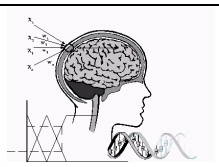
International

Innovation in Knowledge Based and Intelligent Engineering Systems



INVITED SESSION SUMMARY

Title of Session:
Reverse Engineering for CE: 3D model reconstruction and enrichment for circular economy applications

Name, Title and Affiliation of Chair:
Robert Joost, M.Sc.
Fraunhofer Institute for Production Systems and Design Technology, IPK

Details of Session (including aim and scope):

The demand for highly automated processes for 3D model reconstruction (reverse engineering, RE) is growing, driven by improved sensors and technologies such as 3D scanners, lidar, photogrammetry, 2D-3D mapping and AI-based reconstruction methods. The implementation of circular economy practices and R-strategies requires capturing the as-is status in order to obtain information about parts, components and materials – both for economic reasons and to increase sustainability through reuse and recycling. Typical use cases include maintenance, repair and overhaul (MRO) in the Mid-of-Life (MoL) phase and the provision of material, dimensional and sorting data for recycling in the End-of-Life (EoL) phase. RE also supports digitalisation and product transparency by enriching digital twins with as-is data. This points to the relevance of data integration and digital continuity, realized through understanding underlying semantics and smart IT infrastructures.

Model reconstruction and enrichment is only one aspect in cross-domain process chains. Even within a single industry, the diversity of components and scenarios is enormous, and the range of hardware, software and methods is correspondingly large. Since there is no ‘one-size-fits-all’ solution, highly customised and configurable tools are necessary.

The session aims to advance the scientific understanding of requirements, methods and process chains for reverse engineering in sustainable design and manufacturing. We invite contributions that rigorously analyse industrial use cases, propose novel modelling and processing approaches, or provide systematic evaluations of existing RE workflows. A particular focus is on bridging theory and practice: contributors are encouraged to present demonstrators, prototypes and case studies that show how their research can be applied in real industrial contexts. By systematically discussing methods, metrics and validation strategies, the session seeks to identify transferable principles and research gaps, and to stimulate long-term collaborations between academia and industry.

Main Contributing Researchers / Research Centres (tentative, if known at this stage):

- **Team of Fraunhofer IPK for adaptive Repair solutions**
- **Team of Miying Yang, Cranfield?**
- **Unfortunately, I am running late to identify and reach out to contributing researchers, hope that this will be feasible very soon**

Website URL of Call for Papers (if any):

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