Distributed interoperable processing in GIS

PhD research
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Research context: Task oriented distributed processing
Connectivity

- Evaluate potential connectivity through metadata of components

Connectivity levels & metadata

- Spatial dataset
- Spatial operation

- Resources
- Ontologies

Metadat

From:
Geo features - data abstraction stack

Real world
Conceptual data model
Logical data model
Data format

‘How things are’
Human descriptions of reality
Machine processable model
Machine transmission layer

Geo features - Conceptual data model

Metric character
Thematic character
Phenomena
Absolute location references (earth surface)
Relative location references (e.g. topology)
Geo features - Logical data model

- Table
- Spatial vector
  - Points
  - Lines
  - Polygons
- Spatial raster
  - TIN
- Spatial extent

Geo features - Data transmission

E.g. Address: Streetname, Housenumber, City

Or: Address: City, Streetname, Housenumber
Use of ontologies in metadata

- Criteria for connectivity
  - Dataset belongs to class
  - Operation belongs to class
  - Similarity between two specific datasets
  - Similarity between two specific operations
  - Specific connectivity between dataset & operation

- Tools
  - DAML+OIL, OWL for ontologies
  - RDF for references to ontologies in metadata

ISO 19119 as ontology (Ontoedit)

- Classes (concepts)
- Properties
- Relationships
Example geo service chain

User's address → StoreLocator → Store address → PlaceFinder → (x,y)

Web services implementation - example

Disaster event: Is this place in danger?

Mobile  Local office

GPS  Your location: Street address
Crd transf  Geocoding  Hazard database
Your location (X,Y)

Spatial analysis  Local hazard dataset
Visualisation

Local hazard map

Distributed web services
Questions

- Allow co-existing similar ontologies?
- How to map between ontologies?
- How to formalise ontologies (Logic, DAML+OIL)?
- How to model processes in metadata?