COLORE:
Common Logic Ontology Repository

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Ontology Summits

- 2006: Upper Ontologies
- 2008: Open Ontology Repositories
- 2009: Towards Ontology-based Standards

- How can an open ontology repository support the integration of upper ontologies and also support the design and reuse of ontologies for existing and emerging standards?

Plan

- Ensure that the OOR can support the inclusion of Common Logic ontologies
- Characterize logical relationships between ontologies within the repository
- COLORE (COmmon Logic Ontology REpository)

Relationships among Ontologies

- The first step in the integration of a set of ontologies is to understand the logical relationships between ontologies, that is, relationships that can be determined from the axioms alone.
  - Mutual consistency;
  - Extension (one ontology stronger than another in the sense that any sentence in the first ontology entails the sentences in the second);
  - Theory T_1 is definably interpretable in a theory T_2 iff for each symbol in the nonlogical lexicon of T_1 the relation/function/constant denoted by the symbol is definable by a sentence S in the language of T_2.

Consistency is not enough …

```
(forall (x)
    (not (supervises x x)))

(forall (x y)
    (if    (and    (ceo x)
                   (employee y))
           (supervises x y))

(forall (x)
    (if    (ceo x)
           (employee x)))
```

These axioms entail

(not (exists (x) (ceo x)))

Representation Theorems

- Models for ontologies can be represented using classes of mathematical structures
  - Models of PSL-Core represented by incidence structures that correspond to partitions of directed graphs.
  - Models of mereotopologies are represented by classes of lattices
- This allows us to characterize the models of the ontology using the models of well-understood theories

COLORE

- Construct a repository of first-order ontologies that will serve as a testbed for ontology evaluation and integration techniques, and that can support the design, evaluation, and application of ontologies in first-order logic.
- These ontologies are specified using Common Logic (ISO 24707).

Foundational Ontologies

- The foundation of the repository will consist of ontologies for general mathematical structures:
  - geometry,
  - algebraic structures (e.g. semigroups, groups, rings, vector spaces);
  - combinatorial structures (e.g. orderings, lattices, graphs).
- These ontologies will serve as the basis for the representation theorems.

Generic Ontologies

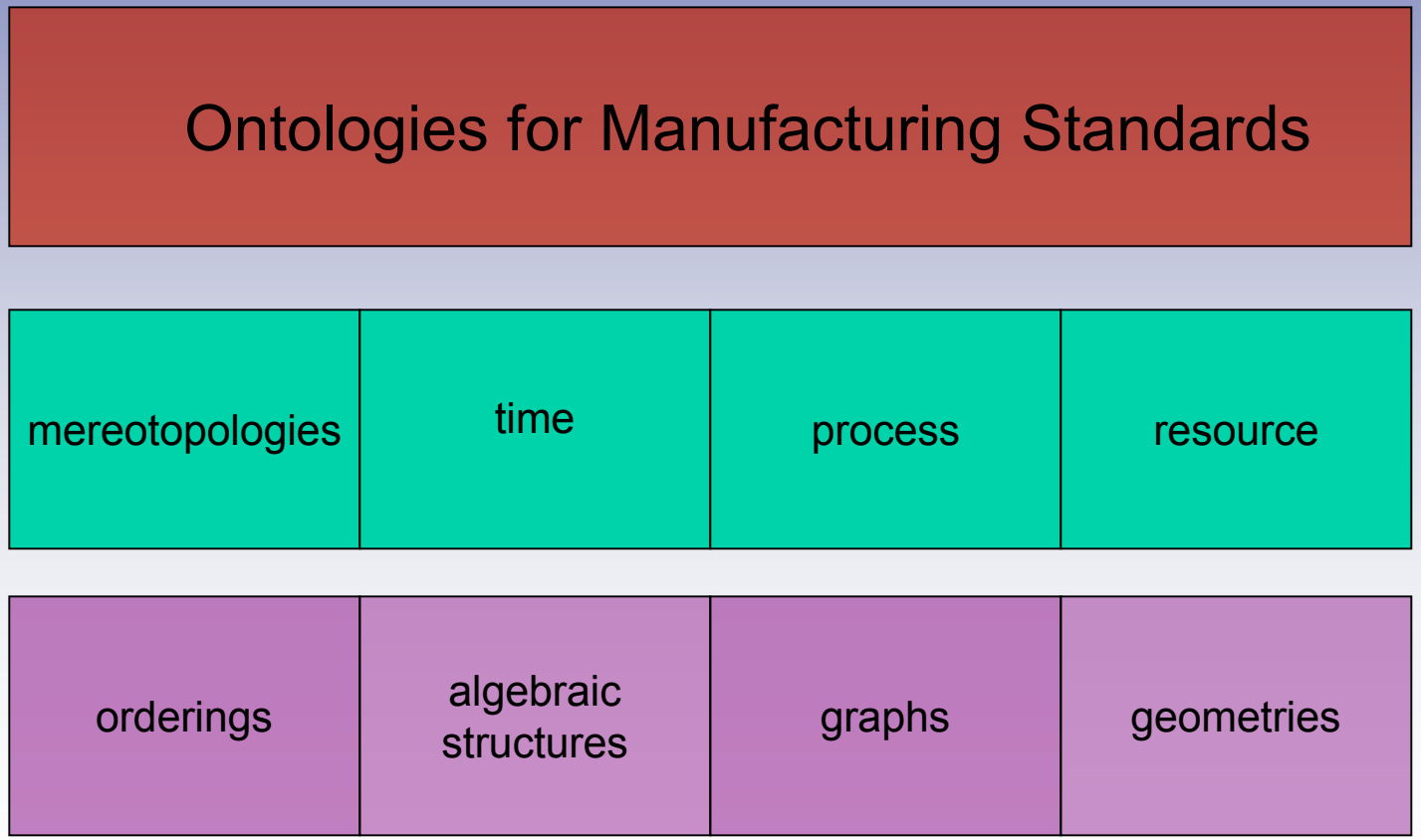
- The next part of the repository will consist of generic ontologies for domains such as
  - process
  - time
  - mereotopology
  - resources
  - products

  which are required by current upper ontologies, as well as existing and emerging manufacturing standards.

Ontologies for Standards

- The final part of the repository will consist of generic ontologies for manufacturing standards that are integrated extensions of ontologies designed and evaluated in the second part of the repository.

COLORE


Ontologies for Manufacturing Standards
mereotopologies
time
process
resource
orderings
algebraic structures
graphs
geometries

Summary

- COLORE will be a repository of first-order ontologies that will serve as a testbed for ontology evaluation and integration techniques, and that can support the design, evaluation, and application of ontologies in first-order logic.

- The near-term objective is to incorporate current Common Logic ontologies into the OOR architecture.