POLITECNICO DI MILANO

AUTONOMOUS VEHICLES

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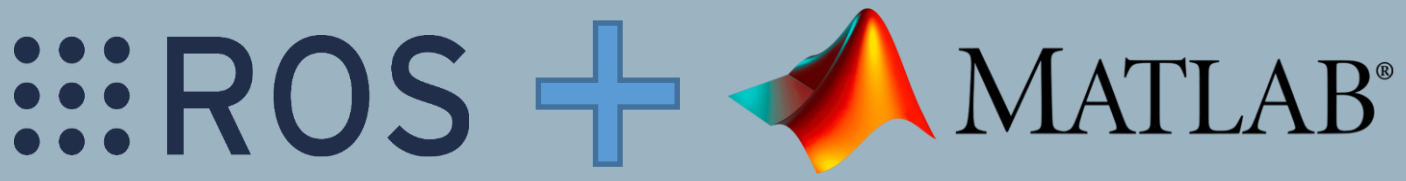
Software requirements



software architecture

- Initialize gazebo with turtlebot3_empty_world.launch

```
$ export TURTLEBOT3_MODEL=burger
$ roslaunch turtlebot3_gazebo turtlebot3_empty_world.launch
```

- Initialize MATLAB/Simulink and connect it to ROS.

rosinit

rosinit('ip_address of the master') *(if using Virtual Machine)*

Alternative software solution

To install and start the turtlesim:

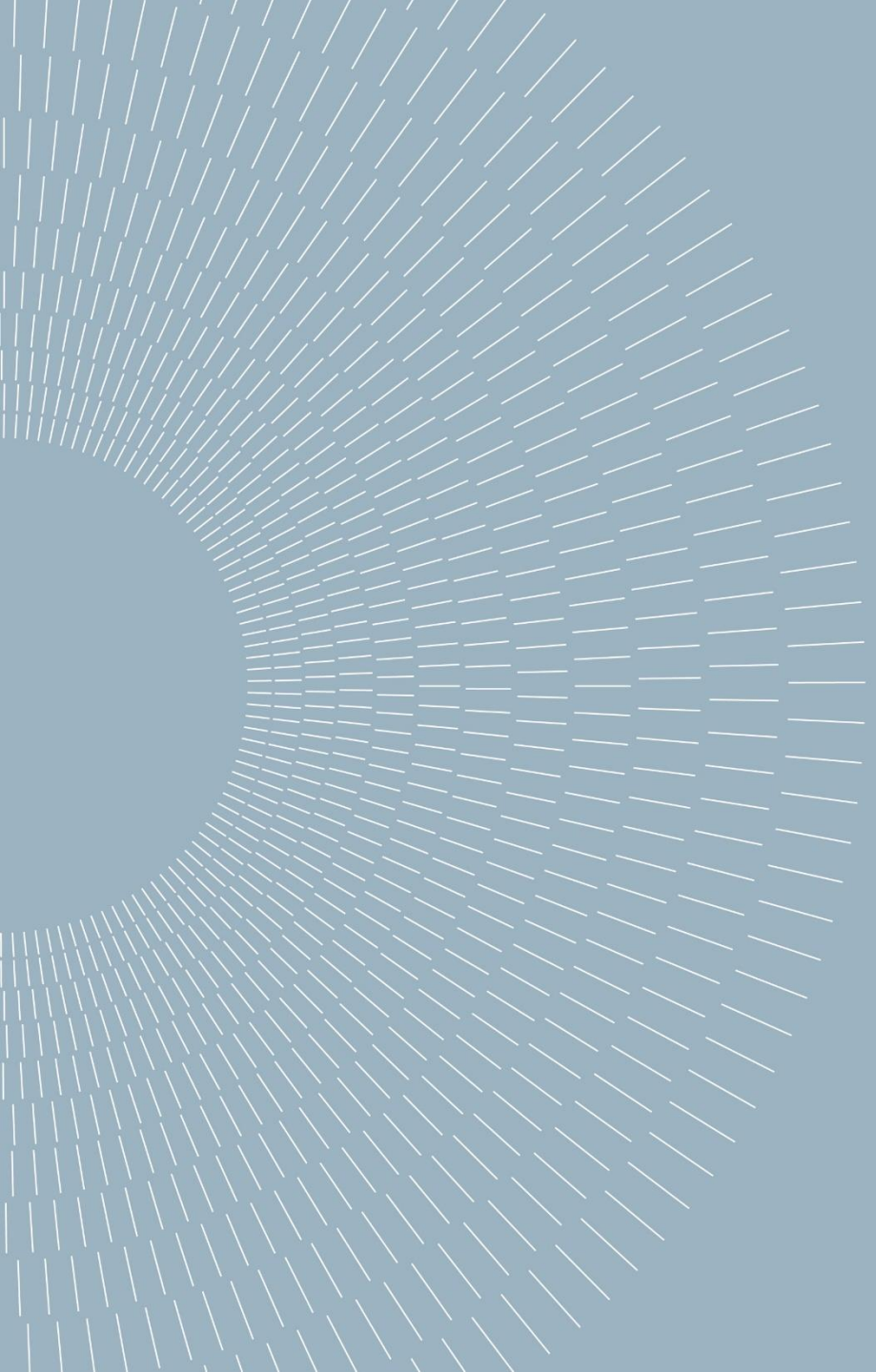
```
$ sudo apt-get install ros-$(rosversion -d)-turtlesim
```

Run turtlesim:

```
$ rosrun turtlesim turtlesim_node
```

- It is **already** part of ***ROS (full desktop)***, in case you don't have it follow the steps reported and install it!

http://wiki.ros.org/turtlesim



ROS

Assignment I -A

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What we expect from you

Starting from a list of waypoints provided (waypoints.txt):

define a feedback control in order to move the #robot from initial position through all waypoints and to stop it at the last one.

