

QSE Research – Student Topics

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Alle Themen können Sie nach Vereinbarung in einer Bakk-Arbeit, Master-/Diplomarbeit bzw. auch als Praktikum/Projekt oder, je nach Eignung, als Seminar absolvieren. Bei Interesse an einem dieser Themen wenden Sie sich bitte direkt an die angeführte (erste) Ansprechperson.

Folgende konkrete Fachbereiche/Themen werden derzeit angeboten:

- Knowledge-based Requirements Engineering
- Model Quality Assurance and Human Computation
- Big Data in Software and Systems Engineering
- User Experience and Interface Exploration
- Social Media and Collective Intelligence Systems
- Open Source Software (OSS) Projects

Knowledge-based Requirements Engineering

new Multi-Domain Engineering Graph Generation with Common Concepts ([Details](#))

Referenz: QSE:MDEG

Ansprechpartner: [Felix Rinker](#), [Stefan Biffl](#).

new Risk Analysis in a Cause-Effect Knowledge Graph ([Details](#))

Referenz: QSE:RACE

Ansprechpartner: [Kristof Meixner](#), [Stefan Biffl](#).

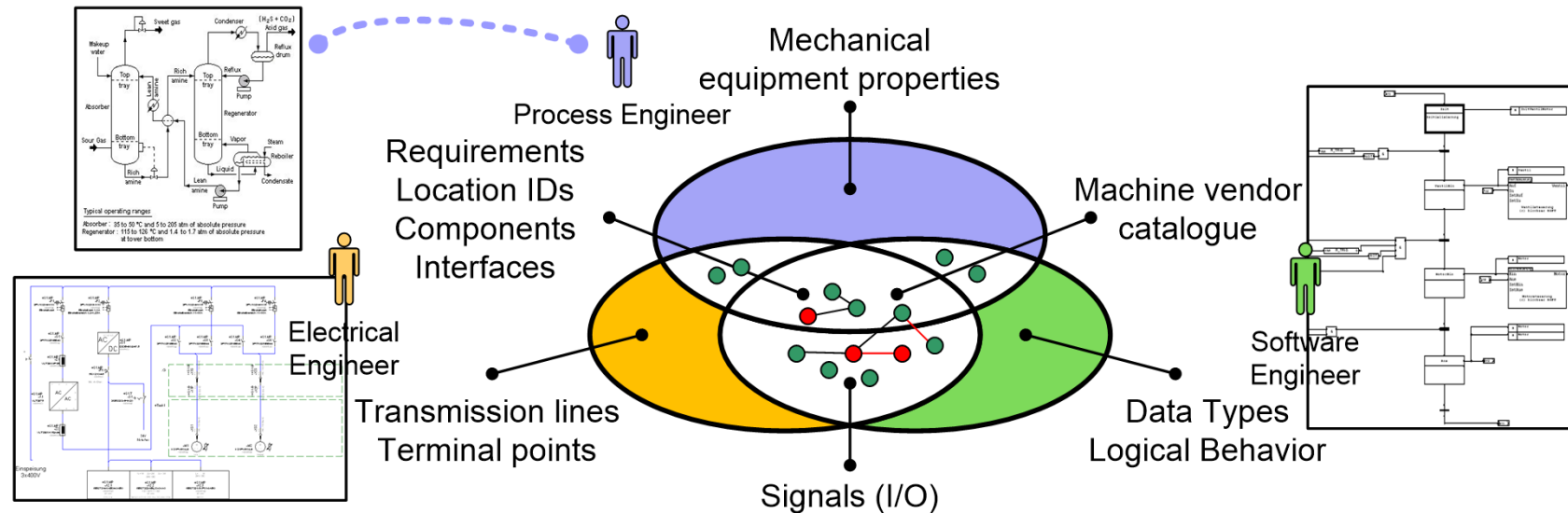
new Change Impact Analysis in an Industry 4.0 Knowledge Graph ([Details](#))

Referenz: QSE:CIA

Ansprechpartner: [Kristof Meixner](#), [Stefan Biffl](#).

