UNIKASSEL VERSITÄT

mrt
Mess- und Regelungstechnik
Univ.-Prof. Dr.-Ing. Andreas Kroll

Internship

Mobile transport robots in small-scale factory µPlant: Retrofitting of Turtlebot 2

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In our small-scale factory µPlant [1] the mobile robots are responsible for transporting products between different parts of the plant (https://youtu.be/iuorBaIg3qc). At the moment we use four "Turtlebot 2" [2] which run the Robot Operating System (ROS) 1 Indigo [4]. While robotic platforms have slightly improved since the release of „Turtlebot 2", depth imaging cameras have become much more compact and powerful, and 2D laser scanners have become much cheaper.

Figure 1: Small-scale factory µPlant

In this work, a "Turtlebot 2" robot should be upgraded from ROS Indigo (Ubuntu 14.04) to the latest ROS1 Noetic (Ubuntu 20.04). Also a new depth image sensor [4] should be mounted and used. It is crucial that the depth image camera is not blocked by the transported products and that the robots can interact with the existing robot bays. For the upgrade, approximately 1.000 lines of Python 2 code have to be ported to Python 3 and some ROS packages may need new configuration files. After the successful upgrade of one robot, the upgrade should be performed for all four. After the upgrade of all robots, the multi-robot system should be tested rigorously and improved where possible.

Knowledge of Linux, ROS and Python [5] is required, but training can take place during the internship. The scope of work the can be adjusted according to personal strengths and skills. If you are interested or have questions of any kind please contact Mr. Lars Kistner (lars.kistner@mrt.uni-kassel.de).

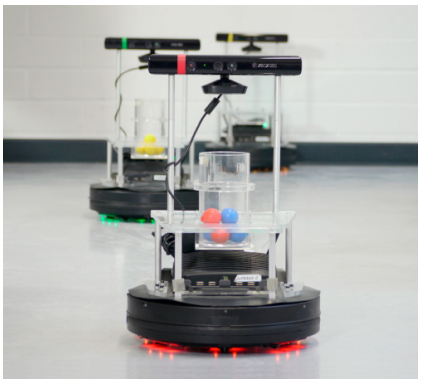

Figure 2: Mobile robot "Turtlebot 2"

Tasks:

- Familiarization with the "Robot Operating System" (ROS) software framework, the Linux operating system and the Python programming language.
- Retrofitting of Turtlebot 2 with a new depth image sensor and performing a system upgrade to ROS1 Noetic
- Rigorous tests of the multi-robot system.
- Documentation of the work and an oral presentation.

Supervisors:	L. Kistner M.Sc., Univ.-Prof. Dr.-Ing. A. Kroll
Start:	1. May 2023
End:	30. September 2023

Literature recommendation:

[1] muPlant, https://www.uni-kassel.de/go/muplant

[2] Turtlebot 2, https://www.turtlebot.com/turtlebot2/

[3] Robot Operating System (ROS), http://wiki.ros.org/

[4] OAK-D Lite, https://docs.luxonis.com/projects/hardware/en/latest/pages/DM9095.html

[5] Python Programming Language Tutorial, https://docs.python.org/3/tutorial/