

Augmenting Standards with Ontologies

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Moving Forward with Ontology-based Standards: Sharing Experiences

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Overview

- Ontology design and evaluation
- Ontology integration
- Semantic integration of software systems
- Repositories

Ontologies for Standards

- Manufacturing and information standards provide an excellent opportunity for the design and evaluation of new ontologies.
- The terminology of the standard and its intended semantics are the result of consensus within the community that developed the standard; the ontology for the standard is the axiomatization of this intended semantics.

Manufacturing Interoperability

Several standards exist which support interoperability among manufacturing software systems

- ISO 10303 STEP (Standard for the Exchange of Product data)
- ISO 14694 (NC Data)
- ISO 15531 MANDATE (Manufacturing Data Exchange)
- ISO 5608 (Cutting Tools), ISO 1832 (Cutting Tool Inserts)
- ISO 16100 (Manufacturing Software Capability)

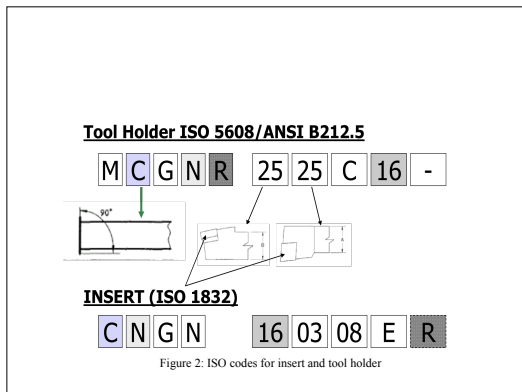
Enterprise Modelling

- ISO 19439 Enterprise integration – Framework for enterprise modelling
- ISO 19440 Enterprise integration Constructs for enterprise modelling
- ENV 12204 (Constructs for Enterprise Modelling)
- ENV 40003 (Framework for Enterprise Modelling)

Lack of Integration

- Nevertheless, these standards have many overlapping concepts, and each standard often has a different intended semantics for these concepts.
- This clash of semantics arises from the lack of an explicit formal axiomatization of the terminology within an ontology.
- Furthermore, the formalisms currently being used to represent manufacturing concepts are weak; consequently, the standards are difficult to verify by customers, complex to maintain, and costly to harmonize.

The Problems of Standards Integration



Semantic Integration of Software Systems

- A semantics-preserving exchange of information between two software applications requires mappings between logically equivalent concepts in the ontology of each application.
- The challenge of semantic integration is therefore equivalent to the problem of generating such mappings, determining that they are correct, and providing a vehicle for executing the mappings, thus translating terms from one ontology into another.

Application of Ontologies

- By providing ontologies for the above standards, we can enable the integration of manufacturing software applications in domains that require the use of multiple standards.
- Ideally, ontologies for supply chain management and enterprise integration can be incorporated into manufacturing standards thus avoiding the barriers to interoperability that could result from a lack of harmonization.

Challenges

- What generic ontologies do we need in order to design ontologies for manufacturing standards?
 - ▶ Time
 - ▶ Process
 - ▶ Shape
 - ▶ Geometry
 - ▶ ?
- Evaluating ontologies for manufacturing standards