OntoMediate
Ontological Mediation and Semantic Gateways for Domain/Enterprise Translations

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Outline

• Introduction
  • Aims & Objectives
  • Issue Tackled
  • Related Work

• OntoMediate Approach
  • Community Driven Data Integration
  • System Features
Aims & Objectives

• Exploit social and collaborative processes for easing the ontology matching task for integrating data
  • Give the community the power to drive the integration process, explicitly addressing causes of semantic misunderstanding among parties

• Facilitate the dynamic construction of shared ontologies for data integration

• Enable the gradual and flexible alignment of ontologies
  • instead of an One ontology fits all approach

• Mediate between different formats, encodings, meanings, etc.
Task (data integration) Issues

- Difficulty of agreeing in ontologies definition for ‘open’ communities of interest
  - Communities can group loosely related entities
  - Standard bodies procedures can be slow (e.g. balloting, survey)
- Necessity of addressing model mediation and evolution
  - Application requirements can change over time and can be different for different sub communities
  - New data sources type can eventually become available

Accessible data

Standard Ontology

Data Source

Data Source

Data Source

Data not compliant with adopted ontology
Collaborative approaches

• Historically the Knowledge Sharing Effort is the first attempt to open knowledge authoring to communities

• Technologies and tools address issues like:
  • orchestrate collaborative efforts,
  • assure global consistency
  • reach consensus?
  • enhance understanding?
Collaborative approaches

- New technologies (social web, micro formats, web 2.0) are fuelling web applications allowing people to create and share content and knowledge more easily.

- How to exploit social interactions for creating formal artefacts (e.g. ontologies, ontology alignments)?

- Can we use the social approach for easing user tasks (e.g. data integration) within community of practice?
Collaborative approaches

• Proposals have been done for addressing communities for:
  • Ontology population (OntoWiki, DBin)
  • Collaborative ontology authoring (Hozo, Collaborative Protégé)
  • Collaborative construction of less formal knowledge (SOBOLEO, BibSonomy)

• Few proposals so far for exploiting collaboration for managing ontology alignments
  • Zhadanova and Shvaiko addressed alignment reuse using groups and user profiles
  • OntoMediate
OntoMediate proposal
OntoMediate Approach

**SOCIAL & COLLABORATIVE**
- Community support for the evolution of an agreed structured vocabulary by means of argumentation of changes, discussion of proposal, voting on change proposals, etc.
- Minimal shared ontological commitment

**ONTOLOGY MAPPING**
- Semi-automatic ontology mapping and mediation tools for supporting different information representations and meanings

**INFORMATION NETWORK**
- Integration via a network of different ontologies
- No requirement for changing the local vocabulary
Community Data Integration (Vision)
Community Data Integration (Process)

- **Local Ontologies editing/extraction**
- **Discovery of suitable community reference ontologies**
- **Alignment toward collaboratively managed ontologies**
- **Browsing of Local Mappings**
- **Changes to alignments/Shared Models**
- **Feedback Change Proposal**
Community Data Integration (Approach)

- Data integration requires an agreed data vocabulary
  - But agreement over metadata definition must be fostered and (if possible) measured against community needs

- Users (data owners/administrators) can provide:
  - Local data vocabularies
  - Data sources valuable to the community
  - Alignments toward agreed upper vocabularies
  - Feedback

- Feedback – building block of collaboration
  - Community correction of inevitable human/machine mistakes/omissions
  - Agreement reaching upon the desired shape of shared ontologies
OntoMediate Features

- Ontology and datasets management
  - Ontology/Dataset add/delete/browsing
  - Ontology mapping (integrated FalconOA, CMS, INRIA)

- Ontology discussion
  - Browse ontologies and their mappings
  - Propose changes to mappings
  - Propose changes to ontology evolution

- Proposal discussion and voting

- Data integration and querying
Collaborative Mapping Management
Mapping Management

- Every user is allowed to browse ontologies
  - concepts descriptions are enhanced with information from other users (e.g. mappings to other concepts, community messages)

- Every user is allowed to issue change proposals if the user disagrees with the existing mapping

- The community is notified of new change proposals via RSS feeds

- Community can then discuss/agree/disagree those proposals in the forums
Collaborative Ontology Evolution
Ontology Evolution

• Users can actually drive the definition of shared ontologies by proposing concepts refinement

• Users can propose extensions to shared hierarchies
  • So far, only subclass addition is permitted

• Axioms can be used to logically define the refinement
  • Coverage - \( C \equiv C_1 \cup C_2 \cup \ldots \cup C_n \)
  • Pair wise disjoint - \( i \neq j : C_i \cap C_j \equiv \emptyset \)
Data Integration
Data Integration

- The system encodes the alignments as n:1 relationships that can produce the rules for decoding/encoding of queries and data if needed

- Query translation algorithm implemented
  - RDF-based representation of alignments (i.e. works with every RDF vocabulary: OWL, DAML-OIL, SKOS)
  - Extendible via XML technologies: XQuery/XPath functions
PREFIX soton: <http://rdf.ecs.soton.ac.uk/ontology/ecs>
SELECT ?name ?home WHERE {
?X a soton:Person.
?X soton:hasGivenName ?1.
?X soton:hasFamilyName ?2.
LET (?name = afn:concat(?1,afn:concat(" ",?2))).
LET (?home = ?3).
FILTER startsWith(?home, "http://www.ecs.soton.ac.uk/")}
Future Work

- Instance mapping and disambiguation
- Support for user profiling and social network exploitation
  - Ontology alignment support
  - Data discovery
- Integration with NITELIGHT
Conclusions and Demo

- Flexible approach to data integration
- Social features for community driven management
- Query translation approach to data integration