List of suggested steps

- Create a simulink block:
  - Incorporate waypoints list
  - Subscribe to #robot position (/odom or /pose)
  - Decide the waypoint to reach
  - Compute control command to publish
  - Stop if last point is reached

Feedback control

- How to reach a waypoint?
  - Consider your distance to the waypoint
  - Consider the direction between you and the waypoint
  - When close to the waypoint, fix your heading

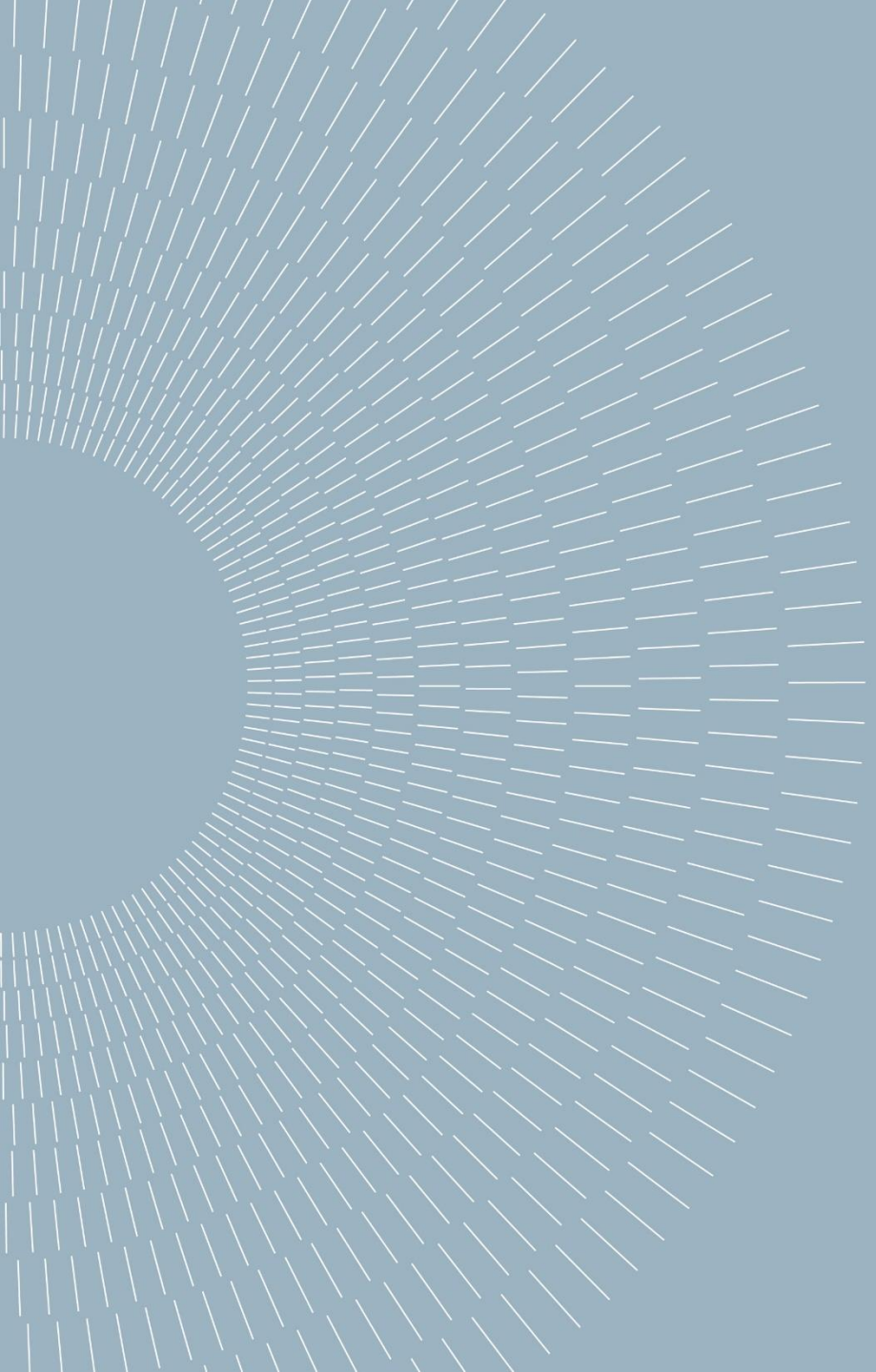
- Control constraints
  - max |v| = 0.2;
  - max dist to waypoints = 0.05
  - max |yaw rate| = 0.4;

HINT: just proportional terms

Results

- What is mandatory for the report?

  - Plot of #robot trajectory and waypoints
  - Plot of velocity time evolution
  - (save a .bag with #robot position, control command)



ROS

Bonus Request

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extra

Waypoint list provided by an external publisher
(i.e python_node, command line, …):

- Create a publisher
- Use message type: "***geometry_msgs/PoseWithCovariance***"
- Insert waypoints into ***covariance*** field (array[36] of float64)
- Modify your simulink in order to subscribe to it

That’s it for today…

See you next time!

S. Arrigoni