

Natural language becomes an executable robot mission

The SAIR'S framework lets non-specialist operators plan robot missions vocally, while grounding every request in explicit robotic capabilities.

HUMAN INTENT

Speak naturally

Operators describe surveillance or inspection goals without programming languages, special commands or detailed knowledge of the robot.

ROBOT GROUNDING

Execute what is valid

The assistant maps language to a skills ontology, validates capabilities and converts accepted requests into structured mission plans.

From project innovation to measurable evidence

The industrial use case progressed from TRL 1 to TRL 7. A dedicated research paper then evaluated the mission-request interpretation pipeline on 322 ground-truth missions across five robotic skills.

TRL 1 -> 7

PROJECTMATURITY

322

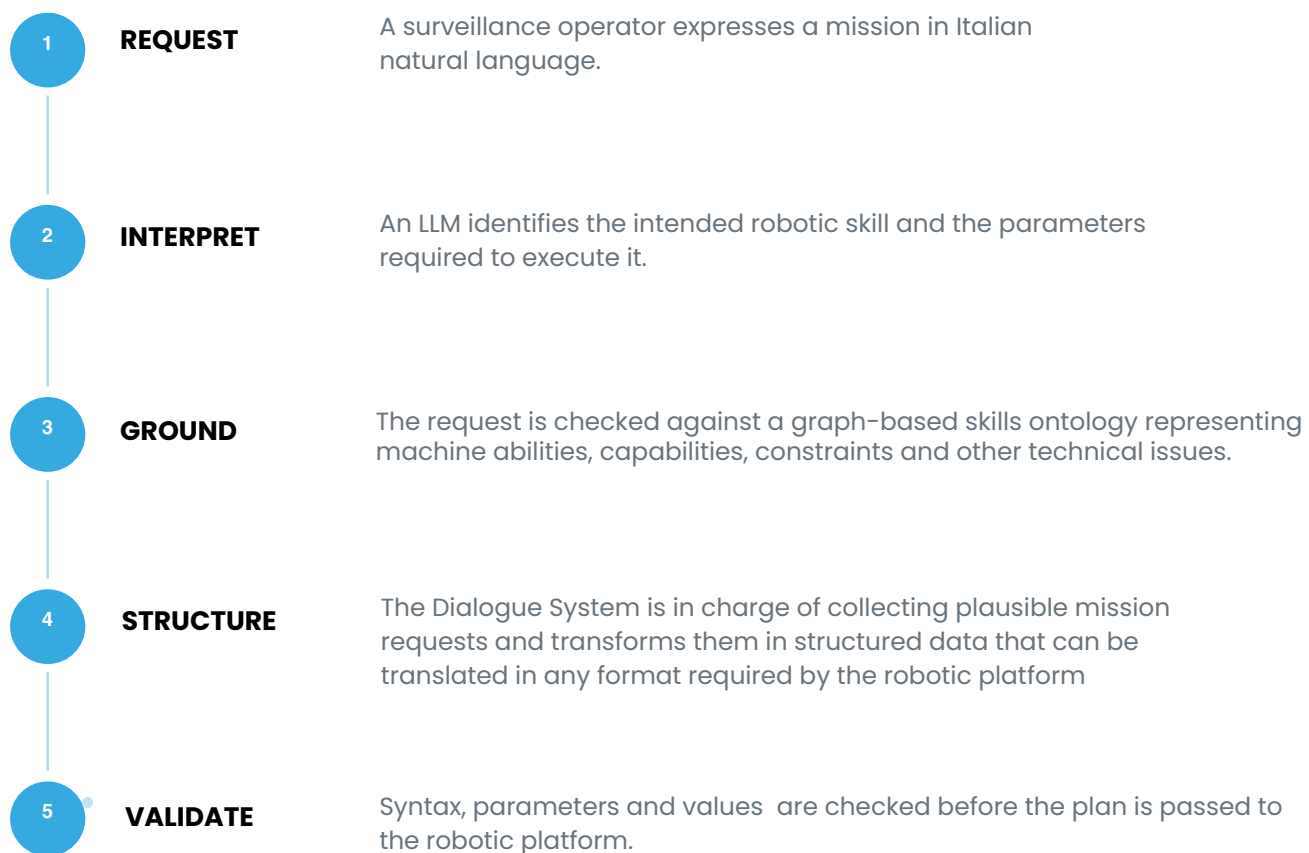
GROUND-TRUTH MISSIONS

5

ROBOTIC SKILLS

Ground language in what the robot can actually do through Symbiotic AI

The research contribution is a Dialogue System grounding Mission Requests against an external ontology of robot capabilities, in order to facilitate mission planning in Natural Language



WHY THE ONTOLOGY MATTERS

The language layer can change without rewriting the robot's interpretation logic

The ontology is modular: changes to the robot's skill set require updates to the ontology rather than to the interpretation mechanism itself.

A validated foundation for adaptive human-robot collaboration

- The scientific results support the feasibility of LLM-mediated robotic planning while also defining the next research steps toward personalization, multi-agent coordination and real-world interaction.

ROBUSTNESS

Constrained generation

Prompt engineering, ontology grounding and output validation reduce the risk of invalid or hallucinated mission structures.

ADAPTATION

Learn the operator

Future work targets user preference learning, so the robot can proactively suggest mission plans tailored to the operator.

SCALABILITY

Move to robot fleets

The roadmap extends from one robot to multiple robotic guards executing complex, multi-skill surveillance plans.

Scientific reference

Barbato, M., Grazioso, M., Mancini, A., Russo, V., & Di Bratto, M. (2025). Grounding Natural Language Mission Requests in Robotic Skill Specifications via Large Language Models. ICSR 2025.

Marco Grazioso, Mario Barbato, Mariacarla Staffa, Azzurra Mancini & Valentina Russo (2025), "Enhancing Human-Robot Collaboration through the SAIRS Framework". In: Proceedings of HFR2025 - 18th International Workshop on Human-Friendly Robotics 2025.

Project context

SymAlbot - The SAIRS framework: Symbiotic AI for Robotics in Industrial Settings. FAIR Project, Spoke 6. Industrial partners: MARTEC SRL and LOGOGRAMMA SRL. Scientific partner: Prof. Maria Carla Staffa, University of Naples Parthenope.

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