Smart Factories

Information Models in Siemens

Many different types of models co-exist
• independently developed
• different (often incompatible) formats
• developed using different types of proprietary software
• models may not come with a well-defined semantics
• specifications of models can be ambiguous

Challenges in practice
• model development, maintenance, and integration
• data exchange and sharing

Manufacturing Model

ISA 88/95 based manufacturing model
• Design & production
• Three layers

Role of Info. Models
• Schema: construction & execution of complex CIs
• monitoring tasks
• anomaly detection
• Data: exchange, storage

Semantic Models for Siemens

OWL 2 for information models
• rich, unambiguous, standardised & flexible modelling language
• well-suited for describing industrial information models
• a wide range of tools, for validation, integration, and reasoning
  → automation of labor-intensive, error-prone tasks

RDF for data exchange
• unified data format for access and exchanged
• RDF triple stores for storing, highly scalable query answering
• can be effectively queried in conjunction with ontologies

Ontologies in Siemens
• Have been successfully used for
  • Ontology Based Data Access
  • MES and shop-floor level diagnostics
• Developed by R&D personnel familiar with SW technologies

Project Goals:
• to widen the scope of ontologies in Siemens
• to scale onto development
• to provide industry-oriented ontology management tool

Energy Production Model

SOMM: Siemens-Oxford Model Manager

Axioms & constraints (A&C)
1. Form based interface
2. A&C on the same interface
3. A&C encoded in Datalog

Auto-generated data forms
1. From properties assigned to classes
2. Both explicit and implicit

Extended hierarchies
1. Based on arbitrary properties
2. Generalisation of partonomy

Alignment
1. Allows to merge and import models
2. Based on LogMap

Reasoning
1. Schema and Instance level reasoning
2. Hermit for schema level reasoning
  • Ontology classification
  • Class satisfiability
3. Datalog engine with Stratified Negation
  • Data validation
  • Query answering