Collaboration on an ontology for generalization

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Searching for an algorithm…

Analysis of Urban Road Networks to Support Cartographic Generalization

Road Network Selection for Small-Scale Maps Using an Improved Centrality Approach

Thin Road Network

A Road Network Selection Process Based on Data Enrichment and Structure Detection

Selective omission of road features based on mesh density for automatic map generalization

Road network selection using an extended stroke-mesh combination algorithm

The 'Good Continuation' Principle of Perceptual Organization applied to the Generalization of Road Networks

Road selection based on Voronoi diagrams and strokes in map generalization

A Structural Approach to the Model Generalization of an Urban Street Network

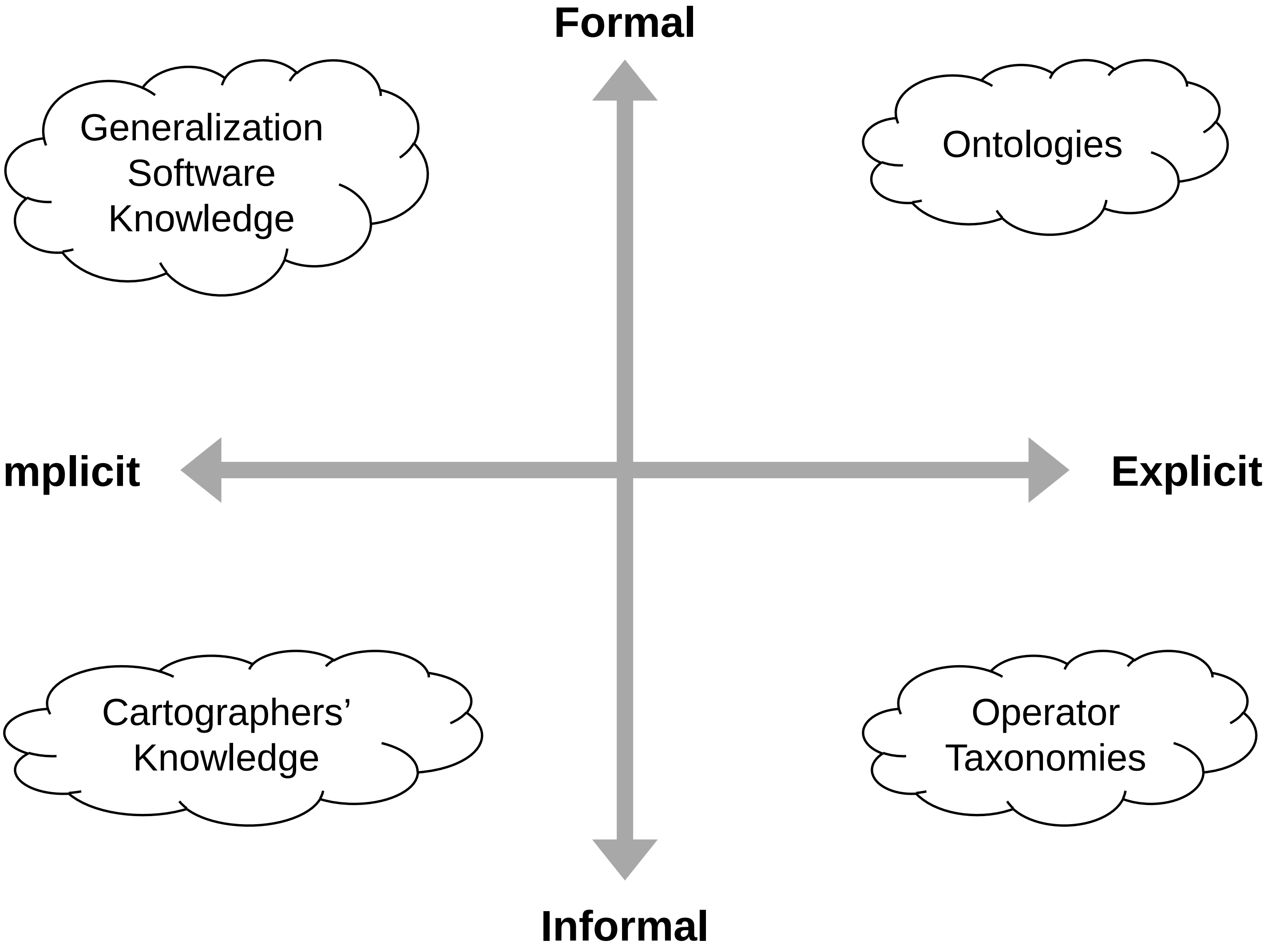
Integration of linear and areal hierarchies for continuous multi-scale representation of road networks

Generalization of Geographical Networks

Selection of Streets from a Network Using Self-Organizing Maps

Generating hierarchical strokes from urban street networks based on spatial pattern recognition

