

Software Lab:

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Autonomous Navigation with the Go1 Robot

Description

Autonomous navigation is a critical task that is shaping the future of mobile robotics. During this project, you will enable a cutting-edge Go1-legged robot to navigate autonomously within a compact environment, all while skillfully avoiding obstacles and detecting target elements.

Initially, you will focus on understanding and tuning navigation algorithms by controlling a Go1-legged robot in a virtual environment. Later, you will transition from simulated scenarios to real-world experiments, in which you will deal with data coming from different sensors, such as a camera and a LiDAR.

Subsequently, objects of interest will be detected, which will be used to help the robot achieve certain tasks, such as autonomous inspection, picking and placing, door opening, etc.



Figure 1: Real Go1 with a mapping system.

Task

1. Familiarize yourself with a robotic simulation environment and the available Go1 setup.
2. Simulate the Autonomous navigation with the robot; this includes localization, path planning, and obstacle avoidance. [1]
3. Detection of objects of interest related to construction (e.g., bricks or given QR codes). [2]
4. Experimental validation with the real robot.

Extra:

5. Add an arm manipulator over the simulated robot. [3]



Figure 2: Simulated Go1 with a mapping system in Gazebo.

Supervisors

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References

- [1] Legged Autonomous Inspection | Nicolas G. Morales 2024. Website. GitHub.
[2] GitHub - pietrolechthaler/UR5-Pick-and-Place-Simulation: Simulate the iteration of a UR5 robot with Lego bricks
[3] Fu, Zipeng, Xuxin Cheng, and Deepak Pathak. "Deep whole-body control: learning a unified policy for manipulation and locomotion." Conference on Robot Learning. PMLR, 2023. <https://manipulation-locomotion.github.io/>