An Update on COLORE and OOR

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Overview

- COLORE (Common Logic Ontology Repository) project, which is building an open repository of first-order ontologies that 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.
- All ontologies are specified using Common Logic (ISO 24707).

Architecture

- The repository consists of theories (sets of axioms) referred to as modules.
- An ontology is a theory that consists of one or more modules, so that relationships between ontologies can be defined with respect to the relationships between their modules.

Ontology Relationships

Extension

- Conservative extension
- Nonconservative extension

Interpretation

- Relative interpretation: For any sentence σ in L_0,

$$T_0 \models \sigma \Rightarrow T_1 \models \pi(\sigma)$$

- Faithful interpretation: For any sentence σ in L_0,

$$T_0 \not\models \sigma \Rightarrow T_1 \not\models \pi(\sigma)$$

- Definable equivalence

Kinds of Theories

- A theory T_2 is a definitional extension of a theory T_1 iff every constant, function, and relation in any model of T_2 is definable in some model of T_1.
- A module T_{core} in the repository is a core theory iff no function and no relation in models of T_{core} is definable in the models of any other theory unless that theory is synonymous.
- A core hierarchy is a set of core theories $T_1, ..., T_n$ such that $\mathcal{L}(T_i) = \mathcal{L}(T_j)$, for all i, j.

Use Cases

Downloading Ontologies

- module aggregation
- translators
- retrieving ontologies with respect to particular relationships e.g. all ontologies that are interpretable by a given ontology

Uploading Ontologies

- consistency checking
- annotation (specifying new relationships)
- testing relationships
- inferring relationships

Theoretical Applications

Relative Interpretation Theorems

- specify the conditions under which two ontologies are equivalent

Nondefinability Theorems

- show that one ontology is in some sense stronger since it is able to define concepts that other ontologies cannot define.

Applications

- Ontology verification (Gruninger, Hahmann, Hashemi, and Ong in FOIS 2010)
- Semantic mappings (Gruninger in Commonsense 2009, [Hashemi and Gruninger 2010])
- Ontology Design (Hashemi and Gruninger in KEOD 2009)

Current Modules

Generic Domain Ontologies

- Time (Catalog of Temporal Theories)
- Duration
- Mereotopologies (RCC, RT)
- Processes (PSL, Event Calculus, OntoSTIT)
- Object recognition (CardWorld)

Mathematical Structure Ontologies

- partial orderings and lattices
- linear orderings
- graphs and incidence structures
- geometries
- algebraic structures (groups, rings, fields,vector spaces)

Will This Work with OOR?

The Repository

- The building blocks of COLORE are modules (sets of axioms)
- The building blocks of OOR are class hierarchies

Relationships

- COLORE is organized by metatheoretic relationships between ontologies
- OOR does not represent relationships between ontologies.

Relationships

- Ontologies in COLORE are written in Common Logic.
- OOR is restricted to the underlying language for Protege