



INFO 802

Master Advanced Mechatronics

Luc Marechal



Lecture 5

2022

ROS

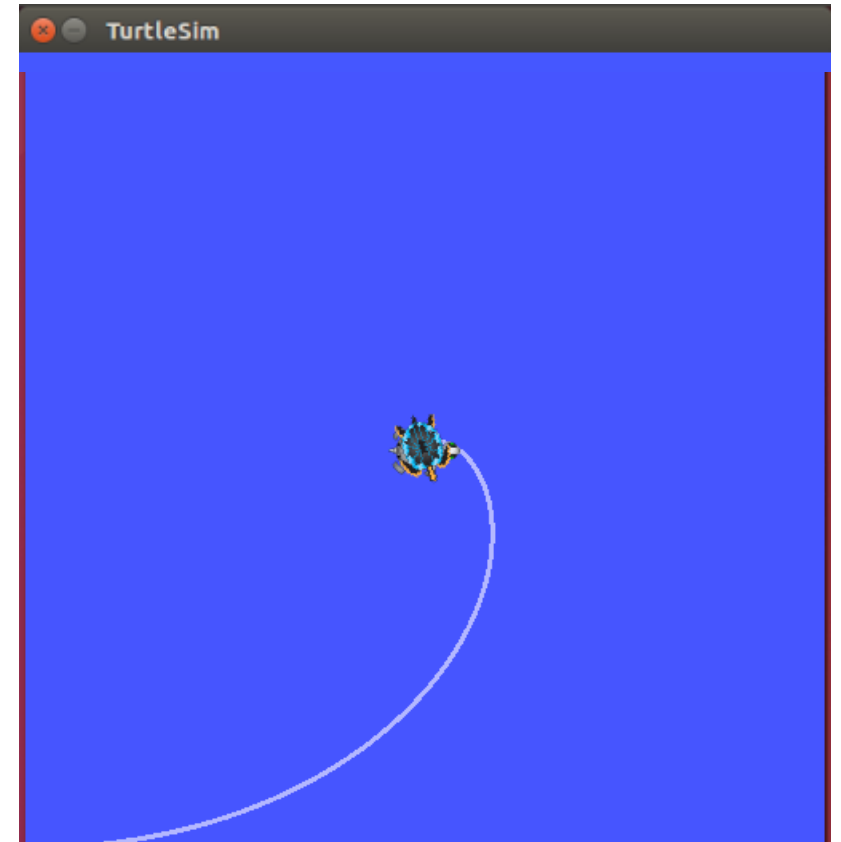
Turtlesim

Turtle to target

Assignement

turtle_to_target (Python)

- Due to Wednesday May 3, 2022. (6pm max. deadline)
- Send me by email the answers to questions in the further slides
- Attach your *turtle_to_target.py* code and launch file
- luc.marechal@univ-smb.fr



Assignement

turtle_to_target (Python)

Download the files: *spawn_turtle.py*
turtle_to_target.py



https://github.com/LucMarechal/ROS_Lectures/tree/master/Assignement_Lecture5

Place them in the appropriate folders inside the *assignments_pkg* package (create the package if it does not exist yet)
Edit the *turtle_to_target.py* and fill the XXXX in the code

Create a launch file named *turtlesim_target.launch* so it launches :

- *turtlesim_node.py*
- *spawn_turtle.py*
- *turtlesim_target.py*

- *spawn_turtle.py* : node that randomly spawn the target (i.e turtle2) in the turtlesim window
- *turtle_to_target.py* : the node that makes the turtle1 move to the turtle2

