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ONTOLOGIES FOR DIGITIZED VALUE CHAINS IN ADDITIVE MANUFACTURING PROCESSES

Task

To continuously improve additive manufacturing processes, engineers must integrate them into digital value chains within the principles of the Fourth Industrial Revolution. In particular, to continuously improve both additive manufacturing processes and the quality of the manufactured components, the inclusion of all influencing factors of the process must be consistent, traceable and transparent. For this purpose, data generation, data storage, data evaluation and the corresponding data streams along the process chain must be known, semantically comprehensible and merged.

Method

Suitable tools for this kind of merging are ontologies. These enable engineers to create a unified vocabulary, to map and index logical relationships and to generate knowledge graphs for linking the data, which can be stored in a standardized file format (RDF, resource description framework), imported into databases, and searched using a standardized query language.

Results

Fraunhofer ILT is using its expertise in the laser-based additive manufacturing processes laser material deposition (LMD) and laser powder bed fusion (LPBF) to create a digital knowledge base, which has been built up over many years. In this, the data along the process chain are networked with regard to the powder material, the process, the machine used and the product. The ontologies developed serve as a template for transfer to databases and can be supplemented with application-specific measurement and process monitoring data, as well as simulations.

Applications

The ontologies for additive manufacturing processes can be applied independently of industry and application and can be extended as required. The work is funded by the Fraunhofer-Gesellschaft as part of the ADAM project. It focuses on developing ontologies as a basis for SME-oriented data-driven value creation through data ecosystems.

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