

Open Master thesis

Human detection in unknown environments with autonomous robots

Autonomous robots are used in a wide range of applications, from autonomous lawn mowing robots to assistance in logistics up to large scale applications in docks or cargo harbors. Mainly, such robots are physically separated from human beings to avoid unwanted collisions due to safety issues as most of such robots may exert forces above certain safety limits.

In this project, you will be investigating the capability of a variety of sensors to reliably detect human beings and objects to avoid collisions while exploring unknown environments using a mobile platform (shown in Figure 1). The mobile platform may be equipped with a robotic arm kit allowing it to perform additional tasks (pick, move & place, HRI) also shown in Figure 1. The arm and the mobile platform can be controlled via ROS. Available sensor hardware include cameras (depth & tracking), ultrasonic, capacitive and radar sensors. Additional sensors technologies taken from your investigations may be considered as well.

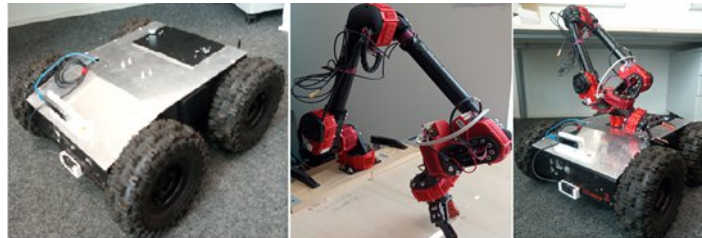


Figure 1: Robots available in this project: Jaguar 4x4 Wheeled Robot [1], 6 DoF robotic arm with gripper by Hebi Robotics [2]

This are your tasks:

- 1) Get familiar with different potentially suitable sensors for indoor localization, object and human detection and their physics
- 2) Define a test strategy and evaluate different sensor hardware assessed in 1) by defining suitable parameters
- 3) Perform Simultaneous Localization and Mapping (SLAM) and human detection & collision avoidance
- 4) Define a use-case involving objects and humans in an unknown environment to verify your approach

Your requirements:

- Good knowledge in mathematics and physics & self-driven motivation to investigate new topics
- Knowledge in ROS (C++ or Python knowledge required)

Nice to have's:

- Completion of "Mobile Robot Programming KS"
- Experience in 3D- Design (AutoCAD, SolidWorks,..)

Time period and contact information:

Duration: ~ 6 months, Start: as soon as possible
 Contact: Dipl.-Ing. Dr. Hubert Zangl (hubert.zangl@aau.at)
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We offer funding and publication possibilities!