AI Planning—Week 5

Tom Wambold
taw38@drexel.edu

Drexel University

July 21, 2009

Ontology Alignment/Merging Methods[5]

- Mapping using an upper ontology (SUMO, DOLCE, etc)
- Mapping using (semi-)automatic processing tools

Using an Upper Ontology

- From week 2: "Enabling Cross-Disciplinary E-Science by Integrating Geoscience Ontologies with Dolce"
  - Hook in GeoSciML and SWEET classes into DOLCE classes
  - SWEET semantically incompatible in some areas
    - Rock subsumed by DOLCE endurant (MixedSubstance) and perdurant (State), which are disjoint
    - Could be solved my modifying SWEET, but compatibility was a goal

(Semi-)Automatic - Anchor-PROMPT[6]

- Set of heuristics to analyze non-local context
- Meant to augment other methods (PROMPT, Chimera)
- Takes set of pairs of related terms (anchors)
  - Can be provided manually or generated
  - Returns pairs of semantically close terms.
- Traverses paths between anchors, incrementing similarity score for pairs of classes traversed on same step
- Joins subclass/superclass into "equivalence groups"
  - Treated as one node in the graph
- Problems if two ontologies are modeled very differently
- Claim 75% correct results

(Semi-)Automatic - GLUE[2]

- Machine learning techniques to create mappings
- Similarity measure by using joint probability distribution
  - $P(A, B)$, $P(A, \bar{B})$, $P(\bar{A}, B)$, $P(\bar{A}, \bar{B})$
  - *Jaccard coefficient* - 0 if two instances are disjoint, 1 if two instances are the same concept
- Three modules:
  - Distribution Estimator - For each pair of concepts from two ontologies, calculate probability distribution
  - Similarity Estimator - User defined similarity function (Jaccard coefficient), output similarity matrix
  - Relaxation Labeler - Takes matrix, with constraints, output mapping

Other (Semi-)Automatic Methods

- Uses interactive mapping, and heuristics
- Similarity Flooding[3] - Compares graphs like Anchor-PROMPT
  - ONION[4]
  - Prompt[7] - Interactive, suggests mappings with user input

References I


B. Brodaric and F. Probst.
Enabling cross-disciplinary e-science by integrating geoscience ontologies with dolce.
IEEE Intelligent Systems, 24(1):66–77, Jan.–Feb. 2009.


AnHai Doan, Jayant Madhavan, Pedro Domingos, and Alon Halevy.
Learning to map between ontologies on the semantic web.
In *Proceedings of the 11th international conference on World Wide Web*, pages 662–673. International World Wide Web Conference, 2002.


Sergey Melnik, Hector Garcia-Molina, and Erhard Rahm.
Similarity flooding: A versatile graph matching algorithm and its application to schema matching.
In *Proceedings of the 18th International Conference on Data Engineering*, pages 117–128, 2002.

References II


P. Mitra, G. Wiederhold, and S. Decker.
A scalable framework for the interoperation of information sources.
In *The emerging semantic web: selected papers from the first Semantic Web Working Symposium*, page 215. Ios Pr Inc, 2002.


Natalya F. Noy.
Semantic integration: A survey of ontology-based approaches.
ACM SIGMOD Record, 33(4):65–70, December 2004.


Natalya F. Noy and Mark A. Musen.
Anchor-prompt: Using non-local context for semantic matching.
Workshop on Ontologies and Information Sharing at the Seventeenth International Joint Conference on Artifcial Intelligence, 2001.

References III

N.F. Noy and M.A. Musen.
The prompt suite: Interactive tools for ontology merging and mapping.
International Journal of Human-Computer Studies, 59(6):983–1024, 2003.