

Synergizing Technologies: Enhancing Production through Digitalization

Use Case: Human robot collaboration for
assembly tasks in obstructed workspaces using
AI and AR technologies

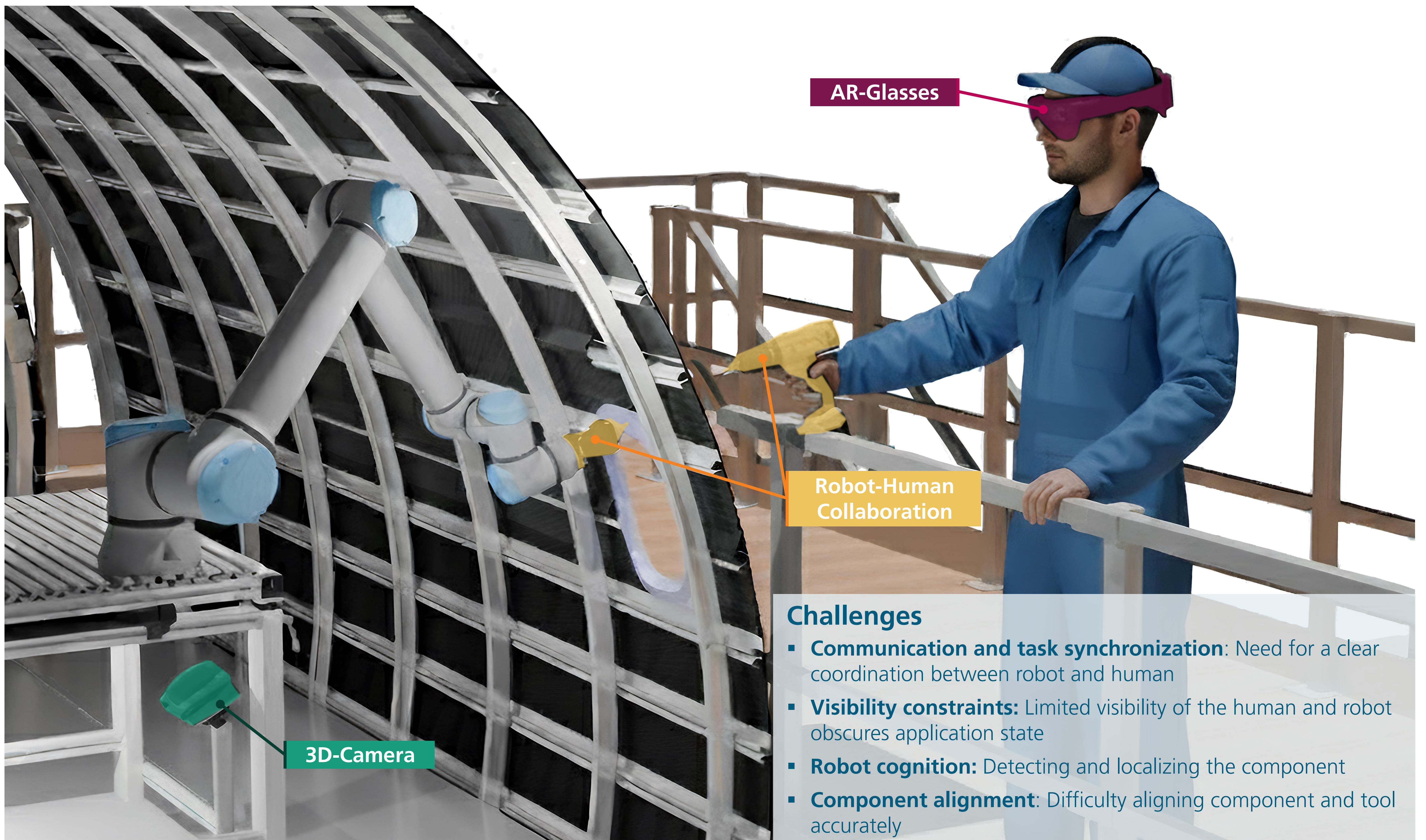
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- Automation and Production Technology
- Assembly, composites and machining technology
- Metrology and robotics
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Challenges

- **Communication and task synchronization:** Need for a clear coordination between robot and human
- **Visibility constraints:** Limited visibility of the human and robot obscures application state
- **Robot cognition:** Detecting and localizing the component
- **Component alignment:** Difficulty aligning component and tool accurately



AI in the loop

- AI augments human abilities and performs tasks that humans can't
- Different LLMs translate human goals into the precise sequence of tool-calls required.
- The real-world mounting process is mirrored by the AI agent's process engine



AI for vision

- 3D visual grounding using augmented reality (AR) glasses and onboard 3D-cameras
- Visualizing robot pose in AR-glasses within obstructed environments
- Projection of accurate 6D component pose for enhanced understanding



AI on the edge

- Onboard AI for enhanced data processing in robotic systems
- Zero-shot 6D pose estimation of components for effective localization within a 3D scene
- Predicting a grasping pose for components using a universal gripper in a cluttered environment



AI for inspection

- Monitoring assembled components through detection and localization
- Monitoring the status of the overall assembly
- Anomaly detection in components based on their geometry and appearance

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