

Joint master thesis proposals between LINKS and POLITO

Proposal 2: “Robot-Environment perception and interaction for multi-floor navigation”

Motivation

Autonomous navigation requires a robot to be capable of interpreting its surroundings. This can be complex since the robot must not only perceive the environment but also understand the role of each element within the considered context. Based on an upgraded interpretation of the environment, interaction with it can unlock navigation capabilities such as moving within a multi-floor layout, typical of many working facilities where autonomous mobile robots are required to operate.

Objectives

During the thesis period, the candidate will investigate existing navigation approaches (e.g., the ones included in ROS Navigation 2 stack) and will explore novel solutions to recognize and interact with the environment (e.g., with automated doors, furnitures and specifically elevators to be controlled through IoT devices) in order to extend identified SotA navigation solutions for a multi-floor navigation. More specifically, existing navigation planning approaches will be extended to enable the concepts of floors and structural elements which connect the floors of a building e.g., stairs and lifts.

- Extensions to the existing open-source ROS/ROS2 (Robot Operating Systems 2) code e.g., costmap and Simultaneous Localization And Mapping (SLAM) algorithms, will be performed to support a continuous navigation across a multi-floor building.
- The solution should exploit data coming from a lidar sensor and cameras for environment perception, and actionable IoT devices for the environment control.
- Depending on COVID-19 guidelines, the student will test the implemented solution on real mobile robots (Turtlebot 3) and devices in the laboratory.

Duration: 6-8 months.

Requirements

- Preferably Robotics, Mechatronics, Computer Science or Electronic background
- Knowledge of C++/Python programming languages
- Knowledge in communication protocols and computer vision will be considered a plus
- Linux OS knowledge will be considered a plus
- ROS/ROS2 knowledge will be considered a plus
- Proactive mindset, problem-solving oriented

For further info refer to:

Enrico Ferrera and Claudio Pastrone – Fondazione LINKS (<http://linksfoundation.it/>) , email: pert@linksfoundation.com

Prof. Marina Indri – Dip. di Elettronica e Telecomunicazioni: tel. 011-0907066, email: marina.indri@polito.it

Fiorella Sibona – Dip. di Elettronica e Telecomunicazioni: tel. 011-0907754, email: fiorella.sibona@polito.it

Pangcheng David Cen Cheng – Dip. di Elettronica e Telecomunicazioni: tel. 011-0907754, email:
pangcheng.cencheng@polito.it