KnowledgeScapes
Making geospatial features meaningful

Dr. Femke Reitsma
Department of Geography, UC

Dr. James Batcheller
Dr. Raphael Grasset, HitLabNZ, Canterbury University
Shunsuke Fukuden, HitLabNZ, Canterbury University
Vlad Tanasescu, Edinburgh University
• impetus
• metadata → ontologies
• features → ontologies
• virtual campus project
Plan A: spatial semantics for automating GI processes

cadastral data

bus stops buffer 1km intersection residences <= 1km from bus stops
Plan A: spatial semantics for automating GI processes

Problems:

1. Semantics of data
2. Semantics of scientific framework for expressing the GI process
where are the semantics?
where's the semantics?

metadata
features
spatial relationships
World Countries 2002
Shapefile

Keywords
- Theme: polygon, countries, international boundaries, coastlines, area, international codes, currencies, sovereignties, population, landlocked information, boundaries, society
- Place: World

Description

Abstract
World Countries 2002 represents the boundaries for the countries of the world, as they existed in 2002.

Purpose
World Countries 2002 provides political boundaries for the world in 2002. To display World Political Organization Membership attributes or CountryWatch Demographics attributes, join these tables to this attribute table using Fips_cntry or Cntry_name as the common field.
where's the semantics?

- metadata
- features
- spatial relationships
features

real world

GIS world

Type: house
Colour: yellow
Chimneys: 2
features
where's the semantics?

- metadata
- features
- spatial relationships
spatial relationships

topological

distance

direction
spatial relationships
where's the semantics?

- metadata
- features
- spatial relationships
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• metadata → ontologies

• features → ontologies

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geosemantics in action
geosemantics in action

<table>
<thead>
<tr>
<th>Database field</th>
<th>Ontology construct</th>
<th>Construct type</th>
</tr>
</thead>
<tbody>
<tr>
<td>building_id</td>
<td>Building</td>
<td>Class</td>
</tr>
<tr>
<td>structname</td>
<td>hasBuildingName</td>
<td>Property</td>
</tr>
<tr>
<td>struse_id</td>
<td>BusinessType</td>
<td>Class</td>
</tr>
<tr>
<td>bus_name</td>
<td>hasBusinessName</td>
<td>Property</td>
</tr>
<tr>
<td>license</td>
<td>hasAlcoholLicense</td>
<td>Property</td>
</tr>
</tbody>
</table>
geosemantics in action

KB: Bar sameAs Pub
geosemantics in action
geosemantics in action
metadata → ontology
• edinburgh impetus
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geog data model semantics

<x, Z, z(x)>

x: 43.52 South, 172.58 East
Z: Tree type
z(x): Maple

real world  GIS world
A geosemantic data model is illustrated in the image. The model connects a real-world entity, a tree at coordinates (43.52 South, 172.58 East), to a GIS world representation. The tree is of a specific type, identified as Maple, and the model includes an ontology fragment.

The model is represented as a tuple: 

\(<x, Z, z(x), o>\)

where:
- \(x\): 43.52 South, 172.58 East
- \(Z\): Tree type
- \(z(x)\): Maple
- \(o\): ontology fragment
geosemantic data model

real world

GIS

<x, Z, z(x), o>

x: 43.52 S, 172.58 E
Z: Tree type
z(x): Maple
o: URI

<owl:Class rdf:ID="Acer rubrum">
  <is_of_family>
    rdf:resource="&biologicalClassification;Aceraceae"/>
  <is_of_order>
    rdf:resource="&biologicalClassification;Sapindales"/>
  <is_of_phylum>
    rdf:resource="&biologicalClassification;Magnoliophyta"/>
  <is_of_class>
    rdf:resource="&biologicalClassification;Magnoliopsida"/>
  <is_of_genus>
    rdf:resource="&biologicalClassification;Acer"/>
  <is_of_kingdom>
    rdf:resource="&biologicalClassification;Plantae"/>
</Acer rubrum>

KB

knowledge of it's use, it's lifespan, how to grow and prune it......
metadata → ontology

D2RQ

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<td>Class</td>
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<tr>
<td>hasBuildingName</td>
<td>Property</td>
</tr>
<tr>
<td>BusinessType</td>
<td>Class</td>
</tr>
<tr>
<td>hasBusinessName</td>
<td>Property</td>
</tr>
<tr>
<td>hasAlcoholLicense</td>
<td>Property</td>
</tr>
</tbody>
</table>

building_id

structureUse

bus_name

business_name

22

Pub

Brass Monkey
Table Name: Fairly Important Buildings

<table>
<thead>
<tr>
<th>Bldg ID</th>
<th>Bldg Name</th>
<th>Bldg Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Eiffel Tower</td>
<td>276</td>
</tr>
<tr>
<td>2</td>
<td>Blackball Pub</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>Sagrada Familia</td>
<td>170</td>
</tr>
</tbody>
</table>

```xml
<Building rdf:ID="Sagrada Familia">
    .....  
</Building>
```
### Table Name: Fairly Important Buildings

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• metadata $\rightarrow$ ontologies

• features $\rightarrow$ ontologies

• virtual campus project
virtual campus
virtual campus
virtual campus
virtual campus
thank you