
WHAT??

WHY??

HOW??

TURTLE BOT3 - AN AUTONOMOUS ROBOT

Terms used:

ROS : ROS (Robot Operating System) is an open source software development kit for robotics applications. ROS offers a standard software platform to developers across industries that will carry them from research and prototyping all the way through to deployment and production.

DYNAMIXEL: The name “DYNAMIXEL” is derived from two words- “Dynamic” and “Cell”, which when combined together become all-in-one smart actuator.

WHAT??

TurtleBot3 is a small, affordable, programmable, ROS-based mobile robot for use in education, research, hobby, and product prototyping.

TurtleBot3 was developed with features to supplement the lacking functions of its predecessors, and the demands of users. The TurtleBot 3 adopts ROBOTIS smart actuator DYNAMIXEL for driving.

The logo of turtlebot 3 itself conveys a lot.

The logo of turtlebot 3 and ROS are inter-related.

The 9 dots seen in the back shell of the turtle indicates that we use ROS



TURTLEBOT3

 **ROS**

The ROS logo, consisting of a 3x3 grid of nine dark blue dots followed by the letters "ROS" in a large, dark blue, sans-serif font.

WHY??

The goal of TurtleBot 3 is to drastically reduce the size and lower the price of the platform without sacrificing capability, functionality, and quality.

Optional parts such as computers and sensors are available and TurtleBot 3 can be customized in various ways depending on how we reconstruct the mechanical parts and use optional parts.

TurtleBot3 is evolved with cost-effective and small-sized SBC that is suitable for robust embedded system, 360 degree distance sensor and 3D printing technology.

HOW??

The TurtleBot can run SLAM(simultaneous localization and mapping) algorithms to build a map and can drive around the room. Also, it can be controlled remotely from a laptop or Android-based smart phone.

The TurtleBot can also follow a person's legs as they walk in a room.

It carries lidar and 3D sensors and navigates autonomously using simultaneous localization and mapping (SLAM).

Features

1. Affordable cost
2. Modular Actuator
3. Open Source Software
4. Small size
5. Strong Sensor Lineups
6. Extensibility
7. Open Source Hardware

The SLAM (Simultaneous Localization and Mapping) is a technique to draw a map by estimating current location in an arbitrary space. The SLAM is a well-known feature of TurtleBot from its predecessors. TurtleBot 3 can draw a map with its compact and affordable platform

SLAM

NAVIGATION

Navigation is to move the robot from one location to the specified destination in a given environment. For this purpose, a map that contains geometry information of furniture, objects, and walls of the given environment is required.

As described before, the map was created with the distance information obtained by the sensor and the pose information of the robot itself.(SLAM)

The Navigation enables a robot to move from the current pose to the designated goal pose on the map by using the map, robot's encoder, IMU sensor, and distance sensor.

WHAT DOES IT DO?

- **Move using Interactive Markers:** The TurtleBot 3 can be moved by Interactive Markers on RViz. You can move the TurtleBot 3 (to rotate or linear) using Interactive Markers.
- **Obstacle Detection:** The TurtleBot 3 can be moved or stopped by LDS(Laser distance sensor) data. While the TurtleBot 3 moves, it stops when it detects an obstacle ahead.
- **Point Operation:** The TurtleBot 3 can be moved by 2D points and angles(z-angular). For example, if you insert (0.5, 0.3, 60), TurtleBot3 moves to point ($x = 0.5\text{m}$, $y = 0.3\text{m}$) and then rotates 60 deg.
- **Patrol:** The TurtleBot 3 can be moved by custom routes. There are three routes(rectangle, triangle and circle).

WHAT DOES IT DO?

- **Automatic Parking Vision:** TurtleBot3 detects the parking sign, and park itself at a parking lot.
- **Lane Detection:** Turtlebot3 drives between two lanes without external influence by using a lane detection package.
- **Traffic Sign Detection:** TurtleBot 3 can detect traffic signs using a node and perform programmed tasks while it drives on a built track.