Institut für Unternehmenskybernetik
an der RWTH Aachen

Container loading using a mobile robot and artificial intelligence

Contact

Name: David Schnermann

Phone.: +4915779477049

Email: david.schnermann@ifu.rwth-aachen.de

Type of Work: Project work, Bachelor/Master Thesis

The global transport of general cargo such as foodstuffs is usually carried out with the aid of standardized (deep-sea) containers. In order to keep logistics and freight costs as low as possible and to achieve the highest possible packing density in the container, in some cases the unit loads (packages) are not loaded on pallets into the containers, but are stacked by hand in the container without any carrier platform. This is in stark contrast to the level of automation in modern goods distribution centers, which is why research is being conducted at IfU on a demonstrator **mobile robot** system for loading containers. Weight-modified cartons are to be gripped automatically from a pallet by a robot arm on a mobile platform and loaded into a container replica. A particular challenge is the necessary press fit of the cartons.

In this project, *Robot Operating System (ROS)* is used to control the robot system. By using simulation software such as *Gazebo*, *PyBullet* or *Isaac Sim*, solutions can be explored beforehand in a safe environment. Due to the changing environment, an application of artificial intelligence methods is promising. In this research area, topics for student theses are continuously available.

Possible tasks/topic directions:

- Integration of a larger robot arm (UR20) and development of an approach for stacking packages under *press fit* using imitation learning, reinforcement learning, etc.
- Development of *collision avoidance* for whole-body motion planning based on model predictive control

Requirements:

- Degree in mechanical engineering, electrical engineering, industrial engineering, CES, or similar fields of study
- High motivation and enthusiasm for topics in robotics and robot learning
- Independent, reliable way of working
- Programming experience desirable
- Previous knowledge of working with robots and ROS is an advantage

We offer:

- Interesting work in an innovative subject area
- Co-design of the project as well as focus of work and contribution of own ideas
- Close, regular supervision in German or English
- Excellent working atmosphere in a highly motivated team in an extraordinary backyard location with office dog