Semi-Automatic Information and Knowledge Systems

Falcon-AO

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Content

- Falcon-AO?
- Architecture
- Linguistic Matching for Ontologies
- Graph Matching for Ontologies
- Linguistic vs. Structural Comparability
- Strengths and Weaknesses
- Conclusion and improvements for future
- Run Falcon-AO and show some examples
Falcon-AO

- Finding
- Aligning
- Learning ontologies
- Capturing Knowledge
- Ontology-driven approach
- Automatic tool for Aligning Ontologies
Architecture

- Central Controller
- 3 matchers integrated: V-Doc, I-Sub and GMO
- PBM for large-scale ontologies
Architecture

- **PBM:**
- **Partition Based Block Matching**
Linguistic Matching for Ontologies

- Function for capturing string similarity SS:
  \[ SS = \frac{1}{e^{\frac{ed}{|s1.len+s2.len-ed|}}} \]

- Term weighting functions:
  \[ \text{TermWeighting} = TF \times IDF \]
  \[ TF = \frac{t}{T} \]
  \[ IDF = \frac{1}{2} \times (1 + \log_2 \frac{D}{d}) \]

- Similarity between documents:
  \[ DS = N \cdot N^t \]

- Final linguistic similarity (from experience):
  \[ \text{Linguistic Similarity} = 0.8 \times DS + 0.2 \times SS \]
Graph Matching for Ontologies

- GMO
- Directed bipartite graphs
- Measures structural similarity between graphs:

Main Idea:
- Similarity of 2 entities: Accumulation of similarities of statements (triples)
- Similarity of 2 statements: Accumulation of similarities of entities of the same role
Linguistic vs. Structural Comparability

- Linguistic comparability (LC) for 2 ontologies:

\[ LC = \frac{M}{\sqrt{N_{O_1} \times N_{O_2}}} \]

- Structural comparability (SC) for 2 ontologies, with VSM method:

\[ SC = \frac{V_1 \cdot V_2}{\|V_1\| \cdot \|V_2\|} \]

\[ = \frac{\sum_{j=1}^{n} v_{1j} \times v_{2j}}{\sqrt{\sum_{j=1}^{n} v_{1j} \times v_{1j}} \cdot \sqrt{\sum_{j=1}^{n} v_{2j} \times v_{2j}}} \]
Strengths and Weaknesses

- **Strengths:**
  - flexible, 3 elementary matchers for managing alignment
  - good performance, alignment for large-scale ontologies in acceptable time
  - good performance for similar ontologies

- **Weaknesses:**
  - algorithms are still attempts
  - No domain knowledge considered yet
  - difficulties with alignments with semantic relationship (Reasoning important)
  - problems in mapping for ontologies with different structure/vocabulary
Conclusion and improvements for future

- Conclusion:
  - New automatic tool for ontology alignment
  - Good performance of Falcon-AO (version 0.6) on tests 2006

- Future for later versions:
  - Use lexicons or thesauri in alignment
  - Combination of different matchers?
  - Support many-to-many mapping
  - Improve linguistic and structural comparability
Some Examples
References

- [Ningsheng Jian, Wei Hu, Gong Cheng, Yuzhong Qu 2006] Ningsheng Jian: FalconAO: Aligning Ontologies with Falcon, School of Computer Science and Engineering, Southeast University, Nanjing 210096, P. R. China, 2006
Thanks for your attention...