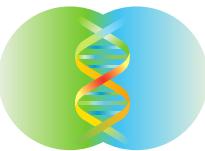


Laboratorio
Sistemi Automatici



ITALY

AVIS Comunale Schio Altovicentino

Colben LAVORAZIONI MECCANICHE

RIS CERTIFIED MANAGEMENT SYSTEM ISO 9001



SACAGNÀ

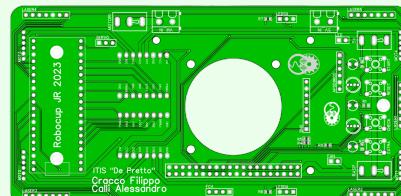


CRACCO FILIPPO
CAPTAIN
CAD, PCB, Python and C
Software, Test



CALLI ALESSANDRO
CO-CAPTAIN
Hardware, Python Software
Test

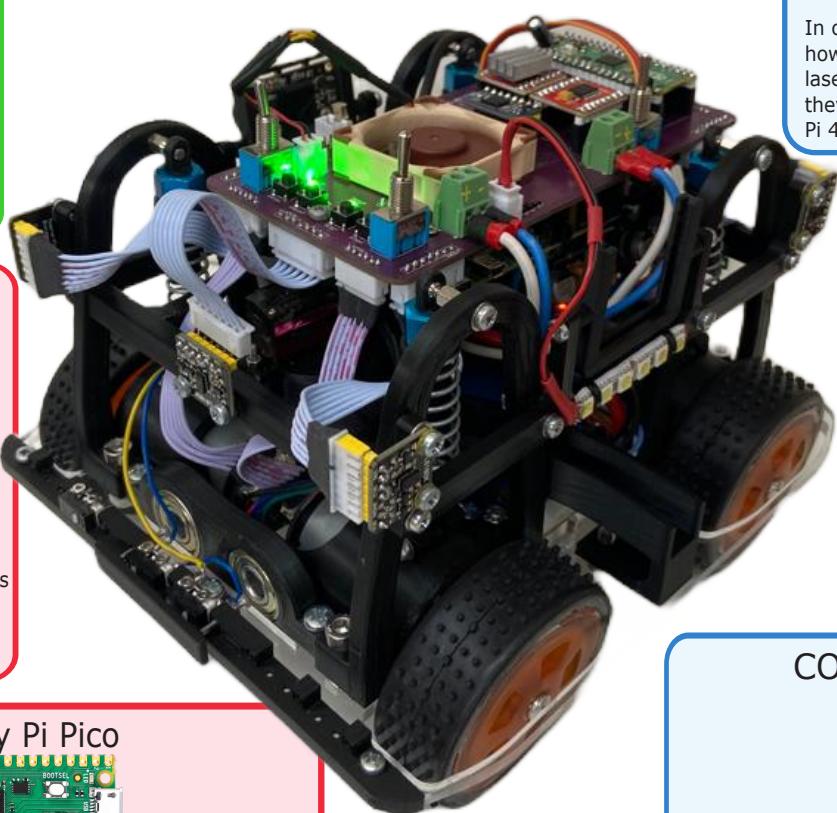
EAS PCB Esse Ti
Electronica



We designed a printed circuit board the could connect all the sensors and actuator with their control boards, and that could ensure a more solid connection than breadboard

STRUCTURE

The robot has been entirely designed in CAD before being made using 3D printing and laser cutting. It has allowed us to have a complete vision of the robot and maximize the space usage.



Raspberry Pi 4



The raspberry Pi is responsible for the decisions, mapping, I2C sensors reading and victim recognition. It communicates with the Pico with a serial interface

Raspberry Pi Pico



The Raspberry Pi Pico is used to control motors and deploy rescue kits. It reads the motor encoders (2 digital signals per motor), it calculates the difference between the wanted speed and the actual speed and it runs a PID loop to mantain the wanted speed. It also controls a mini servo motor to release rescue kits.

PROGRAMMING LANGUAGES

We used both C and Python, we programmed in C the Raspberry Pi Pico, with its own SDK in VS Code, whilst Python is used on the Pi 4. The two boards communicate with a special RS-232 protocol that we developed for our needs

MOTOR DRIVERS



To control the directions and the speeds of the motors we used 2 TB6612FNG drivers. Each of them controls 2 motors with 2 digital signals and a PWM.

DISTANCE SENSORS



In order to detect walls and understand how the robot is positioned, 5 VL6180X laser distance sensor have been used, they communicate with the Raspberry Pi 4 via I2C protocol.

GYROSCOPE



To make turns perfectly and detect ramps we mounted a BNO055 IMU (Inertial Measurement Unit), it is a board with gyroscopes and accelerometers on 9 axis.

COLOR SENSOR



For the detection of blu, black and grey tiles we used the APDS9960 RGB color sensor. It outputs 4 values: Red, Green, Blue and Clear.

THE TEAM



6th Place
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VICTIM RECOGNITION



Visual victims are recognized with 2 cameras, one on the left and one on the right, the images are captured on the Pi 4 and with some simple computer vision code we are able to determine what we are seeing.