

## CO-HAND: *Collaborative Handling of Yarn Cones in Dynamic Textile Environments*

A collaborative mobile manipulator based on TIAGo Pro that autonomously detects, extracts and places yarn cones in a real textile production environment, reducing operators' exposure to repetitive lifting and high-reaching tasks.

### THE CHALLENGE AND WHY IT MATTERS

At CETRIKO, operators manually handle large numbers of yarn cones daily, including lifting medium- and heavy-weight cones and reaching elevated creel positions in narrow, noisy, fibre-prone areas. This repetitive, physically demanding work contributes to fatigue and musculoskeletal strain, and reduces overall process efficiency.

### OUR SOLUTION AND VALUE PROPOSITION

CO-HAND integrates PAL Robotics' TIAGo Pro platform with a custom adaptive gripper, autonomous navigation, the JARVIS/KUKA Object Recognition and Pose Estimation tool, and multimodal HRI (tablet-based WebGUI, LED feedback, and speech as a fallback channel). The solution was deployed and validated in CETRIKO's operational textile environment, reaching TRL7. It demonstrated detection and handling of empty and medium-weight (~4 kg) cones, autonomous navigation within the production area, and operator-in-the-loop task initiation, supervision and recovery. For CETRIKO operators, the solution removes a subset of physically demanding lifting and high-reaching actions from their daily workload, while allowing non-expert staff to initiate and supervise robotic tasks without manual programming, via single-button task initiation on the tablet interface.

### ADDED VALUE FROM JARVIS

The KUKA Object Recognition and Pose Estimation tool was integrated into a two-stage perception pipeline (fast detection followed by precise pose estimation) to identify cone-handling targets and generate the 3D grasping information required by the manipulation pipeline. It was validated using real factory data at CETRIKO, providing the precision needed for reliable grasping and reducing execution errors such as attempting to place a cone in an occupied slot.

### KEY RESULTS

- ✓ Empty-cone detection and handling
- ✓ Manipulation of cones up to approximately 4 kg
- ✓ Working height validated up to 1.56 m
- ✓ Autonomous navigation in the selected production area
- ✓ JARVIS/KUKA perception integrated and validated
- ✓ Operator supervision through mobile WebGUI and LED feedback

### POTENTIAL MARKET OPPORTUNITIES

The first target customer is CETRIKO and comparable textile manufacturers requiring handling support in production. The validated capabilities are intended for integration into PAL Robotics' TIAGo Pro commercial offer, with potential future adaptation to other light manufacturing and intralogistics settings involving repetitive object-handling tasks.



**PAL** *cetrik*<sup>o</sup>

### PILOT AT A GLANCE

**Lead organization:** PAL Robotics

**Consortium:** PAL Robotics, CETRIKO

**Sector / use case:** Manufacturing / cone handling/replacing

**JARVIS module(s):** Object Recognition and Pose Estimation tool

**Demonstration environment:** CETRIKO textile manufacturing company in Spain (reached TRL7)

### MORE INFORMATION

**Website:** <https://jarvis-project.eu/>

**Contact:** PAL Robotics - [euprojects@pal-robotics.com](mailto:euprojects@pal-robotics.com)

**Videos:** <https://www.youtube.com/@JARVISHorizonEuropeProject>