Assignement

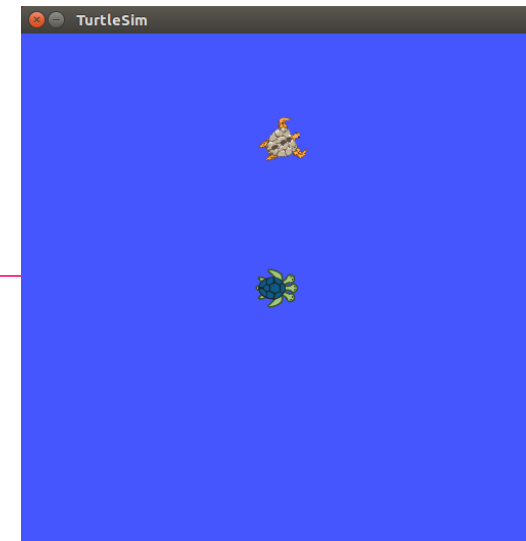
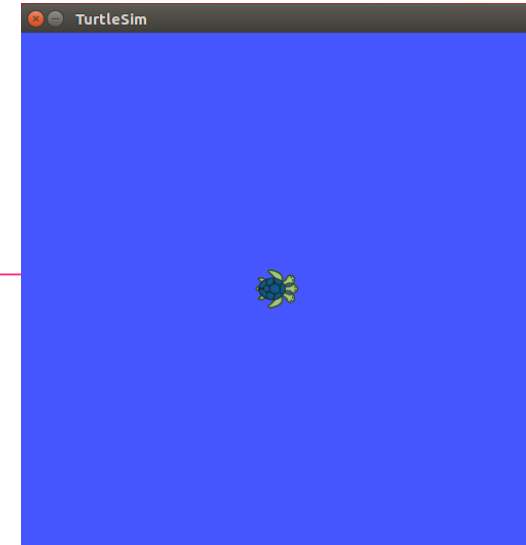
turtle_to_target (Python)

Run the **turtlesim_node** and the **spawn_turtle** node
Find which topics are running on the ROS system

```
luc@USMB:~$ roscore
```

```
luc@USMB:~$ rosrn turtlesim turtlesim_node
```

```
luc@USMB:~$ rosrn turtlesim_tutorials spawn_turtle.py
```



Assignment

turtle_to_target (Python)

At least, answer the following questions:

- What are the turtlesim Pose and Twist message like?
- What should we import in the python header file to use Pose and Twist objects?
- How can we get the Pose of the turtle?
- How can we get the Pose of the target?
- How can we send velocity command to the turtle?
- What should we then import in the python header file ?
- Explain what the `spawn_turtle` node is doing

Assignment

turtle_to_target (Python)

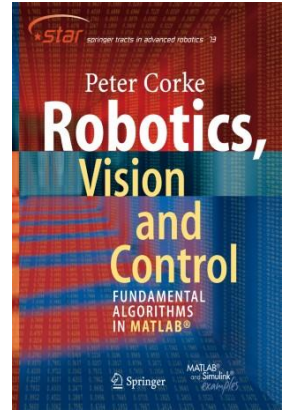
- Create a node called *turtle_to_target* that automatically move the turtle1 to the turtle2. For that you will use linear velocity and angular velocity to control the turtle1.
- The forward velocity is defined as a constant gain multiplied by the distance between the target turtle2 and the turtle1. This means that the forward velocity is higher the further you are away from the target, and goes to zero as you approach the target.
- The angular velocity is calculated similarly with a gain multiplied by the difference in angle between the line that is directly connecting the turtle and the goal position, and the angular pose of the robot itself (check the meaning of the atan2 in the steering angle computation). This causes the robot to adjust its own theta to eventually move in a straight line to the target.

Assignement

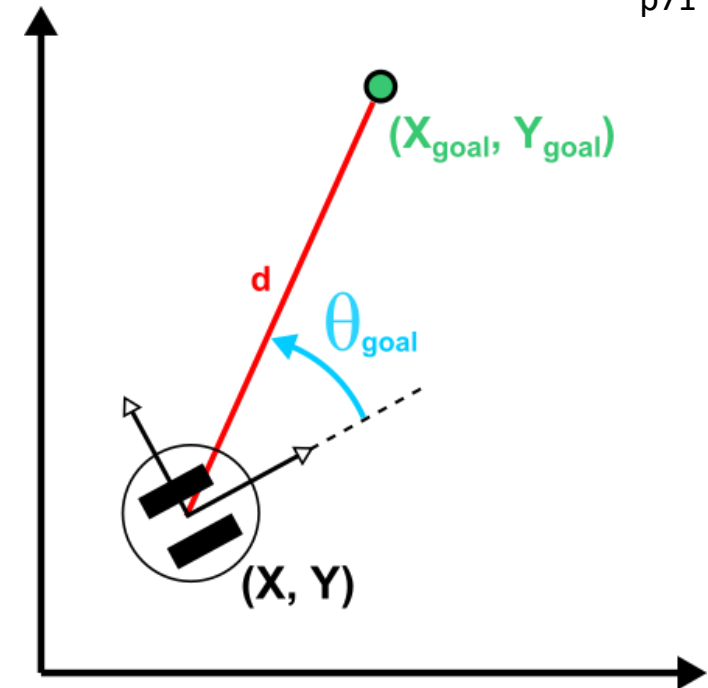
Moving to a Point (x,y) in the 2D plane

- Euclidean distance: $distance = \sqrt{(x_{goal} - x)^2 + (y_{goal} - y)^2}$
- Orientation: $\theta_{goal} = \text{atan2} \frac{(y_{goal} - y)}{(x_{goal} - x)}$
- Proportional Controller: Velocity $v = K_v \times distance$
 Steering angle $\gamma = K_h \times \theta_{goal}$

