

Agenda CENG 5437/4391 April 12, 2022

See Text on Course Website CH4 Turtlebot and Mapping  
Class Textbook ROS Robotics By Example

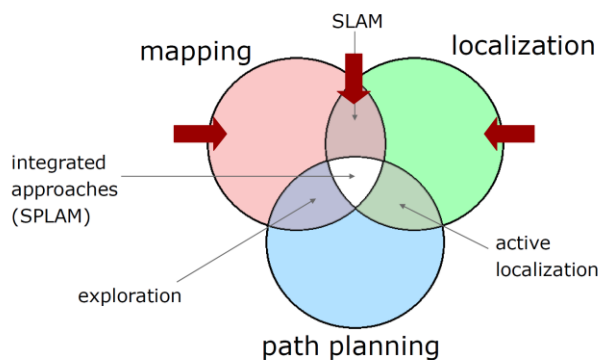
## 1\_HW7\_Review

1a\_CENG 5437\_NguyenTrauner\_HW7\_Mobile\_Robotics\_SLAM\_For22.pdf

1\_HW7\_SLAM\_5931\_Spring2022 Was Due\_4\_7.pdf

## SLAM REVIEW

This is the Navigation process using SLAM.



[courtesy of Cyrill and Wolfram]

2\_SLAM2\_5437\_4391\_4\_12\_2022.pdf (From Slides)

3\_SUMMARY OF CHAPTER 4 LOCALIZATION\_4\_12\_2022.pdf

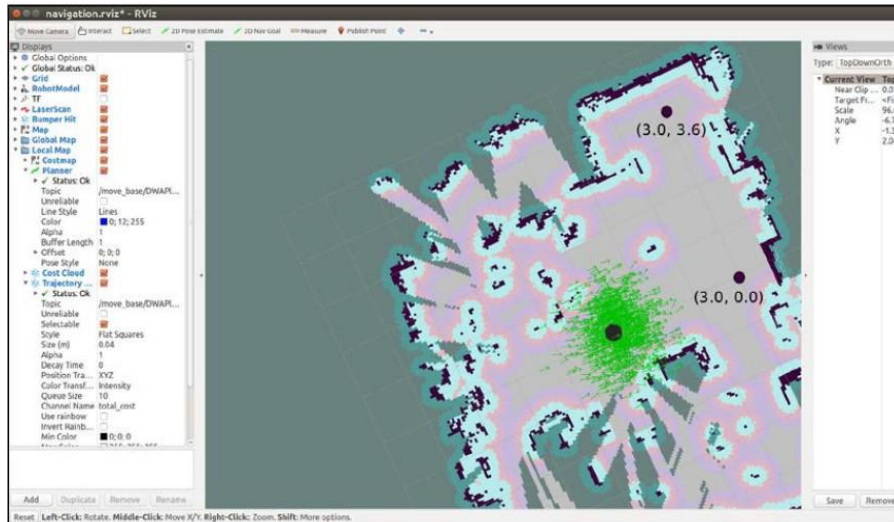
3a\_Ch4\_Mapping\_4\_2022.pdf

3B\_Ch4\_PythonMovesTB\_4\_2022.pdf

4\_Comparison\_Of\_SLAM\_Techniques  
Localization\_Methods\_4\_2022.pdf

April 5, 2022

## Mapping Simulation and the Real Turtlebot3



Goal locations chosen in rviz

## SLAM Examples from Textbook Page 145 to 200 in Textbook

*Navigating the World with TurtleBot*

In this chapter, you will learn the following topics:

- How 3D vision sensors work
- The difference between the four primary 3D sensors for TurtleBot
- Details on a 2D vision system for TurtleBot 3
- Information on TurtleBot environmental variables and the ROS software required for the sensors
- ROS tools for the rgb and depth camera output
- How to use TurtleBot to map a room using **Simultaneous Localization and Mapping (SLAM)**
- How to operate TurtleBot in autonomous navigation mode by **adaptive monte carlo localization (amcl)**
- How to navigate TurtleBot to a location without a map
- How to navigate TurtleBot to waypoints with a Python script and a map

## DEMO - Miguel tames the TurtleBot 3

References: See 5435 ROS Course Website

Chapter 4 [TurtleBot-2-CheatSheet-Mapping](#)

[Turtlebot Demos Mapping Ch4](#)

[TurtleBot Mapping References](#)

## ROS NAVSTACK References

### HOW DO ROBOTS NAVIGATE?

"Little Lost Robot" is a [science fiction short story](#) by American writer [Isaac Asimov](#). It was first published in the March 1947 issue of [Astounding Science Fiction](#) and reprinted in the collections [I, Robot](#) (1950), [The Complete Robot](#) (1982), [Robot Dreams](#) (1986), and [Robot Visions](#) (1990).



5\_SensorFusion      5\_sensor Fusion\_References\_3\_2021.pdf

Play for about 4 minutes – MATLAB Tech Talk #1 Sensor Fusion

<https://www.youtube.com/watch?v=6qV3YjFppuc&t=678s>

• **State vector:**  $\begin{bmatrix} x & y & z & \alpha & \beta & \gamma & \dot{x} & \dot{y} & \dot{z} & \dot{\alpha} & \dot{\beta} & \dot{\gamma} & \ddot{x} & \ddot{y} & \ddot{z} \end{bmatrix}$

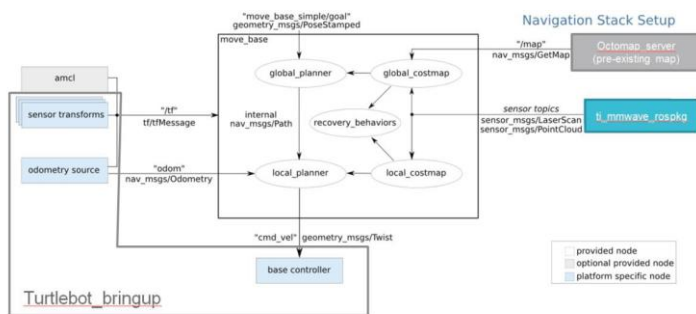


Figure 10. ROS library navigation stack used with the IWR1443BOOST-equipped Turtlebot 2.