
Reference: QSE.KGX

Topic: Cross-Domain Quality Knowledge Graph Exploration

Course Type: Project, Bakk-/Master Thesis

Start: As soon as possible

End: To be defined

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Background

Modern software-intensive production systems require multi-view models to integrate the knowledge coming from the involved domain experts. *Multi-view knowledge graphs* facilitate (i) the efficient analysis of application quality, risk, and security and (ii) improving data quality as a foundation for data analytics for heterogeneous stakeholder groups that have to collaborate to achieve their goals.

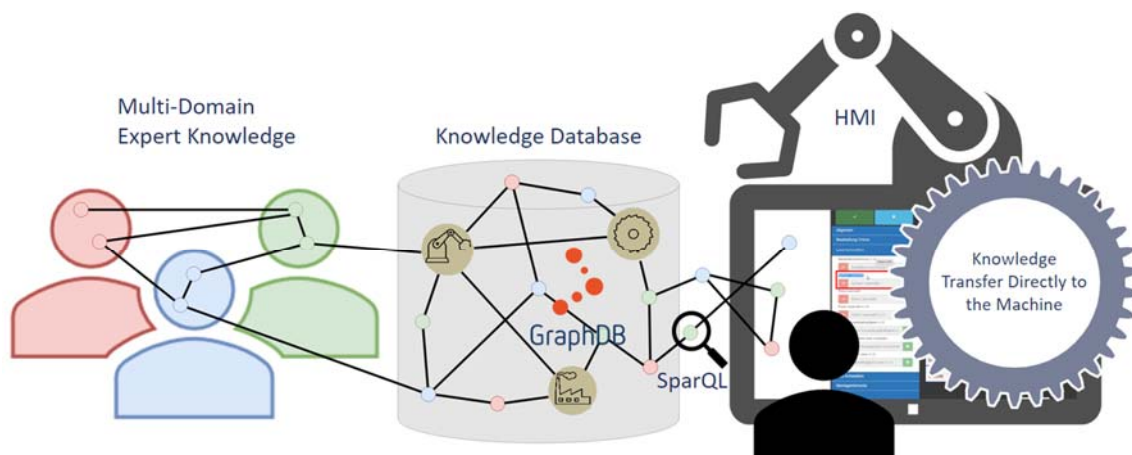


Figure 1: Integrating expert knowledge into a graph database to provide knowledge to an operator.

The spread of the Industry 4.0 paradigm has led to a proliferation of data generated by production equipment in factories. This data opens up new opportunities for data analysts to investigate quality issues. The vast amount of data also makes the identification, selection and correct interpretation of data all the more important. This affects a wide range of experts who design, operate and maintain production equipment. The biggest challenges domain experts face in this context are to capture and integrate their multi-view expertise on potential failure modes and effects,

products, processes, and production equipment, and to coordinate their actions to systematically investigate and address the most important issues first.

To address these challenges (see Figure 1), we have been designing a knowledge base to **represent cross-domain quality knowledge for efficient data analytics**.

Goal of this project is to (1) parse XML data into a knowledge graph, (2) query the knowledge graph for potential causes of a given error, and (3) display potential solutions on user interface and update the knowledge graph with feedback from the solution result.

Tasks

- Design and populate a knowledge graph, based on an ontology.
- Parse XML data into RDF using RML
- Query and filter knowledge graph, e.g., using SparQL
- Explore knowledge graph to find best solutions, e.g., causes of errors in a network.
- Empirical evaluation of the query results regarding the requirements

Expertise

For this topic, a set of skills is recommended (at least two are mandatory).

- Ontology and knowledge graph design
- Knowledge graph database skills, e.g. Graphdb/SparQL
- RDF mapping languages: RML, R2RML, YARRRML
- Data Cleaning

References

Sebastian Kropatschek, Thorsten Steuer, Elmar Kiesling, Kristof Meixner, Thomas Fruehwirth, Patrik Sommer, Daniel Schachinger, Stefan Biffl, "Towards the Representation of Cross-Domain Quality Knowledge for Efficient Data Analytics," in *2021 26th IEEE International Conference on Emerging Technologies and Factory Automation (ETFA)* , doi: 10.1109/ETFA45728.2021.9613406.