JARVIS

DRIVING HUMAN-ROBOT COLLABORATION: TELEWELDER

Funded by the European Union

The project has received funding from the European Union's Horizon Europe

TELEWELDER

Scope of the pilot: *The JARVIS TeleWelder pilot explores human-robot interaction for remote welding, enabling an operator to control a welding robot from a safer position while preserving precision, spatial awareness, and intuitive movement in constrained industrial environments.*

How TeleWelder aligns with the JARVIS framework

The TeleWelder pilot is designed to improve working conditions for welders operating in highly constrained and hazardous environments such as ship hulls and naval structures. During Sprint 2, the project moved forward on three main fronts: precise motion tracking of the operator, immersive feedback in virtual reality, and development of the digital environment needed for collision awareness and avoidance.

This approach directly supports the JARVIS vision of human-centric, sustainable and future-proof industrial innovation. Instead of replacing operator expertise, the solution extends human capabilities through teleoperation: the welder keeps control of the gesture while the robotic system reproduces movement remotely. The pilot combines a VR headset, tracked welding torch, robot controller, digital twin technologies and ROS2-based robot motion to create a practical human-robot interaction workflow for manufacturing.

Sprint 2 also included real-world technical testing. A test at Naval Group on April 9 demonstrated that the team could evaluate different methods of moving the robot, achieve satisfactory overall system latency, and perform a first weld using remote control. These results show that the pilot is progressing from concept validation toward an operational remote welding use case.

Figure 1. The operator with the tracked torch

Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement n° 101135708. The dissemination of results herein reflects only the author's view, and the European Commission is not responsible for any use that may be made of the information it contains.

Sprint 2 highlights

- Setup assembled with a laptop equipped with Nvidia RTX 5090, Meta Quest 3 headset, ART SmartTrack 2 camera, Stereolabs ZED Mini camera, ROS2 robot controller, tracked operator torch, and UR10e robot with welding torch.
- Marker constellation for tool tracking designed and validated on the test bench.
- Successful calibration work between the Meta Quest reference frame and the ART SmartTrack system.
- 3D environment mapping launched successfully, with the generated model positioned using the known camera pose on the robot.
- Robot control through the tracked torch achieved smooth ROS2 motion and the possibility to define restricted areas in the digital twin environment.

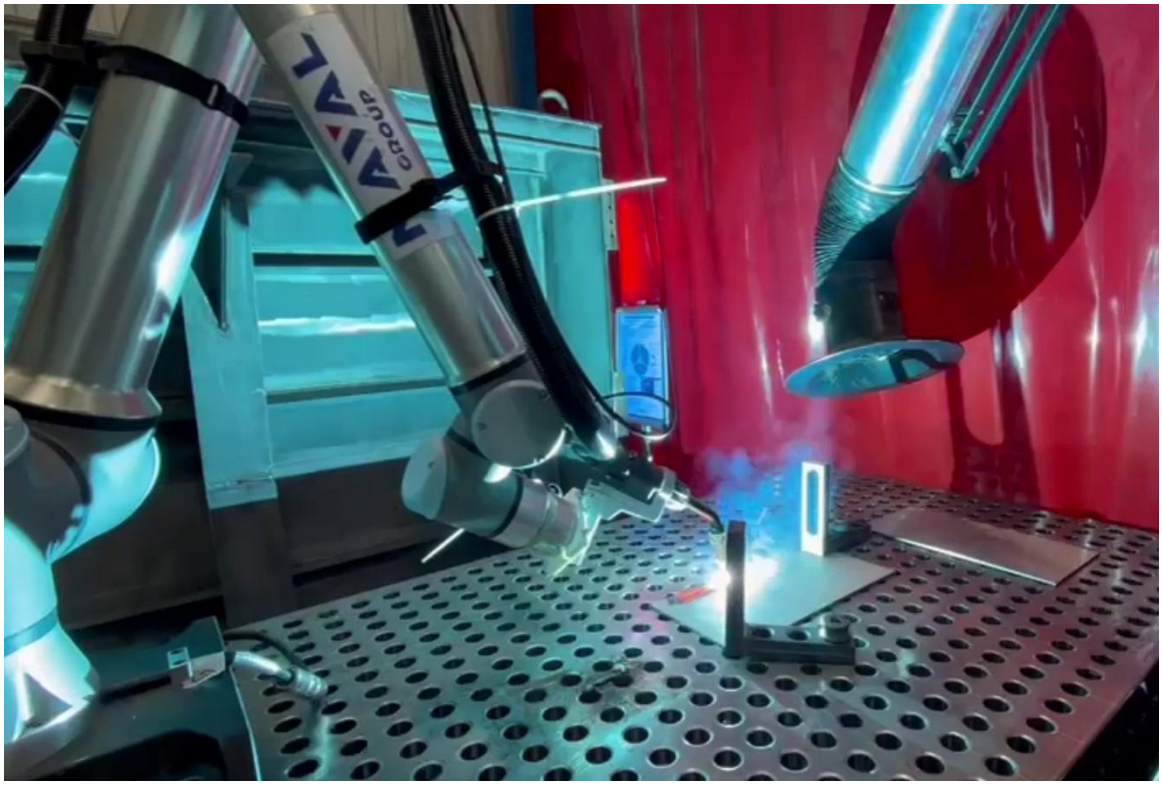

Figure 2. Remote welding operation

Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement n° 101135708. The dissemination of results herein reflects only the author's view, and the European Commission is not responsible for any use that may be made of the information it contains.

How collaboration within the JARVIS ecosystem supported the project

The TeleWelder pilot benefits from being developed as part of the European JARVIS project, funded by the Horizon Europe programme. Within this ecosystem, the project gains access to a collaborative European network focused on advanced human-robot interaction, AI, robotics and digital transformation in industrial settings.

This collaboration supports the project at several levels. On the technical side, JARVIS provides a structured framework for experimenting with key enabling technologies such as teleoperation, robot control and digital representation. It also helps the team compare implementation choices and evaluate which solutions offer the best usability for operators in realistic working conditions.
On the dissemination side, JARVIS strengthens the visibility of TeleWelder results by connecting the pilot to a broader narrative around human-centric industrial innovation. The framework makes it easier to communicate progress, share results from real-world tests, and position TeleWelder as a concrete example of how collaborative robotics can improve both safety and operator effectiveness in demanding environments.

What comes next

The next phase will focus on evaluating the different technical solutions tested in Sprint 2 to select the most effective implementation. In particular, the team will continue to assess the best calibration strategy for operator usability, improve system robustness, and refine the integration between tracking, digital twin and robot motion.

By building on the first successful remote weld and encouraging latency results, TeleWelder is taking a major step toward a safer and more intuitive remote welding workflow for industrial applications.

Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement n° 101135708. The dissemination of results herein reflects only the author's view, and the European Commission is not responsible for any use that may be made of the information it contains.

Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement n° 101135708. The dissemination of results herein reflects only the author's view, and the European Commission is not responsible for any use that may be made of the information it contains.