



Interactive Digital Twin for Interdisciplinary Collaboration and Problem Solving in Industrial Production and Maintenance

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Session 2 Workshops, “European projects seeking partners”: Nanotechnology, Materials and Manufacturing (NMM)

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Topics to explore

- Challenges

- Extensive global interconnection in engineering and manufacturing coupled with increased complexity in technical products and machinery has created a **high demand for collaborative IT solutions across industries**.
- Extended availability of sensor data in the industrial Internet of Things (IoT) leads to information overload and **necessitates novel approaches for data visualization along value-adding chains and product life cycles**.

- Objectives

- to develop an **easy-to-use, hardware neutral Virtual Reality (VR) / Augmented Reality (AR) collaboration platform and services** that enable users to create or import a **digital twin model** - to recreate and extend features and behavior of real world physical objects in interactive 3D - with advanced options to generate, configure and parametrize these models and **to include real-world data**
- to showcase industrial **collaboration over complex technical products, processes and systems across knowledge domains** using **immersive technologies**

- Industrial use cases

- to develop **AR/VR visualization, analysis and interaction capabilities** for joint **interdisciplinary collaboration and problem-solving**
- to apply **AR/VR services involving immersion, co-presence and situational task awareness aspects** for creation of shared understanding in distributed interdisciplinary collaboration
- Adapting AR/VR solutions to industry, extending current consumer-focused technologies and services
- Special focus is on **embedding real-time industrial data sources** such as CAD, PLM and shop floor data.

Keywords

Virtual Reality,
Augmented Reality,
Online Collaboration,
Simultaneous Engineering,
Digital Twin,
Data Visualization.



Why *Digital Twin*?

- Digital twin
 - **3D digital replica** of physical assets, processes and systems
 - accurate real-time copy of the physical object's **properties and states**, including shape, position, gesture, status and motion
 - digital representation provides **the elements and the dynamics** of how an Internet of Things device operates and lives throughout its life cycle
- Living digital simulation models
 - integrating historical data from past machine usage
 - integrating artificial intelligence, machine learning and software analytics with data to create living digital simulation models
 - using sensor data to understand operating condition
 - updating from multiple sources and changing itself as physical counterparts change (real-time status, working condition or position)
 - interacting and learning with human experts, e.g., engineers with relevant industry domain knowledge
 - interacting and learning with other machines and the environment

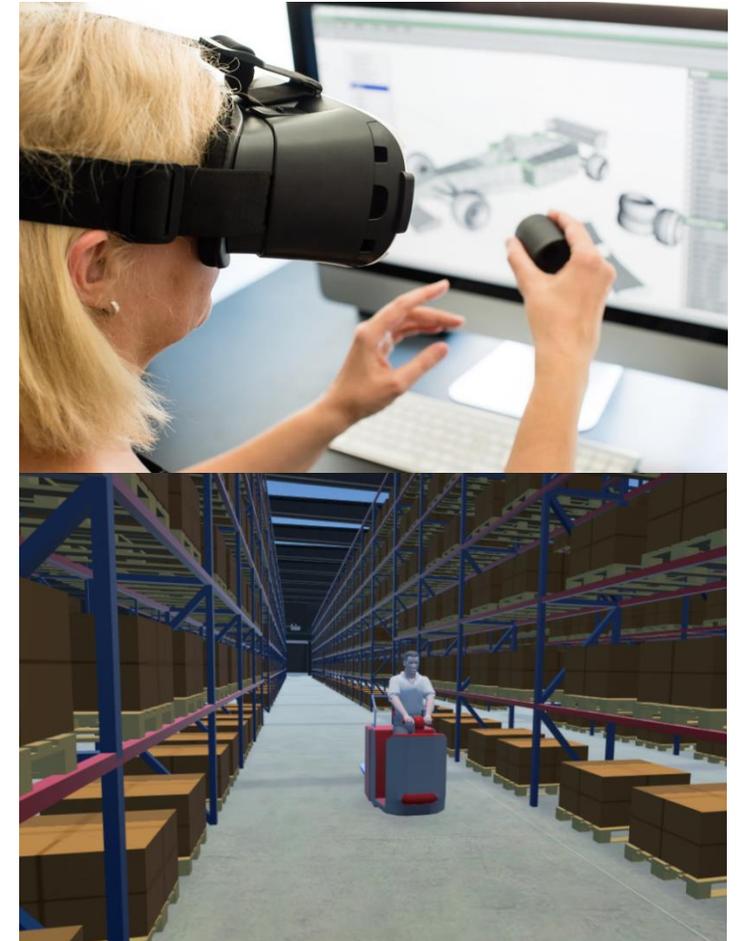
- Advantages and uses
 - logging life cycle information of assets
 - optimizing operation and maintenance of physical assets, systems and manufacturing processes
 - formative technology for the industrial Internet of Things, where physical objects can live and interact with other machines and people virtually
 - enhancing, monitoring, diagnostics and prognostics to optimize asset performance and utilization
 - predictive diagnostics and maintenance to find root causes of problems, reduce risks and improve productivity
 - Examples of industry applications: aircraft engines, wind turbines, large structures e.g. offshore platforms, locomotives, buildings...

Source: Adapted from Wikipedia



Existing expertise and network

- The network partners have *extensive experience in European and German national funding schemes*. EU project participation from FP4, including large-scale SME-IPs, in ICT/IST and NMP/NMM programs.
- Core partners are an established R&I company in automotive (Germany) and a business school (Germany). A *global network of academia experts in use of AR/VR* exists.
- Expertise existing on *Virtual Reality (VR) and Augmented Reality (AR)*, including
 - VR prototyping, content modeling
 - Development of UI/UX concepts for VR environments
 - Conception and development of data transformation tools and system interfaces
 - Computer vision and image processing
 - ...
- Expertise existing on *collaborative work* and *information systems adoption and use*
 - Training in mixed environments
 - User studies esp. with focus on multi-user-environments
 - ...



Collaborations sought

to establish consortia for Horizon2020 calls including but not limited to

- **Industrial use case partners from various industries** to co-develop and apply digital twin solutions
- **Specialized AR/VR companies** to extend their service portfolio
- **Machinery/equipment/sensor manufacturers and engineering firms** to co-develop digital twin services and platforms
- **Specialists in artificial intelligence and machine learning** for simulation of industrial assets
- **Specialists in cognitive, psychological and ergonomic issues** with respect to VR-based work



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