The robot's velocity is proportional to its distance to the goal



p71



Further References

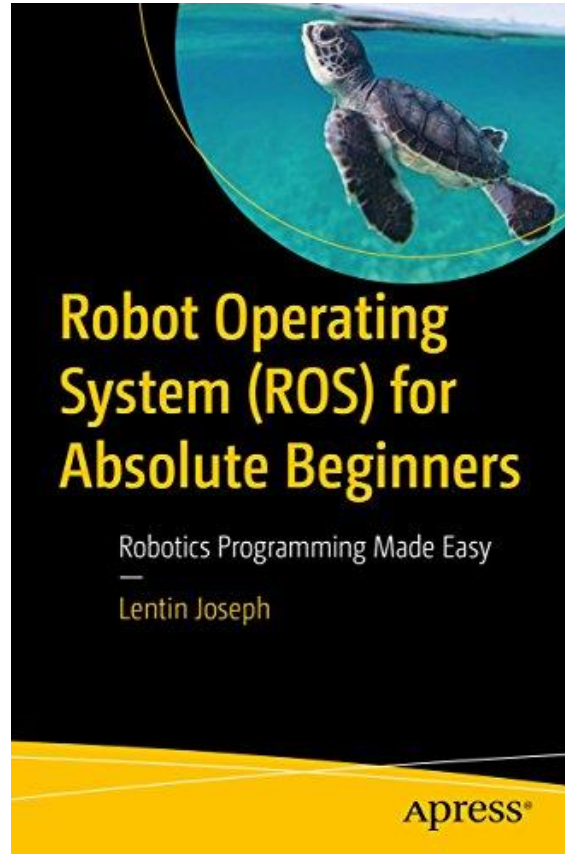
- **ROS Turtlesim tutorials**

- wiki.ros.org/turtlesim/Tutorials/

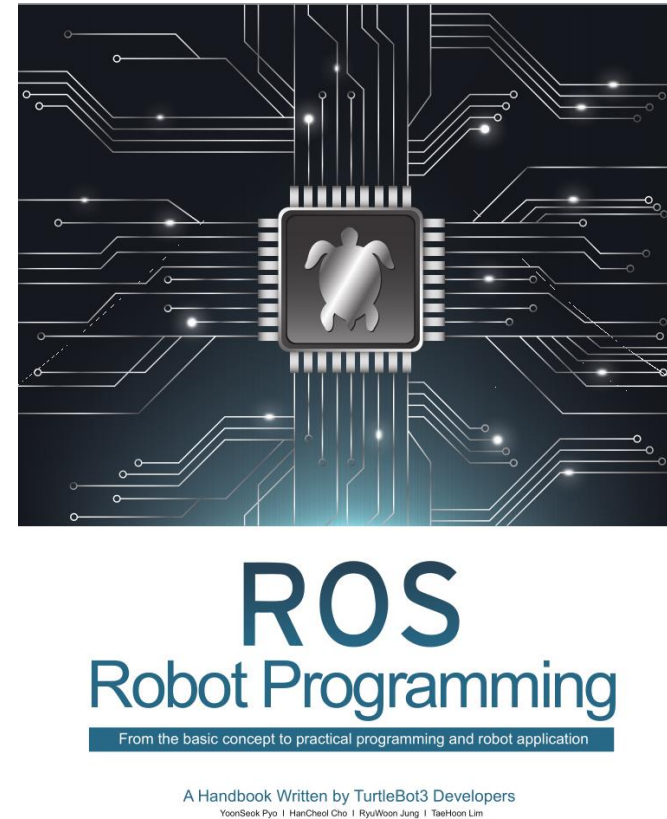
- **ROS Cheat Sheet**

- <https://www.clearpathrobotics.com/ros-robot-operating-system-cheat-sheet/>
- https://kapeli.com/cheat_sheets/ROS.docset/

Relevant books and sources



Chapter 5



Chapter 10

Contact Information

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SYMME