International Workshop on Software Engineering for Smart Cyber-Physical Systems (SEsCPS)

Versioning in Cyber-Physical Production System Engineering – Best-Practice and Research Agenda

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Motivation & Background

Motivation:
- Large-Scale Engineering Projects, e.g., hydro power plants, car manufacturing plants, steel mills.
- Cooperation of different engineering disciplines.
- Disciplines have specific engineering tools.
- Manual effort required for data exchange and synchronization (high risks).

Key research questions focus on:
- domain experts and researchers in ASE environments
- with a set of concepts, methods, and tools
- to make informed decisions on top of integrating engineering knowledge
- to design advanced applications for mitigating risks of defects in the engineering of flexible automation systems
Limited engineering process analysis and improvement capabilities

- Engineering processes seem sequential but have loops back.
- Heterogeneous knowledge representations in diverse engineering models.
- Fragile change management in parallel multi-disciplinary engineering.
- Insufficient early risk management in a heterogeneous environment.
Industry 4.0: Engineering Knowledge at Run Time

- Flexibility increases system complexity
- Need for better integrated engineering to cope with larger solution space and with system changes at run time – commissioning
Version Management of Mechatronic Objects

- Versioning of various semantic model element levels
  - File, Folders, Structural Elements, and detailed content levels
- File-Level Versioning not sufficient
  - reflects data format syntax
- Detection of Changes at Model-level
Summary & Research Aspects

- Engineering of sCPS needs to cope with multiple heterogeneous engineering domains

- Data heterogeneity integration
  - Methods, tools and modeling approaches of various domains
  - Access to domain specific model data from project/process level

- Versioning and linking of engineering artifacts
  - Scalability of framework in managing versions
  - Formulation of cross-domain queries with domain-specific knowledge

- Model-driven engineering
  - Modeling permitted changes of the production system during runtime
  - Modeling corridor of allowed changes
  - Formalization of operator’s knowledge to support automation