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:

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<thead>
<tr>
<th>market</th>
<th>Top seller</th>
<th>Others</th>
</tr>
</thead>
<tbody>
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<td>EU</td>
<td>EMCA</td>
<td>ACME</td>
</tr>
<tr>
<td>US</td>
<td>EMCA</td>
<td>-</td>
</tr>
<tr>
<td>ASIA</td>
<td>ACME</td>
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*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.

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- 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* a *partitioned model*

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

- 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): $FS = \{\mu_1/A1 + \mu_2/A2 + \mu_3/A3\}$

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

Basic concept in FS
Details on voting on the SW:
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