Distributed Information Processing
22nd Lecture

Eom, Hyeonsang (엄현상)
Department of Computer Science & Engineering
Seoul National University

©Copyrights 2011 Eom, Hyeonsang All Rights Reserved
Outline

- Information Transmission and Use
  - Introduction to the Semantic Web
  - A Portrait of the Semantic Web in Action
- Q&A
Future of Search Technology
[Brewer02]

- Integration of Textual Search and Database Technologies
- Distributed Repositories
- Context
- Integration with the Physical World
- Novel User Interface
  - To Avoid Information Overload
- Personalization
- Bias
Semantic Web Basics
[Gruninger02]

- Ontology
  - Formal Explicit Specification of a Shared Conceptualization
    - Conceptualization: how people think about things in a particular subject area
    - Explicit Specification: concepts and relationships of the abstract model given explicit terms and definitions
## Semantic Web Basics (Cont’d)

### Ontology Uses

<table>
<thead>
<tr>
<th>Uses of Ontology (customized from the uses of ontology identified at the KRSL kickoff meeting 1994).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>For communication</strong></td>
</tr>
<tr>
<td>between implemented computational systems.</td>
</tr>
<tr>
<td>between humans.</td>
</tr>
<tr>
<td>between humans and implemented computational systems.</td>
</tr>
<tr>
<td><strong>For computational inference</strong></td>
</tr>
<tr>
<td>for internally representing and manipulating plans and planning information.</td>
</tr>
<tr>
<td>for analyzing the internal structures, algorithms, inputs and outputs of implemented systems in theoretical and conceptual terms.</td>
</tr>
<tr>
<td><strong>For reuse (and organization) of knowledge</strong></td>
</tr>
<tr>
<td>for structuring or organizing libraries or repositories of plans and planning and domain information.</td>
</tr>
</tbody>
</table>
XML vs Ontologies [Kim02]

**Commonality**
- Means of Explicitly Representing Information Applied So That a Reader Interprets Shared Data As Intended by the Data Author

**Differences**
- Need for the Same Understanding
  - XML requires it while ontology does not
    - E.g., `<foo>7</foo>`
- Complexity
  - Semantics are not represented with XML use
- Efficiency vs Interpretability
  - Reducing Complexity vs Reducing Uncertainty
Using Ontologies for Uncertainty Reduction [Kim02]

- Case Where Ontology Is Appropriate
Example CS Department Ontology

Name: cs-dept-ontology
Version: 1.0
Extended Ontology
Base Ontology (base-ontology, version 1.0)
ISA Hierarchy (Taxonomy)
   Person
      Worker
      Faculty
         Professor
      Assistant
      AdministrativeStaff
   Student
   Organization
   Publication
   Schedule
Relationships
   Relation Arg1 Arg2
   PublicationAuthor Publication Person
Inferences
   Suborganizations are transitive
   Affiliations are invertible
   Membership transfers through suborganizations

For the Semantic Web, an Ontology Must Be Expressed in a Formal Language So That a Given Ontology Expression Can Be Interpreted and Processed Unambiguously by a Machine
Ontology Issues [Kim02]

- Designing an Ontology Development Tool
  - Useful and Usable to a Knowledge Worker

- Developing of Decentralized and Adaptive Ontologies
  - To Be Used in Combination with Other Ontologies
    - Use of Ontologies for Software Specification
References

