Mari4_YARD: User-centric tools for flexible manufacturing

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101006798

Mari4_YARD project

Call topic MG-3-7-2020: Improved Production and Maintenance Processes in Shipyards

Shipbuilding and ship maintenance industry

- 18 partners from 9 countries
- https://www.mari4yard.eu/
- Public Workshop on February 15th!!

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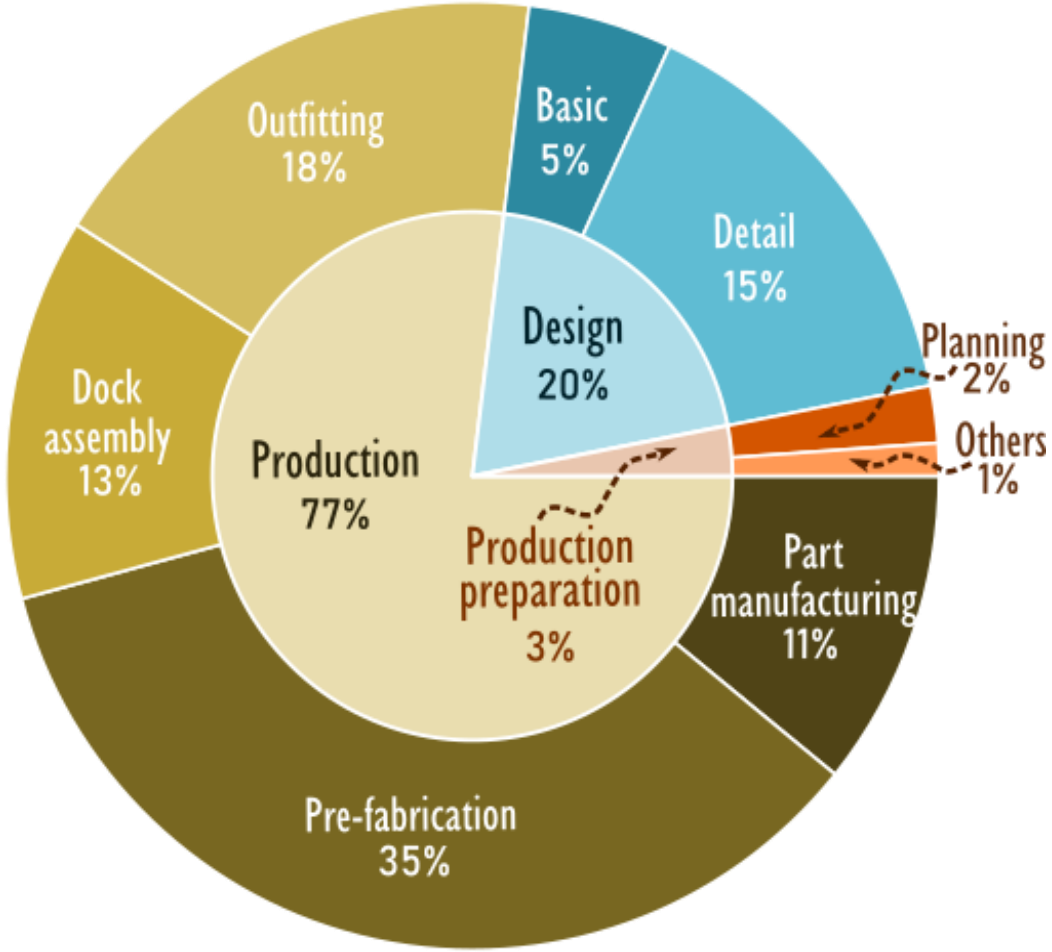
Overview

Shipbuilding and ship maintenance industry

- An increasing complexity in design and manufacturing setup
- Limited production efficiency and product quality
- Preservation of the industry-specific knowledge and skills
- Supply Chain integration
- Struggle to remain competitive and attractive



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Overview

Current automation solutions lack of flexibility and are expensive

We want to have small, cost-effective and highly flexible tools

Basic action tool

Advanced action tool

Advanced action tool

Automated tool

Complex action tool

Worker with process knowledge

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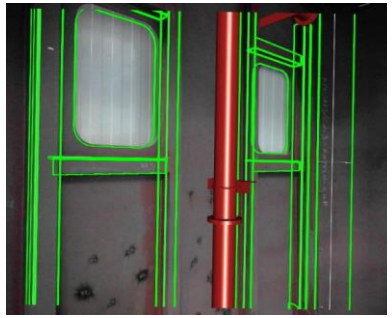
Overview

We want to have small and highly flexible tools



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Objective and concept

Portfolio of worker-centric tools that allows for an easy deployment of advanced technologies.

