Position Statement

Our group at EPFL focuses its researches on ICT for Sustainable Manufacturing. In order to make manufacturing more sustainable, we want to avoid machine breakdowns and defects along the product lifecycle. To achieve this goal, we want to exploit the data produced by the machines along the assembly line. The exploitation of this data is made easier by the use of ontologies, that helps us add semantics to the data, and therefore, give meaning to the data we are handling.

To be more specific, our goal is to provide standard ontologies in the context of the Industry 4.0. This leads us to graph data, which we need in order to achieve data integration and data management. The purpose is to standardize data management and data exchange, in order to improve the interoperability between industrial processes.

For example, we are a contributor to the BOOST 4.0 project, which aims at providing a European Industrial Dataspace, which is an open-source platform that offers a space for standardized data exchange and management for better interoperability between manufacturing industries in the context of the Industry 4.0.

In order to add meaning to the data we exploit, we use tools such as RDF and OWL, which helps us describe what data represents, where they it's coming from, add properties, and more importantly, link data together.

The challenge we are frequently facing in our research, though, is how to exploit already existing data. The data we collect from machines comes in different types of formats, which are usually not graph data, formats such as JSON, Excel tables or relational databases. This means that in order to be able to exploit this data, we need to transform it first. This transformation consists in mapping the format of the existing data to our ontologies, so that we can add the proper semantics to them. For each piece of data we collect, we need to ask ourselves : is it the instance of a class ? Or is it a property ? Does it have to be linked to other data ?

Mapping relational data to RDF in itself isn't particularly hard, as the W3C has already issued recommendations in that regard. But in our case, we cannot simply "hard-code" this mapping. We need to transform huge datasets, sometimes data that is generated in real-time, and map them to ontologies that are themselves very rich. Mapping "by hand" every field of the relational data to the corresponding semantics would be a tedious work. So we need to automate this mapping, and for this purpose we need to come up with a methodology that we can implement in a software.

This workshop is therefore of particular interest for us, and we are particularly looking forward to the sessions regarding the exchange of datasets from relational formats to graph formats, and how we could leverage the standards that exists in this regard to automate our mapping processes.

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