7. Ontology Engineering

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Overview

- Ontology → Concept of existence
- Information Science
  - hierarchical data structure with objects
  - rules within one domain
- Artificial Intelligence
  - knowledge management
  - natural language processing
  - e-commerce
  - education
  - semantic web

Ontology Engineering

- Common vocabulary
- Information sharing
- Knowledge base
- Taxonomy
  - set of classes and objects and their relationship
- Data collection process

Ontology Applications

- Categories of ontology applications
  - Neutral Authoring
  - Ontology as Specification
  - Common Access to Information
  - Ontology-based search

Contructing Ontology

- Iterative approach
  - Set the scope
  - Evaluate reuse
  - Enumerate terms
  - Define taxonomy
  - Define properties
  - Define facets
  - Different facets on slots
  - Define instances
  - Check for anomalies

Ontology Development Toops

- DAG-Edit
- Protege 2000
- WonderTools
- WebOnto

Spot ontology example

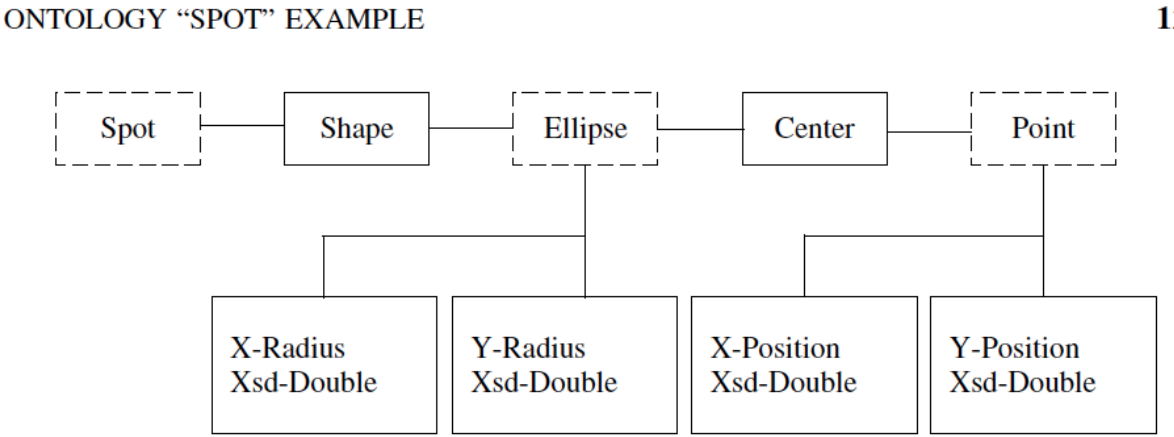

Figure 7-1. Example ontology.

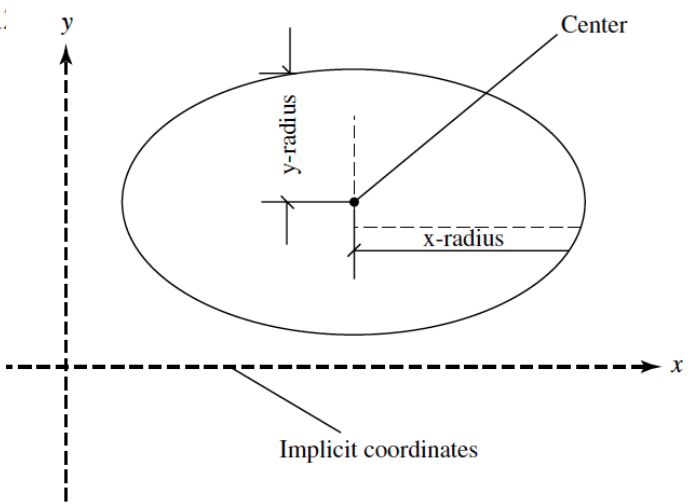

Figure 7-2. Ellipse definition.

```
<?xml version="1.0" encoding="iso-8859-1" ?>
 <!DOCTYPE rdf:RDF (...)>
<rdf:RDF xmlns="http:// example#"
  xmlns:example="http:// example#" xmlns:rdf=
         "http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema#"
  xmlns:owl="http://www.w3.org/2002/07/owl#"
         xmlns:dc="http://purl.org/dc/elements/1.1/"
  xml:base="http:// /example">
<owl:Ontology rdf:about="">
<rdfs:isDefinedBy rdf:resource="http:// example/" />
<dc:author>Smith</dc:author>
<dc:title>Example Ontology</dc:title>
<rdfs:comment>This file defines a partial ontology in
       OWL</rdfs:comment>
<owl:versionInfo>2005</owl:versionInfo>
  </owl:Ontology>
<owl:Class rdf:ID="Spot" />
<owl:Class rdf:ID="Ellipse" />
<owl:Class rdf:ID="Point" />
<owl:ObjectProperty rdf:ID="shape">
<rdfs:domain rdf:resource="#Spot" />
<rdfs:range rdf:resource="#Ellipse" />
  </owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="center">
<rdfs:domain rdf:resource="#Ellipse" />
<rdfs:range rdf:resource="#Point" />
  </owl:ObjectProperty>
<owl:DatatypeProperty rdf:ID="x-radius">
<rdfs:domain rdf:resource="#Ellipse" />
<rdfs:range rdf:resource= "http://www.w3.org/2001/XMLSchema#double"/>
  </owl:DatatypeProperty>
<owl:DatatypeProperty rdf:ID="y-radius">
<rdfs:domain rdf:resource="#Ellipse" />
```

Ontology Methods

- TOVE (TOronto Virtual Enterprise)
- Cyc Knowledge Base
- Electronic Dictionairy Research
- WordNet
- Methontology
- On-To-Knowledge

Ontology Sharing And Merging

- Logic
  - Sharing information automatically with a common subset
- Ontology
  - Same object → different name, differen object → same name
- Computation
  - Same name and definitions → different behaviour

Ontology Libraries

- DAML, Ontolingua Library, Protege Ontology Library
- Upper ontologies
  - IEEE Standard Upper Ontology
  - Cyc
- General ontologies
  - www.dmoz.org
  - WordNet
  - Domain-specific ontologies
  - UMLS Semantic Net
  - GO
  - Chemical Markup Language

Ontology Matching

- String matching
- Comparing Ontologies

Ontology Mapping

- Mapping between local ontologies
- Mapping between integrated global ontology and local ontologies
- Mapping for ontology merging, integration, or alignment

Ontology Mapping Tools

- GLUE
- Learning Source Description
- OntoMorph

Conclusion

- Basic issues for designing and building ontologies
- Requires more ontology engineering