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Supervisor's contact details

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Title of the project

Long-term Autonomy in the Wild

MSCA-PF Research Panel

☐ Chemistry (CHE)

☐ Social Sciences and Humanities (SOC)

☐ Economic Sciences (ECO)

☒ Information Science and Engineering (ENG)

☐ Environment and Geosciences (ENV)

☐ Life Sciences (LIF)

☐ Mathematics (MAT)

☐ Physics (PHY)

Description of the project

In large unstructured environments, single robot missions are limited by energy constraints in terms of operational time, the reduced area that can be surveyed or monitored at any certain time, and the capacity of the robot to remain autonomous for long periods of time. Multi-robot systems have multiple benefits, as have been consistently showcased in the literature and relevant real-world competitions and events. However, multiple challenges remain, e.g., localization in GNSS-denied environments or when connectivity is limited. Robust and dependable mobile inspection and monitoring solutions for industrial operations in remote, unstructured and underground environments are still far from reality.

The project will look for heterogeneous multi-robot systems supporting Digital Twins in Dynamic Unstructured Environments. The project will address research questions covering how to design digital twins that leverage advanced autonomous mobile robotic platforms in remote environments, to how detailed and evolving digital twins built with multi-modal real-time data can in turn aid the autonomy algorithms and methods. The premise of this research is to integrate the information and data needs from the digital twin perspective and the needs of different relevant business processes into high-level planning of distributed multi-robot missions.

Research objectives or research questions of the project

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The project will bring the design and development of new methods and algorithms for (i) cooperative localization and collaborative autonomy for surveying and mapping, and (ii) a digital twin framework providing realistic simulation environments for challenging environments while enabling further digitalization of industrial operations with real-time multi-modal data models.