kickelhack 2024

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Research topics

- Autonomous working machines
- Localization
- path planning / control
- Multidimensional environment detection
- Quality forecasts in industrial production
- Simulation environments
- AI, SLAM and optimization algorithms

Task 1

Environment perception for autonomous working machines

Your mission: Develop a software tool that helps robots understanding their working environment. Use a 3D-Lidarsensor and a RGB-camera to build an algorithm for detecting obstacles and objects in the sensor data. Your task is to build a GUI which visually presents the outcome of you algorithm and can be used as an interactive demonstrator.

Task 2

Traversability analysis for outdoor/offroad scenarios

Your mission: An outdoor robot created a 3D-map of its environment during an exploration phase. The environment contains paved but also overgrown and uneven spaces. Develop a tool that analyzes the traversability of the 3D-map and visualize the results. Note here that the robot has a certain ground clearance and can overcome smaller obstacles.

Task 3

Finding potential transport goods

Your mission: A robot has created a 3D map of the environment and now it is your task to find out where potential transport goods (e.g. Euro pallets, boxes etc.) are placed. To do this, design a tool that enables a teleoperator to recognize these goods and read out their pose.

Recommendation: software and frameworks

- Open3D
- CloudCompare
- ROS2
- librealsense
- ouster-sdk
- Python, C++, …

Provided materials

Sensors

- Intel Realsense RGB-D camera
- RGB cameras

Data

- Rosbags which contain sensor data:
  - RGB-D
  - 3D Laserscans (Ouster OS1-128)
  - RGB images
- 3D Pointclouds (colored and uncolored)

Links to provided materials

Online material

- Task 1
- Task 2
- Task 3

Offline material

- the provided materials will also be available on a local webserver
- IP: 192.168.7.1