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Special Aspects of Mobile Autonomous Systems

REPORT

Autonomous Object Hunting

by:

TIM MENNICKEN

MANUEL AUDRAN

ROBERT ROSE

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1 Introduction

This research project has the objective to design a system that is able to navigate on its own in an unknown environment, search and identify an object[1] and build a map of the navigated route as well as a map of its surroundings. The system as a whole will consist of a mobile device, further named robot, and an auxiliary external computer. As the robot on its own only offers limited computing power, it will outsource computing intensive tasks to the external computer. Hence multiple processes on different platforms will be involved. To be able to operate in any arbitrary location, the system shall be independent of any additional hardware as for example networking devices.

The robot will steer by controlling multiple motors, which will be attached to wheels. Furthermore it will be able to capture its surroundings and any obstacle near it by distance measurement sensors. They will be mounted around the robot in order to register surroundings in any direction. Additional sensors will keep track of the orientation in space and movements of the robot. The target object will be identified by processing data of a visual sensor, i.e. a camera attached to the robot.

The aim of the robot is to avoid collisions in any environment and find the target object. When the target object is found it shall stop navigating and indicate the successful identification to the user.

[1] The action of searching and identifying an object will further be referenced as object hunt.

2 Hardware

The hardware of the device can be separated in two subsystems. On the one hand, the robot, which will navigate in the environment, on the other hand the external computer with a static location. This section only focuses on the hardware of the robot. The hardware of the external computer is not further described in this report as any arbitrary recent computer with a working WiFi interface can be used.

Following you will find a short description and the use case of each part used in the robot. All parts mentioned in this section will be combined to one mobile robotic system.

2.1 Chassis

The chassis forms the foundation of the robot. It consists out of two identical floors, arranged above each other.

2.2 Gear Motors

Every movement the robot as a unit can make, is realized through four direct current gear motors, each attached to a wheel. Since the Processing Unit can not operate the gear motors directly, dedicated motor drivers are needed in order to operate the gear motors properly.

2.3 Stepper Motor

2.4 Revolution Sensors

2.5 Ultra Sonic Sensors

2.6 Power Unit

2.7 Processing Unit

2.8 PCB Board

3 References

References

[1] Texas Instruments Incorporated (2016): L293x Quadruple Half - H Drivers – Data Sheet.