



# European Project Semester

## PROJECT OUTLINE

**Project dates:** March 2019 - June 2019

**Title: Navigation and Human tracking of Autonomous Mobile Robot in Crowded Indoor Environment**

**Project activity areas:**

*Mobile robotics, system control, vision-based tracking*

**Keywords:** Mobile robotics, control theory, sensors, programming

**Tutor's name and coordinates**

Client – End-user: **ENIT**  
Technical ENIT Supervisor + contact:  
**Mourad BENOUSSAAD**  
*[mourad.benoussaad@enit.fr](mailto:mourad.benoussaad@enit.fr)*

**Project origin**

Research, innovation

**Project technical background:**

Mobile robots are robot that can move around in their environment and are not fixed to one physical location. There are several applications of autonomous mobile robots, such as material transportation, dangerous or unreachable area exploration. Mobile robots are "autonomous" (AMR - autonomous mobile robot) when they are capable of navigating in environment without the need of user guidance devices.

The purpose of the current project is to use a mobile robot as an autonomous assistant of human by carrying a load. This assistance should be done in crowded and dynamics environment, in presence of other humans. To do so, the robot should use the information of itself and its environment, through the different embedded sensors (ultrasound, laser, IMU) and camera, in order to navigate safely, by avoiding obstacles and humans, and reach or track a specified target or human.

The purpose is to explore and apply several strategies of robotics navigation on the Adept Pioneer LX system (<http://www.mobilerobots.com/ResearchRobots/PioneerLX.aspx>) that we have in LGP-ENIT laboratory. This wheeled mobile robot is an advanced mobile robotics research platform (Fig. 1), which is programmable, and easy to add, switch and customize with different sensors, effectors and other equipment for new projects. In addition, a *Pan-Tilt-Zoom (PTZ)* vision system and a *Microsoft Kinect 2* are also available in our laboratory to use for the robot tracking and navigation.

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Figure 1. Adept Pioneer LX Research Platform, with its PTZ system (on top)

The Pioneer LX platform includes the extensive Pioneer SDK (Software Development Kit), a set of software applications and libraries and tools to accelerate the development of custom applications. The information is gathered in a wiki and in ROS websites (open sources Robotics Operating System).

Simulation tool and previous works on this robot are also available and can be used in this project to get an easier and a quick start.

**Studied topics:**

- Definition of requirements and technical specifications (overview of mobile robots and their applications)
- Establish the issues related to our application and explore possible solutions
- Get started with the Adept Pioneer LX research platform (modeling, control and other existing software tools)
- Implement parts of solution and test them separately or in simulation
- Test the navigation and tracking strategies on the real robot
- Make an objective comparison between strategies, by considering efficiency, safety feeling, robustness, ...