A possibilistic trust layer over semantic web assertions

position paper

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Outline

- Basics on uncertainty on the Semantic Web
- Different uncertainty types: what can we do?
- Trust layer: a naïve view
- Conclusion

Basics

- Two basic features of knowledge creation and sharing on the open web :

  A. No agent performing an inference can be sure of holding all relevant assertions

  B. Assertion sources have diverse reliability

- The Open World assumption takes care of feature A, preventing deriving negation from lack of knowledge

Basics (II)

- Example:
  - Global Competitor(X): *someone who sells the same product of X in at least two continental markets*
  - Is ACME a competitor for EMCA?
    - Available Info from official web sites:

market	Top seller	Others
EU	EMCA	ACME
US	EMCA	-
ASIA	ACME	-

SW: Cannot derive NO
- Information on ACME sales in US may be missing (site down?)
- BTW, one could derive NO with business rules.

Basics (III)

- Suppose some assertion x on ACME sales in the US comes in from the RSS of an unofficial blog

market	Top seller	Others
EU	EMCA	ACME
US	EMCA	ACME
ASIA	ACME	-

- Now I can infer that ACME is a global competitor.. But should I?

What can we do (I)?

- Partition metadata based on the degree of control that each actor has over the information (local info - full control - closed world; community info - partial control - open world)
- Perform *hybrid reasoning* on *partitioned model*

P.Ceravolo, E. Damiani, C. Fugazza, F. Mulazzani and B.Russo, "Business Process Monitoring via Ontology-based Representation Models", Information Sciences, to appear

What can we do? (II)

- Explicitly modeling the uncertainty of assertion x, then use some type of uncertain DL-calculus to perform inference
  - But, uncertainty can have many other semantics than source reliability..

- Use reification on x and assert something about it
  - Add *trust metadata*

Trust layer: a naïve view

Basic concept in FS
Details on voting on the SW:
Paolo Ceravolo, Ernesto Damiani, Marco Viviani: Bottom-Up Extraction and Trust-Based Refinement of Ontology Metadata. IEEE Trans. Knowl. Data Eng. 19(2): 149-163 (2007)

- A1: ACME sells in US

- A2: ACME sells in EU

- A3 ACME sells in Asia

Use a *voting model* to associate a fuzzy set to *DESCR(ACME)={A1, A2, A3}*

Obtain (say): $\boldsymbol{FS}=\{\mu_1/A1+\mu_2/A2+\mu_3/A3\}$

- *Semantics of membership values is uniform (same voting model behind all trust assertions)*

Trust layer: a naïve view (II)

- Now we can have standard possibilistic inference. We create rules such as:

  "DESCR(ACME)" IS F THEN
  "GLOBALCOMPETITOR(ECMA)" IS G

- Get a fact like
  "DESCR(ACME)" IS **FS**

- Use the possibility distribution induced by F, with interval or point unification, to compute another trust layer assertion
  "GLOBALCOMPETITOR(ECMA)" IS **FG**

Conclusion and outlook

- A trust layer is a modular addition to SW metadata
- Features:
  - Independent inference mechanism, supporting trust-specific assumptions
  - Uniform semantics of uncertainty (voting model)
- Trust metadata can be expressed in RDF and computed/managed both in centralized and P2P fashion

Conclusion and outlook

- Trust layer can be used to filter and improve SW metadata
  - E.g., compute *trust-landscapes* on available knowledge based on trust assertions
  - Can be seen as the view of a community over some assertions
    - Anonymous vs. non-anonymous voting models