Scenarios

- Shipbuilding
- Retrofitting/Repairing

Impact areas

- Safety
- Quality
- Productivity

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Objective and concept

Worker-centric approach

User acceptance

Scope

- Increase the efficiency in the manufacturing of complex vessels by small and medium-sized shipyards
- Preserving industry-specific workers' knowledge

Approach

- Automation based on worker-centric tools
- Modular, portable and flexible equipment

Deployment

- New construction and retrofitting/repairing
- Steelwork, pre-production and outfitting stages

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Technical objectives

Development of intuitive human-robot collaborative solutions

- Symbiotically integration of operators' skills and dexterity into flexible and reconfigurable solutions
- Safe, modular and collaborative robot solutions
- Programming and setting time reduction by skill-based and intuitive robot programming
- Reduction of production process time

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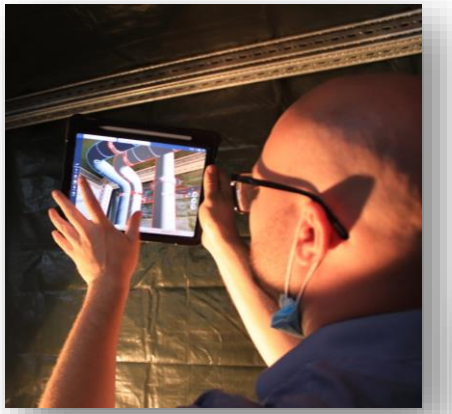
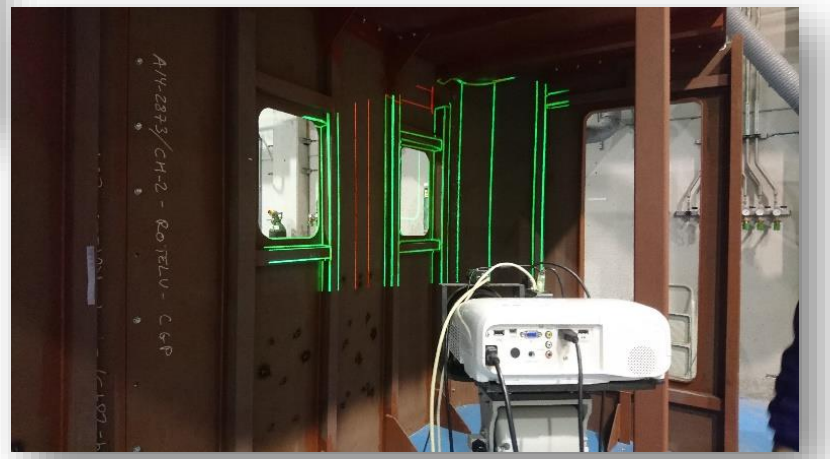
Technical objectives

To develop handheld and portable AR/MR tools for assisting shipyard workers





- Reducing reworks and changes, particularly in the latest phases of the construction.

- Increasing precision and quality by relying on AR/MR tools for a precise positioning of the different subassemblies

- More efficiently training for new shipyard workforce in machinery and deck equipment.

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Technical objectives

AI-assisted exoskeletons for reducing fatigue and physical stress

- Reduction of workers physical effort in the execution of the target tasks
- Usability and acceptability assessed
- Improvement of the ergonomics risk factor in the target applications

