

Our team, deeply invested in robotics and electronics, is composed of Agheles, Karim, and Yanis, all active members of Arès, the robotics association at Ensea, a prominent electronics engineering school. Agheles serves as the Partnerships manager, Karim as the Vice President, and Yanis is a dedicated member. Our collective background in electronics and our shared passion for mechatronics provide a robust foundation for tackling the complexities of this project.

The hardware configuration integrates several key components within a multi-tiered, 3D-printed structure. The core of the system relies on a Raspberry Pi 3B+ and an Arduino Mega 2560, working in tandem. The Raspberry Pi, running ROS, is designated for high-level processing and decision-making, while the Arduino Mega 2560 manages low-level control tasks. These two are interconnected via USB. The Arduino is equipped with a custom RobotCraftBot Shield, simplifying the interfacing of various sensors and actuators. Propulsion is handled by two DC motors (Micro Metal Gearmotors 298:1) equipped with encoders, driven by a DFRobot TB6612FNG Dual Motor Driver. The system is powered by a 7.4V battery and regulated by 5V DC voltage regulators.

The robot's navigation strategy for the maze competition is centered on a coordinated approach between the processing units and the sensors. A LiDAR sensor, positioned at the top of the structure, is crucial for Simultaneous Localization and Mapping (SLAM), allowing the robot to build a comprehensive map of the maze and determine its location within it. The motor encoders provide vital odometry data, enhancing the accuracy of the robot's localization. For immediate obstacle detection and wall-following, IR sensors (Sharp GP2Y0A21) are strategically utilized. The Raspberry Pi will process the sensor data, execute path planning algorithms using ROS, and transmit high-level commands to the Arduino. The Arduino, in turn, will interpret these commands and activate the motor driver to control the motors, ensuring precise movement and successful navigation through the maze.