

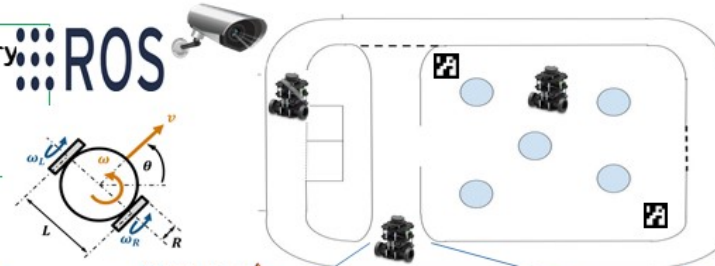
Remote control of a robot fleet

Objectives

Autonomous navigation of a fleet of robots able to follow a dynamically calculated trajectory and estimate their positions by combining local (odometry and lidar) and video system information.

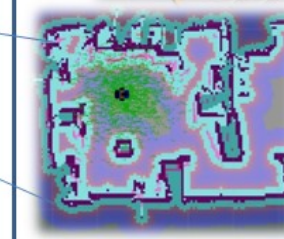
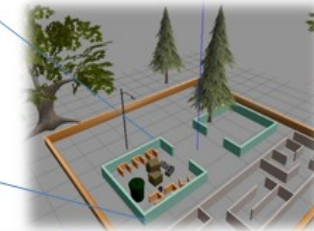
Navigation and control

- Moving and locating robots by odometry
- Obstacle detection and avoidance
- Autonomous parking
- Platooning and tracking features



3D Visualization and simulation

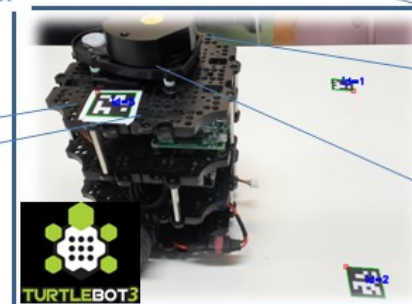
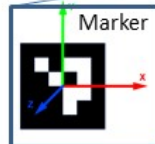
- Construction of a 3D physical environment with Gazebo.



- Real time mapping of Robot environment using Lidar; SLAM
- Reading maps and generating trajectories

Location and augmented reality

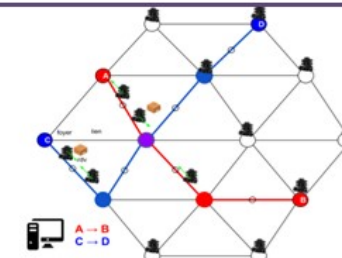
- Use of augmented reality techniques: ARUco markers fixed on the ground and mobile on robots.
- Image processing for marker detection
- Estimated robot position and marker (precision: 1mm, max distance: 2m)



Prototype

Development of navigation strategies: application to collaborative parcel distribution

- Robot network able to deliver packages
- Transmission of packages between robots in an order established by a global controller
- Limitation by a perimeter around its hearth for efficient recharging
- Positioning in space by odometry and taking into account the global and local mapping



Multidisciplinary skills and tools: embedded systems, ROS (Robotics Operating System), distributed systems, network, Image processing with OpenCV, augmented reality, finite state machine, embedded linux, C++, Python, Gazebo, Rviz, QtCreator, Matlab/Simulink, Blender, TurtleBot3, Raspberry PI3.



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