European Project Semester

PROJECT OUTLINE

Project dates: September – December 2025	
Title: Make and test a Mobile-Robot for a Collaboration with Human	
Project activity areas: robotics, communication between systems, Robotics Operation System (ROS)	**Keywords:** Mobile robotic platform, Human-Robot collaboration, ROS, Industry 5.0
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Project technical background:

The collaborative robotic consist in the fact that robots are able to share safely the same space and interact physically with humans. It is an important field for the future industry, but also for the medical and assisted-robotics training. Mainly, these robots are a manipulator arms that have the capabilities to detect the external forces of human and react in consequences.

However, the manipulator arms have a fixed base, which limits the space of interaction with the human. In this case, one usually fixes a manipulator arms robot on mobile robot platform that can move freely in a larger space and thus enlarge the collaboration space. This combination, called mobile-manipulator collaborative robot, is illustrated by the figure 1, where the while robot is the manipulator and black lower part is the mobile structure. This collaborative robotic structure may be used for different applications such as assisting human in carrying a load.

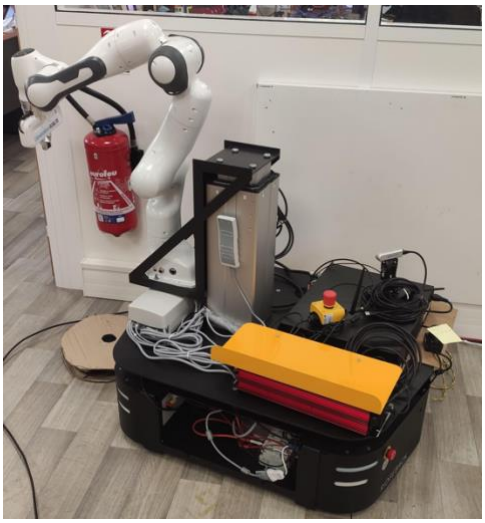

Fig. 1 : illustration of mobile-manipulator collaborative robot

The purpose of the current project is to create a communication between two robotic systems, available in our laboratory the Production Engineering Laboratory (LGP), and make a common control of the whole robotic system.

The two robotic systems are the mobile-platform Ridgeback of Clearpath (Fig. 2-left, https://clearpathrobotics.com/ridgeback-indoor-robot-platform/) and the collaborative manipulator-arm robot Kinova Gen3 (Fig. 2-right, https://www.kinovarobotics.com/product/gen3-robots). Indeed, each robot is independent from the other, with its own system and embedded computer. Ensuring a collaboration between them is a twofold challenge:

Fig. 2: Two available robots: The Mobile robot (left) and the collaborative one (right)

1- Establishing a communication, when handling the communication protocol.

2- Managing the complex task representation, in order to synchronize actions between the two robots.

This mobile-manipulator collaborative platform is a part of bigger and important project, called ECOSYSPRO, which aims to create a complete platform of industry 5.0, at our University of Technology Tarbes Occitanie Pyrénées (UTTOP).

To achieve the project objectives, several documentations are available about the two robots, since it is open for research and development, and the communication may be easier by using Robotic Operating System (ROS), which is a standard for the control and communication of most of existing robots.

Studied topics:

- Definition of requirements and technical specifications
- Analysis of each robot specifications
- Test and analyze each robot separately
- Create a communication between the two systems
- Create a common system that make the measurements and the control of the whole mobile-manipulator collaborative robot
- Make a typical use-case and experimental test of the robot in collaboration with a human to carrying an object.