Defect Detection Across Engineering Models

Use of common concepts in models across engineering disciplines



Defect type examples

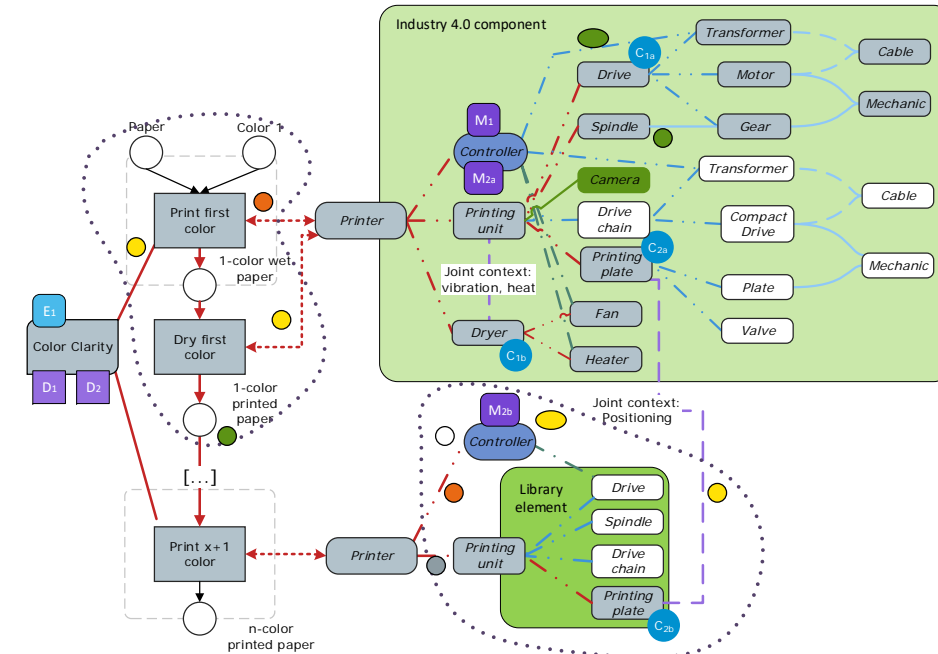
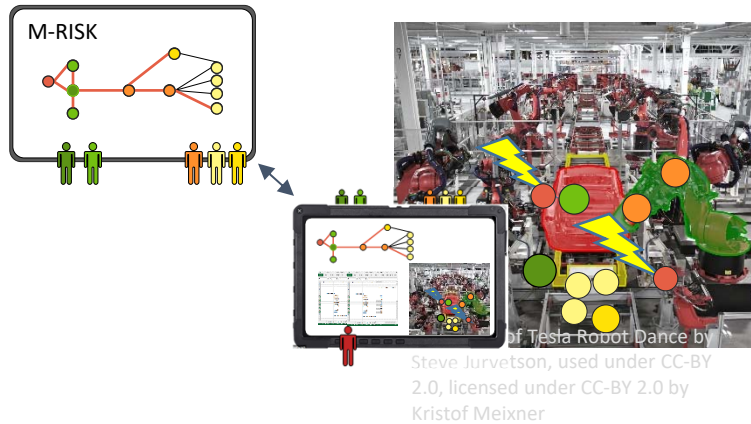
- Missing, wrong, inconsistent model elements or relationships
- **Conflicts from changes** of overlapping model elements
- Run-time violation of model constraints

Defect detection approaches

- Review of overlapping model parts
- Automated check of model assertions (syntactic and semantic)
- **Change conflict detection** and resolution
- Derivation of run-time assertions

Knowledge-Based Requirements Engineering

Seminar, Practical Course, Bachelor Thesis, Master Thesis



Context

- Knowledge Graph of System elements and links.

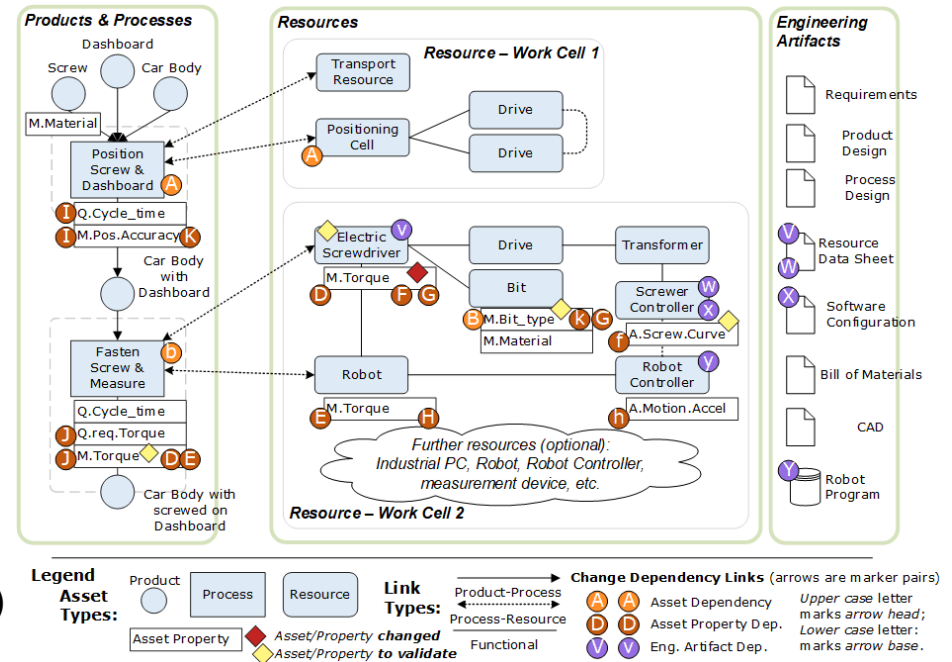
Topics

- Risk Analysis based on a Cause-Effect Knowledge Graph.
- Change Impact Analysis in an Industry 4.0 Knowledge Graph.

