Scientific Question

In the context of Industry 4.0, reliable communication is as important as data analysis. For example, the NASA probe Mars Climate Orbiter was lost in 1999 due to a simple unit error. In general, just numerical values (e.g. “22.4”) make the analysis of collected data difficult.

In order to increase the informative value of data for data scientists, we research common vocabularies the cluster of excellence “Internet of Production” at RWTH Aachen University. Ontologies properly map semantic relationships, but must be expensively created and maintained. Standards already exist in the engineering sciences, but their full potential is not being exploited.

The aim of this master thesis is to extend a data stream of real machine data with proper metadata (e.g. units) and to extract an ontology from existing communication standards like OPC-UA. Finally, commonalities between production systems will be automatically identified and the information flows of different machines will be analyzed prototypically using Machine Learning.

Scientific Methodology

- Analyzing the live data integration (OPC-UA) of an injection molding machine at the IKV
- Implementing an ontology extraction feature into an existing OPC-UA Connector
- Construction of an ontology and verification on a real injection molding machine

Objective and Expected Results

- Extraction and analysis of information models from a CPPS in injection molding
- Conversion of an OPC-UA information model into an ontology
- Upgrade of the current data integration with semantics, including evaluation
- Prototypical data analysis via Machine Learning on semantic data

The results of this work are an important step towards interoperability between production machines in the context of Industry 4.0 and include software for the conversion of OPC-UA information models, as well as a concept and implementation of a comparison of different ontologies with subsequent evaluation. Data Scientists are supported in their work and the interoperability of machines is promoted.