Århus University

Computer Technology

Project 1

Robot Design

Turtlebot3

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Abstract

Define what have we done and talked about in the report.
Set up the general "question" for the report to answer.

Contents

Specifications

Turtlebot-3

What are the Specifications of the project, what was the purpose here?
What do we have to work with?
Details about our robot, and it's sensors system etc.

In this project we are using the Turtlebot3 Burger robot, to practice our ROS based robot programming.
The Turtlebot3 burger uses the Raspberry Pi 3 Model B in combination with an OpenCR 1.0 board to provide us with options for programming and controlling it.
The Raspberry Pi is running Ubuntu 18.04 and is used to run our ROS-modules so that we can implement control and sensor usage for the Burger.
Turtlebot-3: The TurtleBot-3 is a popular mobile robot platform designed for education, research, and hobbyist purposes. It is an open-source robot that is capable of operating autonomously or being remotely controlled. It is equipped with a range of sensors, including a 360-degree LIDAR (Light Detection and Ranging) sensor, a camera, an IMU (Inertial Measurement Unit), and wheel encoders, that allow it to navigate its environment and avoid obstacles.

LDS-01 Lidar

Additionally the Burger has a Lidar scanner mounted on top, which we use for the navigation of the Burger.

The LDS-01 Lidar is a laser-based sensor that can be used to create a map of the robot's environment and detect obstacles. It uses a rotating laser to scan the surrounding area and can detect objects up to a distance of 12 meters. The data from the LIDAR sensor can be used to create a 2D or 3D map of the environment, which can be used for navigation and obstacle avoidance.

Raspberry Pi

Raspberry Pi 3 Model B
The Raspberry pi is a small, low-cost computer that can be used for a wide range of applications. The raspberry Pi 3 model B is a popular model since it features a 1.2 GHz quad-core processor, 1 GB of RAM, and built-in Wi-Fi and Bluetooth connectivity. It is widely used in robotics due to its low cost, small size and versatility. In this instance, we usethe Pi to run the software to controll the TurtleBot-3 and processes the data from its sensors

RGB-sensor

ISL-29125 Model RGB sensor.

Karnaugh Maps

Karnaugh maps or K-maps, is a way to simplify boolean expressions which are too tedious for Boolean algebra. The reduction could be done with Boolean algebra. However, with the Karnaugh map it is faster and easier. The ISL-29125 is a low-power, high-sensitivity RGB (Red, Green, Blue) sensor that can detect light intensity and color. It is commonly used in applications such as ambient light sensing, color balancing, and display backlight control. The sensor can detect light in the visible range (380-780 nm) and has a resolution of 16 bits per channel. The ISL-29125 communicates with the Raspberry Pi over the I2C (Inter-Integrated Circuit) bus, which is a widely used serial communication protocol.

Process

In the following three subtasks we are to simplify the given expressions using boolean algebra.

a.

In week 7 we had problems with being unable to have the robot autonomously drive.
At first the script would run into errors trying to setup and publish subscribers etc. to the ROS environment, the fix for this was to update the OpenCR boards firmware with (i forgor, maybe some push or whatever).
The second problem after having the script output 1 reading, where we expected more, was that the program would halt as the linear speed variable for the robot in this script, was set too high, at 0.22, lowering this to 0.15 fixed the issues, and the robot could now run.

Discussion

How did things go in this project?
Did we do what we wanted, is the robot working, did we learn anything?

Conclusion

Wrap up the abstraction, is it achieved, was the project a success?