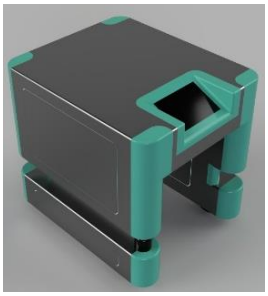
GRADUATION ASSIGNEMENT - DEVELOPING A SOFTWARE SOLUTION FOR ENABLING PRECISE DOCKING/MANOEUVRING OF ROBOTS USING 3D COMPUTER VISION

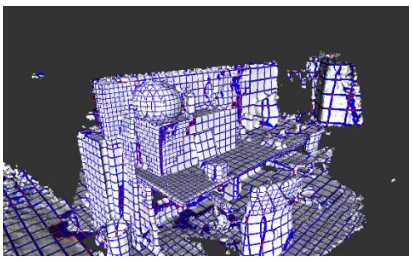


The goal of the project Next Generation Navigation (NeNa) is to develop safe, robust, precise and trustworthy navigation for robots (autonomous guided vehicles - AGVs) using open-source software. Small and medium-sized enterprises (SMEs) that develop AGVs currently need to fall back to costly black-box commercial software solutions.

The goal of this project is to develop an open-source software solution for enabling precise docking/manoeuvring of robots using machine learning supported 3D computer vision.

The top left figure shows the AGV that is currently in development by the Mechatronics lectorate. Using open-source software (ROS - Robot Operating System), the AGV should, in the end, be able to demonstrate driving to a crate, picking it up, driving with the crate to a designated location, and putting it down again. While a number of steps are important to perform these tasks, a crucial step is the precise manoeuvring of AGVs during docking steps and when interacting with other objects.

For moving about, the combined output of different sensors ("sensor-fusion") is often sufficient enough to give the AGVs a sense of location, position and direction. However, by adding an additional visual sensor like a 3D stereo camera (top right figure), supported by machine learning for 3D computer vision, more precise manoeuvring operations and object interaction would be possible (left figure – possible combined sensor output available for processing).



To fulfill the requirements of precise operation, the final product should help in minimizing the docking/manoeuvring error to within ± 1 cm and ± 1°.

DESCRIPTION OF POSSIBLE TASKS:

- Developing 3D computer vision-based software solution tools for enabling precise docking/manoeuvring of AGVs.
- Critically assessing whether and why ROS or ROS2 is better for building the demo in view of the usability/maturity of available packages (e.g. OpenCV for ROS).
- Enabling a real-time connection of the machine learning supported 3D computer vision output to the ROS navigation stack, to be simultaneously processed with signals from other sensors.
- Validating these solutions in an AGV testing environment and make it open source.

PRACTICAL INFORMATION

- **Student profile:** HBO-ICT SE, graduate student, knowledge of ROS and Linux is a plus.
- **Duration:** February 2020 – July 2020.
- **Compensation:** 230 euro per month (before taxes) when carrying out this assignment at Ambient Intelligence / Mechatronics.
- **Contact person:** For more information, contact Miha Lavric (**m.lavric@saxion.nl**) and Wilco Bonestroo (**w.j.bonestroo@saxion.nl**).