Agenda March 22, 2022 March 29, April 5, 2022

1_You Talk about Project HW6 3/22/22

   1_HW6_CENG5437_MobileProjectReport_SP_2022_March22_.pdf3

2. My Introduction to Navigation Slides

   2_IntroToTurtlebot&Navigation_Presentation1_3_22&29_ 2022.pptx

3. CHAPTER 3 TEXTBOOK

Driving Around with TurtleBot   Chapter 3

- Loading the TurtleBot simulation software and using Gazebo with TurtleBot
- Setting up your system to control a real TurtleBot from its own netbook computer or wirelessly from a remote computer
- **Controlling the movement of the TurtleBot with ROS terminal commands or using the keyboard for control in teleoperation**
- **Creating a Python script which, when executed, moves TurtleBot**
- Using rqt tools to provide a GUI that aids the user in analyzing robot programs and also monitoring and controlling the robot
- **Exploring an environment using TurtleBot's odometry data**
- Executing the automatic docking program of TurtleBot
- Introducing a newer version of TurtleBot, called TurtleBot 3, and describing the simulation and keyboard control of a real TurtleBot 3

ROS_ROBOTICS_BY_EXAMPLE_SECOND_EDITION.docx

Text   (**CENG 5435: Robotics and ROS)**

Let's talk about Turtlebot in Chapter 3 – Simulation and the Real Turtlebot

VirtualBox Demo of Chapter 3. Ubuntu 16.04 ROS Kinetic
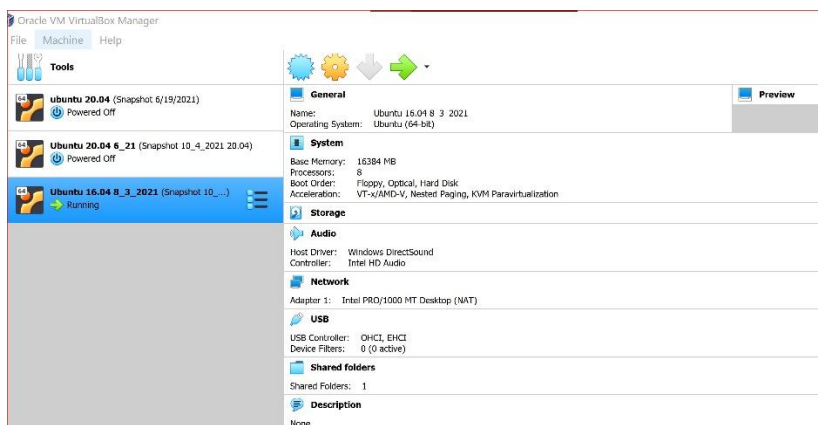
Chapter3_Turtlebot 3_22_2022.txt

TB_Ch3_Run_3_22_2022.txt

4_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

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:** $\begin{bmatrix} x & y & z & \alpha & \beta & \gamma & \dot{x} & \dot{y} & \dot{z} & \dot{\alpha} & \dot{\beta} & \dot{\gamma} & \ddot{x} & \ddot{y} & \ddot{z} \end{bmatrix}$
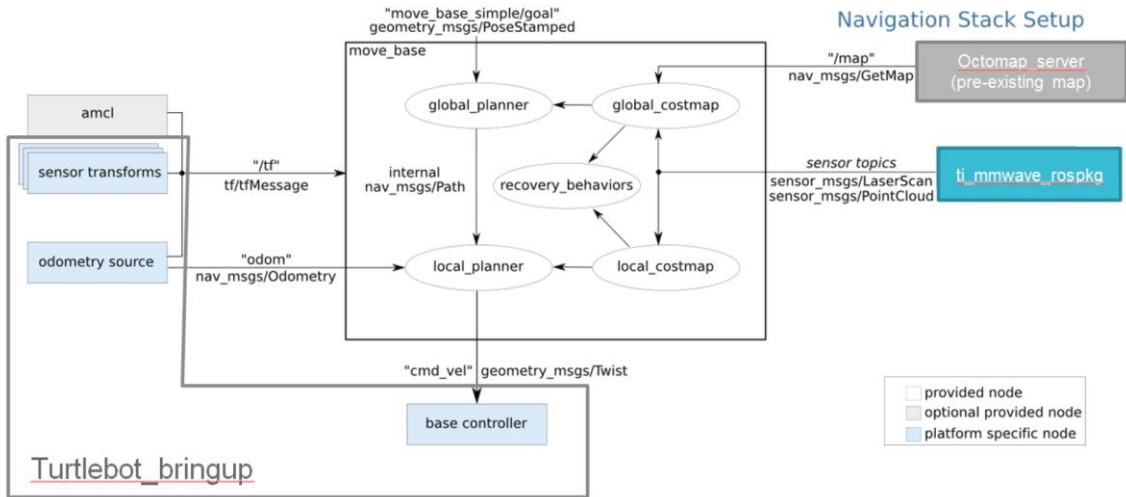
Figure 10. *ROS library navigation stack used with the IWR1443BOOST-equipped Turtlebot 2.*