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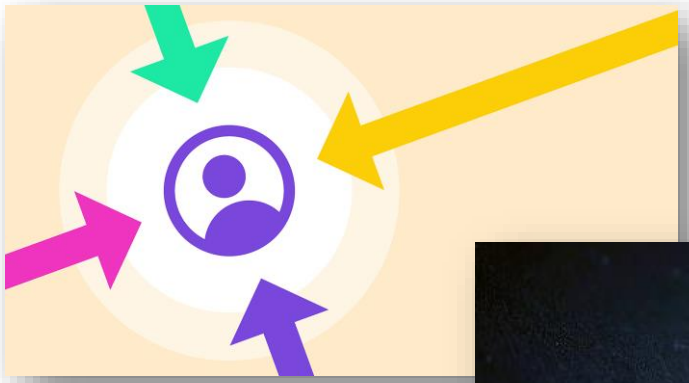
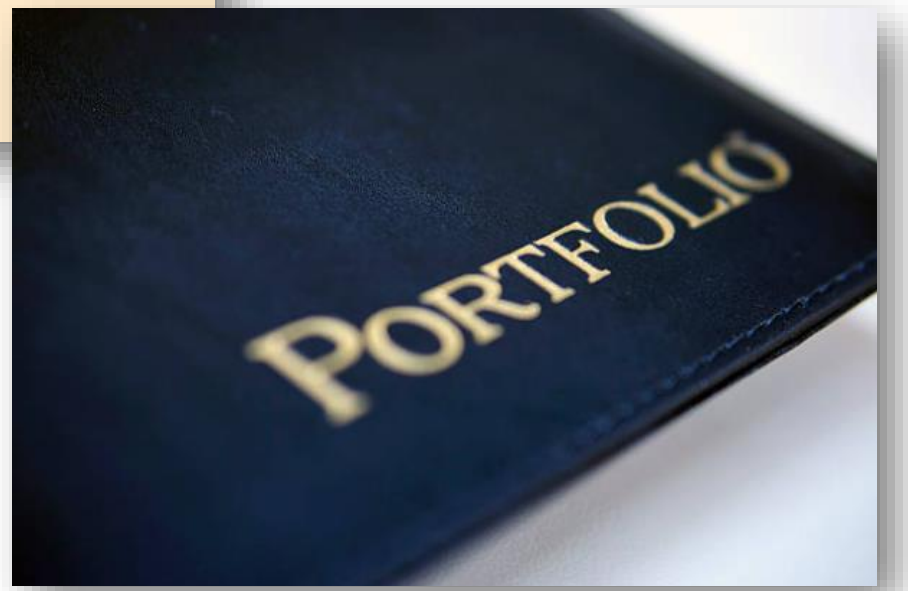
Technical Objectives

To implement a portfolio of worker-centric tools (TRL 7)





- High-payload collaborative robots for assisting operators and acting as work-holding devices
- Flexible and mobile manipulators (Easy to deploy)
- Upper-limb and lumbar exoskeletons
- Projectors and handheld devices providing instructions to operators in the manufacturing processes
- Head Mounted Displays for training.
- Digitalization and reverse engineering (3D scanning)

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Technology transfer and impact

Demonstrate Mari4_YARD approach at real-scale targeting both shipbuilding and retrofitting in SME-shipyards (TRL7), fostering results exploitation and enabling EU wide manufacturing adoption

- **2 real-scale demonstrators** (TRL 7) in small-sized (NODOSA) and medium-sized (BRODOSPLIT).
- **Didactic Factories Networks**: 5 open pilot lines, hosted at RTOs, enabling EU-wide workforce upskilling and technology adoption by EU industry, ensuring a successful market uptake
- **Mari4 alliance community**: engage stakeholders to participate in the community, promoting the Mari4_YARD and its results and opportunities.
- **Training courses**

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Brodosplit shipyard deployment and impact

Worker-centric tools to be deployed

- Exoskeletons for manufacturing activities
  - Ergonomic improvement

- Digitalisation using reverse engineering, 3D scanning and 3D modelling
  - Production planning
  - Continuous monitoring
  - Pre-step for other digitalisation phases

- Augmented reality
  - Construction supervision
  - Production planning
  - Workers training

- Use of robots with fast programming
  - Production improvement
  - Quality improvement

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Nodosa shipyard deployment and impact

Use-centric tools of main interest

- Exoskeletons for welding in non-ergonomic poses
- Use of small robots inside the vessels for welding operations
- Use of robots in shared space in the workshop (fast teaching)

Situation for other technologies

- Digitalisation using reverse engineering, 3D scanning
- Augmented reality

Potential impact

- Improvement on working conditions
- Reduction of welding time
- Improvement on repeatability and quality of welding

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Thank you for your attention!

MARI4YARD
MARI4ALLIANCE

https://www.mari4yard.eu/

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