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"AI-Equipped Collaborative Robot Technology"

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Collaborative environments human-robot interaction in industrial working robot cells

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DGH

GROUPE ADF SMART INDUSTRIAL SOLUTIONS

GOBIERNO DE ESPAÑA

MINISTERIO DE CIENCIA, INNOVACIÓN Y UNIVERSIDADES

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DGH / ADF IBERIA

- ✓ General data from DGH
  - Capacity and Competence to Provide solutions Worldwide.

- Workforce close to 600 people.
- Turnover 2024 > 50 million €.
- 5 Main offices and > 50 work centers

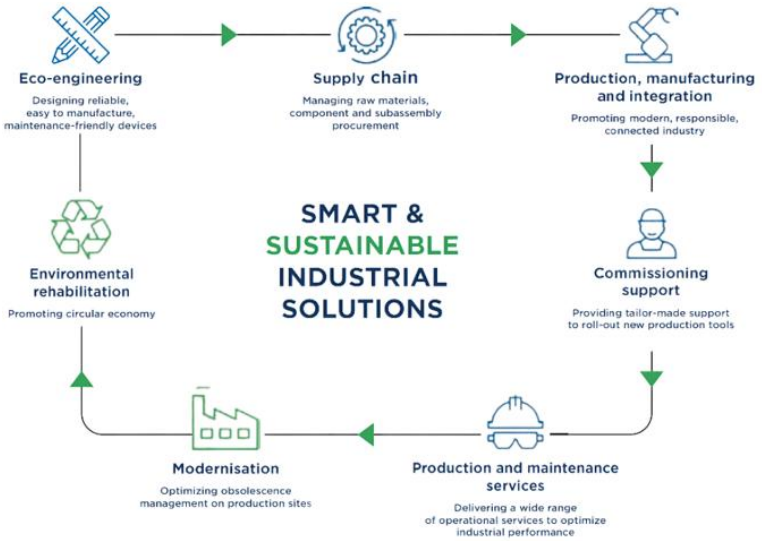
Projects operating on Europe, Asia, América and Asia >12 countries

DGH / ADF IBERIA

- ✓ DGH Main Activities
  - Projects and Industrial installations types
    - Engineering and turnkey projects for automation and intelligent robotics.
    - Applied technological innovation projects by specific R&D&i department.
    - Industrial maintenance. (In site of clients)
    - Process improvement consulting.

  - End to End solutions.
    - Our teams are involved throughout the life cycle of production tools.

    - Our end-to-end solutions are tailored to changing industrial processes constrains.



End to End solutions

Main challenges and solutions

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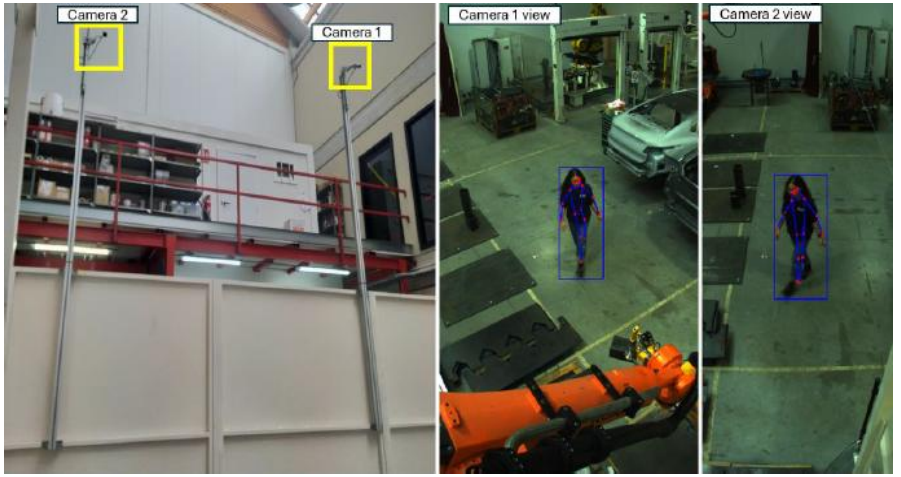
- ✓ Multi-Level Safety System Robot Human Collaboration cell.
  - Safety-rated stop (SRS) and Speed and Separation Module (SSM).
    - System allows industrial robots to work in shared workspace with humans without barriers or fences.

SSM system modes and Simulation in real time of system



Physical installation in industrial layout and view of cameras

- BENEFITS:
  - Industrial robots can work on shared space with humans.
  - Automatic switching between operational modes.

