Contribution ID: **78**   Type: **TALK**

Project MEMAS: Integrated Data Management for Additive Manufacturing enabling High-Fidelity Modeling

Tuesday 5 November 2024 13:40 (20 minutes)

Predicting the performance of aerospace and automotive structures requires detailed reflection of the actual manufacturing process of each produced part. This is especially the case for composite structures produced with additive manufacturing processes in view of their process complexity and its influence on the product reliability. For high-fidelity numerical models to reflect the actual state of the manufactured structures and cover their individual load-bearing capability, it is essential to consider data across pre-production, production, and post-production stages comprehensively. In this study, we established a robust data acquisition and database infrastructure using the shepard integrated data management system (IDMS) tailored for Robotic Screw Extrusion Additive Manufacturing (RSEAM). Shepard IDMS is designed for storing highly heterogeneous research data adhering to the FAIR principles and offers a consistent API for depositing and accessing various types of supported data. Our data acquisition strategy integrates KUKA Robot Sensor Interface (RSI) and OPC Unified Architecture (OPC UA) protocols for collecting high-frequency time-series data during production. By capturing end-to-end manufacturing data along with associated metadata, we ensure a comprehensive overview of RSEAM activities. Additionally, we developed graphical user interfaces (GUI) in Python using Taipy and Streamlit, streamlining data management including metadata integration and facilitating analysis within this infrastructure. The coupling of the IDMS to a multi-field ontology enables the creation of high-quality and well-documented datasets, which can be converted into predictive numerical models. The contribution will present key solutions for live data acquisition, structuring and storage. The benefit of data enhancement will be highlighted on an exemplary structure.

Please specify "other"

In addition, please add 3 to 5 keywords.

Additive Manufacturing, Integrated Data Management, Numerical Modeling, Ontology, Composite Materials

Please specify "other"

For whom will your contribution be of most interest?

Researchers

Please assign yourself (presenting author) to one of the following groups.

Researchers

Primary author: Mr UNGER, Nicolas (German Aerospace Center (DLR e.V.) Institute of Vehicle Concepts)

Co-authors: Mr KAMBLE, Pradnil (German Aerospace Center (DLR e.V.) Institute of Vehicle Concepts); VINOT, Mathieu (German Aerospace Center (DLR e.V.) Institute of Structures and Design); Mr GLÜCK, Roland (German Aerospace Center (DLR e.V.) Center for Lightweight Production Technology)

Presenter: Mr UNGER, Nicolas (German Aerospace Center (DLR e.V.) Institute of Vehicle Concepts)

Session Classification: Session E2

Track Classification: Connecting research data: 7. Infrastructure and common practices for consolidation of (meta)data