- /fix gps data
- /odom odometry from encoders
- /scan single plane laser scan data



THE PROJECT (First Node)

- Create a ROS package called *first_project*
- Create a ROS node to compute the odometry from gps data:
 - write a node called *gps_to_odom* which publish:
 - odometry message:
 - type: *nav_msgs/Odometry*
 - topic name: *gps_odom*



THE PROJECT (First Node)

- to convert gps data to odometry:
 - convert (latitude-longitude-altitude) to Cartesian ECEF
 - convert Cartesian ECEF to NED
 - NED is a relative position, so you need to specify the zero
- gps_to_odom should have three parameters :
 - lat_zero
 - lon_zero
 - alt_zero
- These parameters should be set in a launch file, for this project you can set manually to the first value from GPS:



THE PROJECT (First Node)

- GPS gives you only position
- For the odometry you also want orientation
- In this scenario we work on a 2D plane, so we want the robot heading
- After computing the robot position in NED you can use consecutive poses to estimate the robot heading



THE PROJECT (Second Node)

- Inside the *first_project* package
- Create a ROS node to convert from odometry to tf:
 - write a node called *odom_to_tf* which subscribe to:
 - odometry message:
 - type: *nav_msgs/Odometry*
 - topic name: *input_odom*
 - publish with a tf broadcaster an odometry between two values set as node parameters:
 - the two node parameters are called *root_frame* and *child_frame*
 - the node is supposed to be started from launch file with topic remapping for input and parameter for the tf_broadcaster



THE PROJECT (Second Node)

- You should write a launch file which create two instances of this node, one to publish as a tf the odometry from the encoders, and one the odometry from gps
- both published tf should have the same root set as world, but the child frame should be *wheel_odom* and *gps_odom* respectively



THE PROJECT (Third Node)

- Inside the *first_project* package:
 - Final node for lidar data visualization
 - The node subscribe to the `/scan` topic and change the frame set in the header
 - The value set in the header is regulated by a dynamic reconfigure callback which allow to dynamically change it to be set to the *wheel_odom* or *gps_odom* frame
 - The final node should allow the user to select from `rqt_reconfigure` to which tf the lidar is connected



THE PROJECT (Launch file)

- The three nodes should all start from a single launch file called **launch.launch**
- The launch file should also open rviz
- the only command to start the project should be:
`roslaunch first_project launch.launch`



THE PROJECT (debugging)

- If the odometry and the tf are set properly you should see in rviz the laser scan data and the odometry
- If you set world as root frame in rviz you should see the laser scan data features stay almost still, and update while the robot moves in the environment
- If the lidar data moves around probably the odometry or the tf are wrong
- Also, check the odometry value, the gps and wheel odometry should have similar values, and diverge a bit trough time



<https://goo.gl/GonArW>

First_Project folder



Deadlines and requested files

- Send **only** a tar.gz file
- Send via e-mail both to Simone Mentasti and Matteo Matteucci
- name the e-mail “FIRST ROBOTICS PROJECT 2024”
- Inside the archive:
 - info.txt file (details next slide)
 - folders of the nodes you created (with inside CmakeLists.txt, package.xml, etc...)
 - **do not send** the entire environment (with build and devel folders)
 - **do not send** the bag files



Deadlines and requested files

File txt must contain only the group names with this structure

codice persona;name;surname

You can add another file called readme.txt with additional info. I will not always look for it. But if something goes wrong I'll check for explanations.



Some more requests

Name the archive with your **codice persona**

Don't use absolute path

The project need to be written using c/c++



Deadlines and requested files

Deadline: 3 May (1 month)

Max 3 student for team

Questions:

- write to me via mail (simone.mentasti@polimi.it)
- do not write only to Prof. Matteucci