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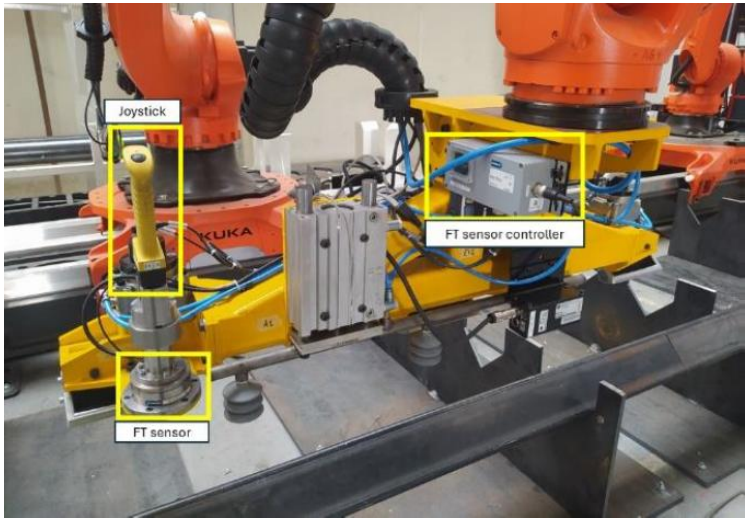
Main challenges and solutions

✓ Hand-Guiding Industrial Robots

- Hand-guiding solutions enables fast and intuitive robot interaction with high-payload industrial robots.

Worker using HG system in real layout



Detail of components physically implement in HG system

- BENEFITS
  - Manipulation of industrial robots in an intuitive way.
  - Easy trajectory by points programming.
  - Hand-guiding allows the use of the robot as a Work holding device to move any type of parts

Products, services, technologies of DGH

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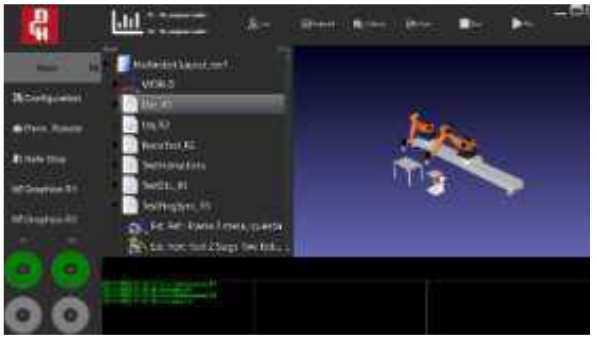
- ✓ Trajectory Manager Software Solution
  - Trajectory Manager is robot program management software: Software Modules inside of TM:
    - **TM Runtime.** Sending of programs to the robots in real time.
    - **TM Preprocessing.** Import programs in robots in many formats.
    - **Buffer Manager.** Dynamic program buffer management.

TM Runtime

TM Preprocessing



Buffer Manager

  - BENEFITS:
    - Reduce the human programming time onsite robot cell, better ergonomic work conditions.
    - No need an expert in robotics to make complex and long robot programs.
    - Reduce the robot collisions checking before them in preprocessing process.
    - TM permits modify the robot trajectories during the process by human user, reducing user reworks and use of resources.

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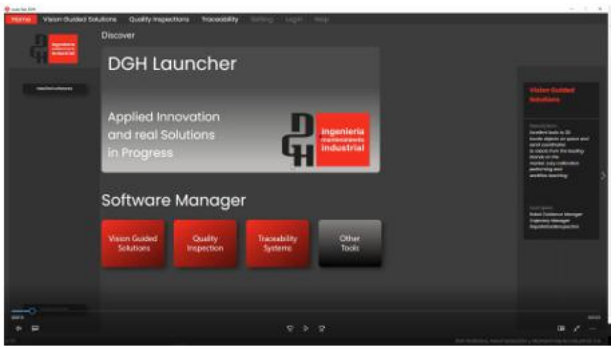
Products, services, technologies of DGH

- ✓ HMI/HRI Launcher Solution
  - HMI/HRI desktop application for Industrial Management Software Modules
  - Software Manager: Warehouse of Software Modules:
    - Vision Guided Solutions, Quality inspection, Traceability systems and Other Software Tools.



Logging and Selection Screen

Running mode Screen

  - BENEFITS:
    - Implementing all industrial management software modules that you need.
    - Work with real time communication of industrial processes.
    - Send robot and PLC programs from cell simulation in real time.
    - Update Robot positions or PLC orders in real time.

