JARVIS

DRIVING HUMAN-ROBOT COLLABORATION: REPAIR

Funded by the European Union

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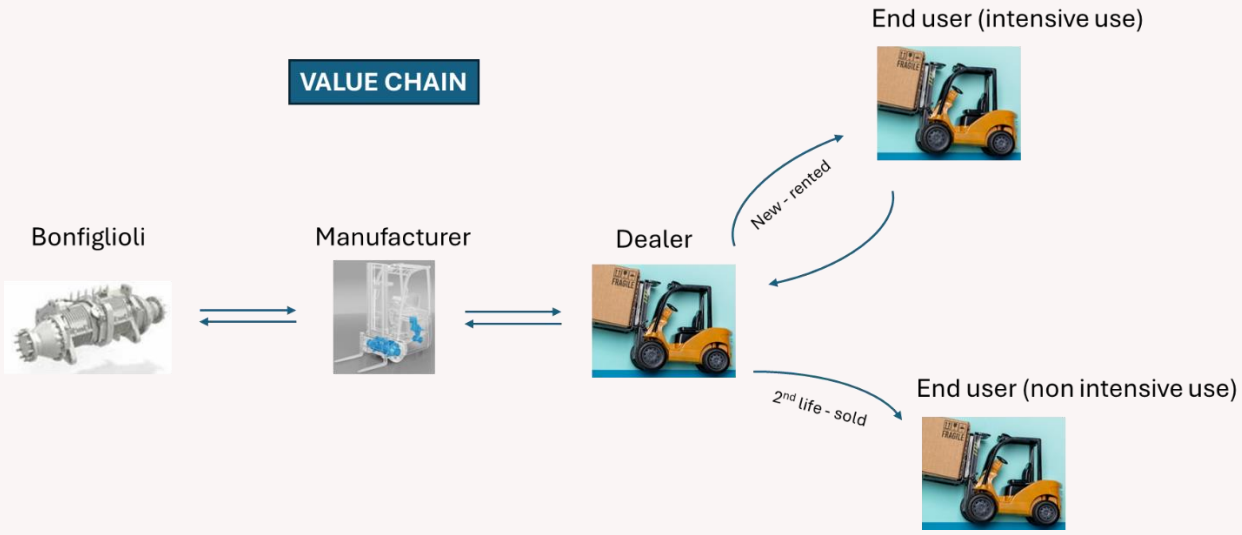
Project name

REPAIR

Introduction

The REPAIR project addresses a significant challenge in the remanufacturing of mobile handling machines, particularly when assessing the condition of mechanical transmissions returned at the end of their life cycle. It unlocks the potential of remanufacturing industrial components, especially for equipment like forklifts that often undergo two distinct life phases—first through intensive use and later as refurbished units for lighter applications.



The innovative approach contemplates the recovery of essential sub-assemblies, such as axles (which include motors and transmissions), to enhance the sustainability and cost-effectiveness of these operations.

Successful remanufacturing relies heavily on accurately assessing the condition of returned units. This task typically requires highly skilled personnel and enables the following demanufacturing phase where the product is dismounted and components are recovered.

To tackle these issues, the REPAIR project employs cutting-edge robotics and vision systems. These technologies automate and support operators during the critical assessment phase of remanufacturing, enabling faster and more accurate evaluations. A robotic arm equipped with a vision system and projector will scan returned products, identify defects, and present evidence in a structured format, streamlining the entire process.

How does your work align with the goals or methodology of JARVIS?

The REPAIR project aligns seamlessly with the goals and methodologies of the JARVIS initiative. It will utilize JARVIS's "Robot Trajectory and Path Planning Interfaces" to ensure safe and effective automated inspections, coupled with DVC expertise in fast path planning and motion control algorithms.

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Moreover, REPAIR will integrate the "AR Projector Interfaces for Operator Commands and Awareness" provided by JARVIS. This partnership, combined with advanced knowledge in camera-projector calibration, perspective correction algorithms, and surface-aware warping techniques, will enhance the reliability of the information relayed to operators, facilitating prompt and objective decision-making.

Importantly, our solution will be designed to be reusable and scalable, reflecting the spirit of JARVIS tools.

Upcoming focus or next milestones in the pilot's development

The immediate focus of REPAIR project will be on completing the ongoing requirements phase and setting up the robotic system in the laboratory.

Following this, we will develop control and vision software leveraging JARVIS platforms to execute the outlined tasks effectively.

Subsequent testing will involve applying the system to an axle component, where we will evaluate its ability to detect specific defect classes identified in our requirements.

The pre-tested system will then undergo rigorous qualification within a designated testing area at the Bonfiglioli facility, during which we will gather performance metrics and assess usability from the operators' perspective.

How does your solution advance Human-Robot Collaboration in a user-centric manner?

The REPAIR solution significantly enhances human-robot collaboration, focusing on a user-centric design. It empowers skilled personnel to assess returned products through:

- automated defect identification, by guiding operators in the search for defects with robotic assistance.
- defect clear visualization, utilizing an onboard projector to highlight specific defects detected during the assessment process.
- streamlined documentation, accelerating the generation of comprehensive documentation, including images, descriptions, and comments, to support decision-making.

Notably, the REPAIR system's fast reconfigurability, without requiring high efforts from the operator, ensures it can seamlessly adapt to various product shapes and dimensions, allowing for versatile applications across diverse mechanical components

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