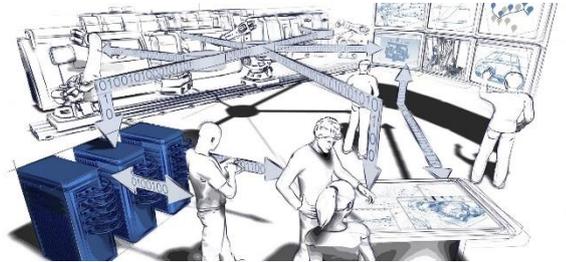


Extraction and Evaluation of Ontologies for Application of Big Data Technologies in Production

Scientific Question

In the context of digitization and industry 4.0, reliable communication is just as important as data analysis. Unit errors can lead to significant problems. In 1999 the NASA probe Mars Climate Orbiter was lost due to communication difficulties between navigation and ground station. In general, purely numerical values (e.g. "22.4") complicate preparation and evaluation of collected data.



The Cluster of Excellence "Internet of Production" is developing a common vocabulary for data acquisition to increase the significance and meaning of collected data for data scientists. Ontologies represent all necessary semantic relationships, but it is costly to create and maintain these. At the same time, there are established communication standards in the engineering sciences, such as OPC-UA.

The aim of this thesis is to extend a data stream of real machine data by metadata (e.g. units) and to extract an ontology from existing communication standards. Finally, commonalities between production plants are to be recognized automatically and the information models of the respective machines are to be evaluated.

Scientific Methodology

- Creating a data model with important metadata for semantic storage of machine data
- Analysis of the OPC-UA information model of an injection molding machine at the IKV
- Implementing an ontology extraction method as a feature of an existing OPC-UA Connector
- Setting up an evaluation system to reward standardized values over subjective inputs

Objective and Expected Results

- Automated extraction and evaluation of information models from a CPPS in injection molding
- A system for converting an OPC-UA information model into an ontology
- Evaluation system to reward standardized vocabularies, including test runs

The results of this work are an important step towards interoperability between production machines within the Industry 4.0. They include a software for converting OPC-UA information models, as well as a concept and implementation of a comparison of different ontologies with subsequent evaluation. This greatly supports Data Scientists in their work and promotes the interoperability of machines.

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