Ideas for Future a Japan – Spain collaboration

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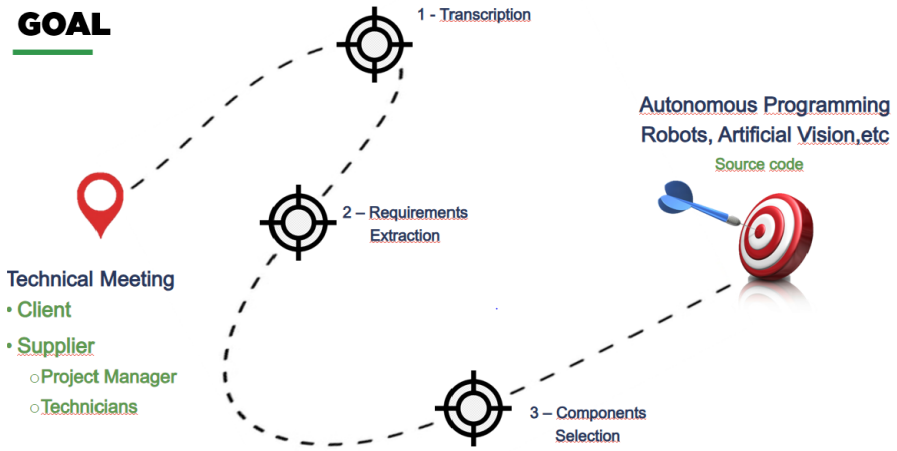
✓ Customized and Advanced Design of Future Industrial Systems

- **GOAL Next Years:**
- Functional and Non-Functional Ideas are Expressed.The team works with AI systems that implement the best ideas considering different parameters such as time, cost, and security.Deployments and Real-Time Simulations.Conversations in the team's domain language with the trained AI system.
- **STEPS:**
  - Technical Meeting recording.
  - Recorded Meeting Transcription.
  - Requirements Extraction.
  - Smart Selection of Components.
  - Source code Generation.
- **BENEFITS:**
  - Significant increase in the efficiency
  - Focus on added value tasks
  - Process more flexible and creative
  - Reduces the dependence of expert programmers



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Ideas for Future a Japan – Spain collaboration

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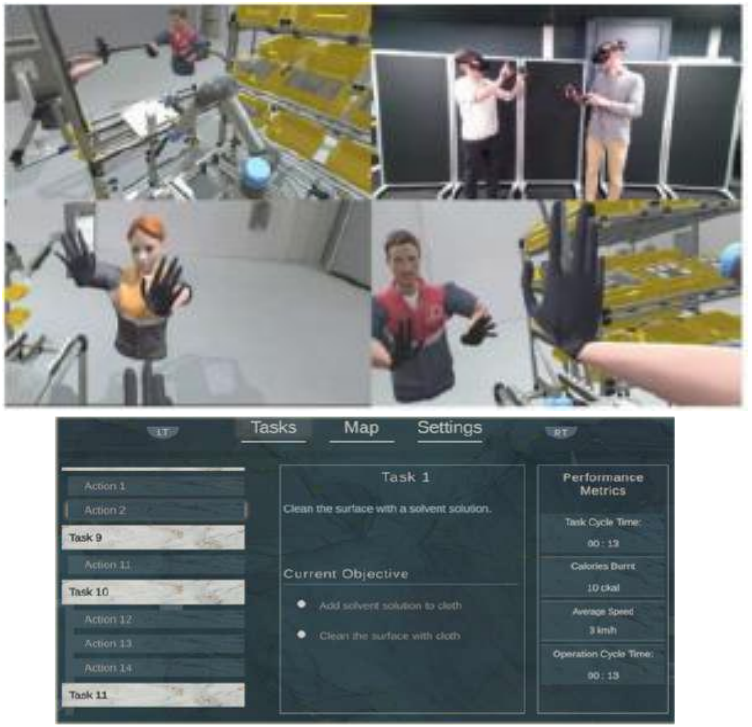
✓ AR Suite for collaborative assembly operations

- Augmented reality (AR) suite that enables the intuitive support of operators during human – robot collaboration.

  - Assembly guidance provision.
  - Robot controlling.
  - Interaction with gripping tools.
  - Safety awareness.
  - Resilience in case of robot actions failure.
  - Quality inspection result awareness.



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Ideas for Future a Japan – Spain collaboration

- ✓ Research into responsible AI systems
  - To provide a responsive and empathetic virtual human interface.
  - To investigate the differential impact of the verbal and non-verbal dimensions of empathic virtual humans.
  - Implement real-time human feedback mechanisms.
  - Studying continuous learning architectures with human supervision

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Thank you

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