Stakeholders Views	Products & Processes	Mechanical Resources	Automation Resources	Engineering Artifacts
Functional Planner (FP)	Process	Abstract Resrc		Requirements Product Design Process Design
Detail Planner Mech. (ME)	Process	MRes1 MRes2	Abstract Resrc	CAD Bill of Materials
Detail Planner Autom. (AE)	Process	MRes1 MRes2	ARes1 ARes2	Robot Program Software Config.
Team Workspace	Process	MRes1 MRes2	ARes1 ARes2	Team Workspace

Multi-Domain Engineering Graph Generation based on Common Concepts

- Application example:
Robot Work Cells in Automotive Production
- Integrated knowledge systems** can support stakeholders in CPPS engineering
 - with project **coordination**
 - provide **inspection** and **analysis** capabilities
- The Multi-Domain Engineering Graph (MDEG) approach, enables the **efficiently building** of a comprehensive CPPS overview.
- Applications: **Data Analytics (ML)** and **IT Security Analysis** (attacks, countermeasures)

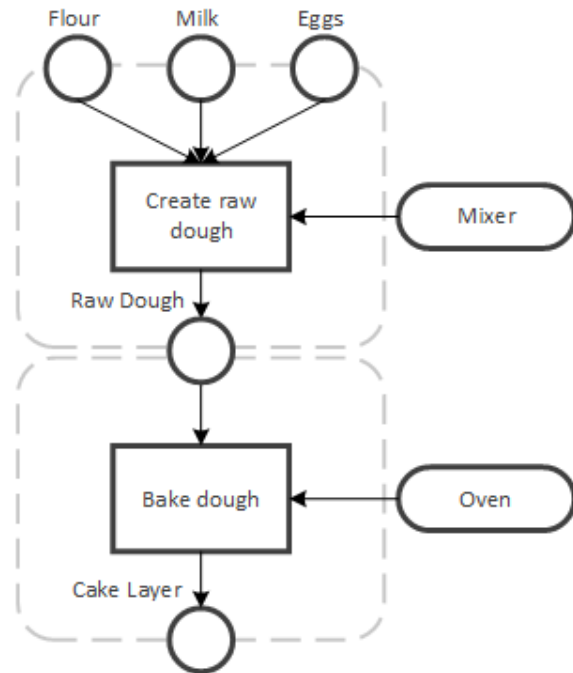


- Expertise**
 - For this topic a set of skills is recommended (at least two are mandatory).
 - Java programming skills
 - Graph database skills, e.g., Neo4J/Cypher.
 - Data modeling
 - Empirical evaluation, e.g. case study, pre/post comparison.
 - Semantic web / model-driven engineering skills



Searchable Engineering Knowledge Graphs

A Web interface for querying *Engineering Knowledge Graphs*.



Context & Issue

- **Product-Process-Resource** models are knowledge that can **represented in Neo4J graphs**.
- Engineers need **better query options** to find specific assets.

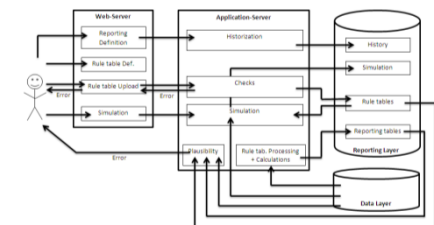
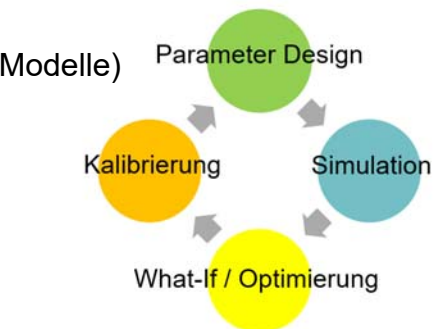
Tasks

- Define **Cypher queries** to read and retrieve knowledge.
- Design **Angular interface** for preselected queries.
- **Evaluate** the design solution.

Stellenausschreibung

Software Entwicklung/Design, junior oder senior

- Kontext: Anwendungspartner (Engineering bzw. Enterprise, Fallstudien) in einem Forschungsprojekt des Instituts für Information Systems Engineering
- Software-Entwicklung/Mitarbeit in einem erfahrenen Team für Risikomanagement, Simulation, Daten-Design und Daten-Qualitätssicherung
 - Konzeption und flexible Umsetzung projektspezifischer IT-Anforderungen / agile Prozesse
 - Erlernen von fachspezifischem Know-How im Anwendungsbereich, etwa
 - Weiterentwicklung parametrierbarer Simulationsmodelle (Risiko/Scoring-Modelle)
 - Dynamische Reportgenerierung und Workflow-Management
 - Large-scale Datenkonsolidierung und -Mining
 - Flexible Zeiteinteilung auf Werkvertragsbasis oder (Teilzeit-)Anstellung
- Qualifikation
 - Lernbereitschaft bei Einsatz neuer IT-Werkzeuge/Prozesse
 - SQL (etwa Oracle, SQL Server)
 - Office/Excel/Visual Basic/Scripting; Interesse an Python
 - Interesse an OO-Design, etwa .Net/C# oder Java
 - Erfahrung mit agiler Entwicklung im Team, gute Kommunikationsfähigkeit



- Kontakt: Prof. Dr. Stefan Biffl <Stefan.Biffl@tuwien.ac.at>