

**Research theme title:**

Optimal design of localization infrastructure for industrial AGVs

**Description:**

The industrial autonomous guided vehicles (AGVs) must be localized in the environment with suitable precision with respect to the tasks that they must fulfill. To this aim, one of the most employed techniques requires the installation and mapping of many artificial landmarks (or “reflectors”) in the industrial scenario. The reflectors are built as rigid tubes covered with a special reflective material that ensures high reflectivity for LIDAR sensors. Given a map of landmarks, an AGV can perform precise and not ambiguous localization.

Usually, a trained designer define the map of landmarks for a specific plant, exploiting fixed structures as installation supports. This process is time consuming and error-prone, and leads to a too high number of reflectors: in this case, the probability of landmarks symmetries dramatically increases with the size of the environment. Additionally, the physical installation of the reflectors and the subsequent mapping phase are very expensive, since a specialized surveyor with high-end tools is required.

The goal of this project is to define a workflow for the creation of the optimized landmark map to ensure accurate AGV localization with an adequate number of reflectors. This workflow aims at drastically reducing the number of landmarks in the plant and eliminating symmetries, thus guaranteeing an optimized “a priori” localization.

This approach will also expedite the deployment of new industrial plants and significantly reduce infrastructure costs. Existing facilities or those undergoing technological retrofits can be analyzed to improve the reflector constellation if necessary. The reduced number of reflectors and the absence of symmetries will also be crucial during Global Localization phases of the vehicles (when an AGV is lost or powered on and needs to determine its position for the first time), preventing any ambiguous results.

The research will be applied to real scenarios provided by E80 Group SpA, an Italian company specialized in automated solutions for logistics 4.0.

**References**

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*Magnago, Valerio, et al. "A nearly optimal landmark deployment for indoor localisation with limited sensing." 2017 international conference on indoor positioning and indoor navigation (IPIN). IEEE, 2017.*

*Meyer-Delius, Daniel, et al. "Using artificial landmarks to reduce the ambiguity in the environment of a mobile robot." 2011 IEEE International Conference on Robotics and Automation. IEEE, 2011.*

**Type of scholarship:**

DM 117/2023 – Project on PNRR (Italy's Recovery and Resilience Plan)

**Hosting University**

Polytechnic of Bari, Italy

**Study and research period outside the Hosting Institution:**

Study and research period at the company:

E80 Group SpA

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