Representing cartographic knowledge



Formal

Generalization Software Knowledge

Ontologies

Implicit

Explicit

Cartographers' Knowledge

Operator Taxonomies

Informal

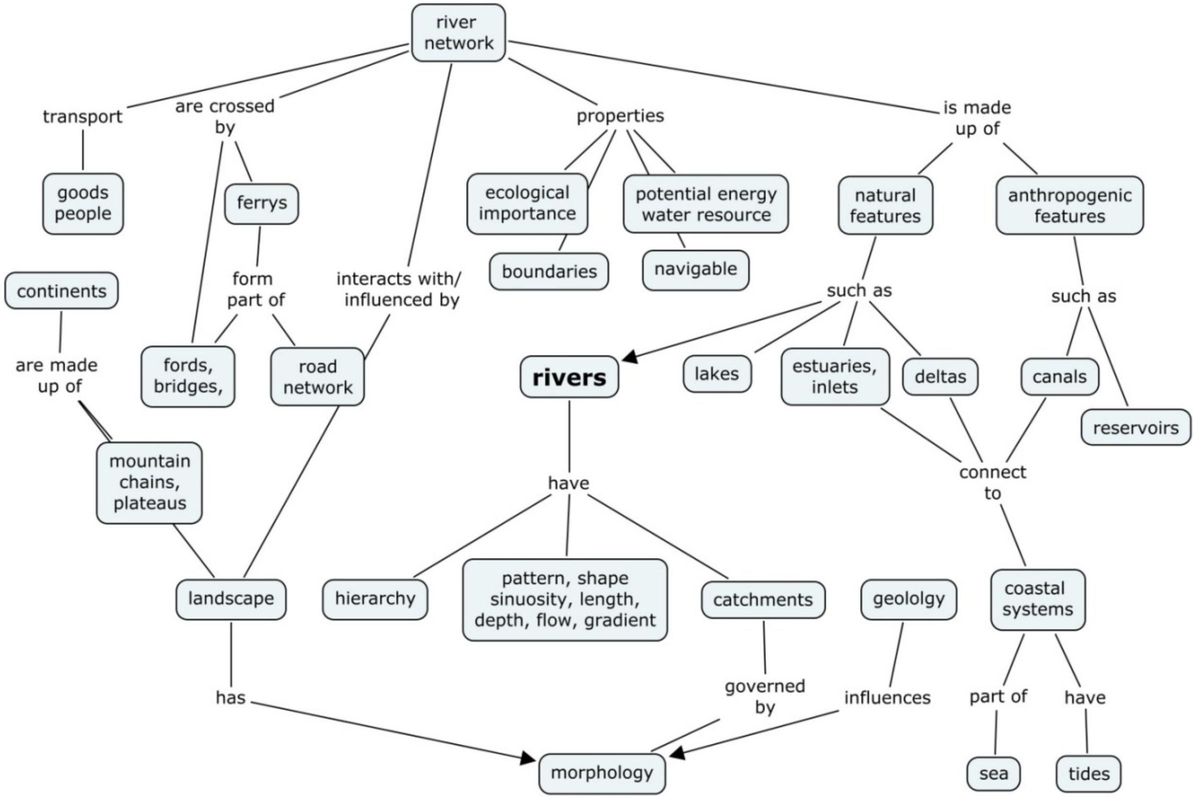
Collaboration

- An ontology is a “formal, explicit specification of a *shared* conceptualization” (Studer et al. 1998)
- Requires collaboration
- Ensure acceptance

Capturing the semantics of generalization

- Should avoid encapsulating rules
- Goal: capture the semantics of generalization
  - Modelling relationships
    - Spatial but also geographic
    - An ontology can (theoretically) model any relationship – hierarchical, topological, partonomic
- Support reasoning about generalization

Size of the task



Benefits

- Better sharing of algorithms
  - what are the characteristics of generalization algorithms?
- Support for on-demand mapping
- Support for web services - WEBGEN

Core skills

Neuhaus, F., Florescu, E., Galton, A., Gruninger, M., Guarino, N., Obrst, L., Sanchez, A., Vizedom, A., Yim, P., & Smith, B. (2011). **Creating the ontologists of the future**. *Applied Ontology, 6*, 91-98.

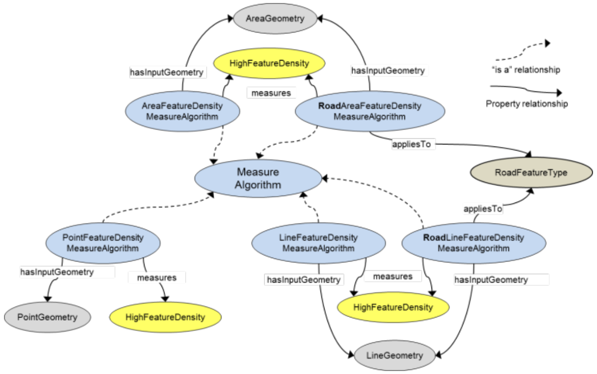
- Clarifying the **purpose** of a given ontology, understanding potential deployment, performing **requirements analysis**.
- Managing ontologies across their **life cycle** (requirements analysis and planning, managing a systematic update process, versioning, documentation).
- Identifying, evaluating and using **software tools** that support ontology development.
- Choosing the appropriate **level of detail**.
- Conducting **ontological analysis**, that is identifying entities and relationships; formulating definitions and axioms.

Core knowledge

- The basic **terminology** of ontology (relation of ontology to knowledge representation, conceptual modeling, data modeling, . . .).
- Theoretical foundations: Set theory, **description logic**
- Ontology **evaluation strategies** and theories (e.g. Ontoclean).
- Representation languages: Resource Description Framework (RDF), **Web Ontology Language** (OWL)
- **Reasoning** with ontology content;
- improving **search** and retrieval;
- **decision support**, situational awareness, information fusion, anomaly detection.

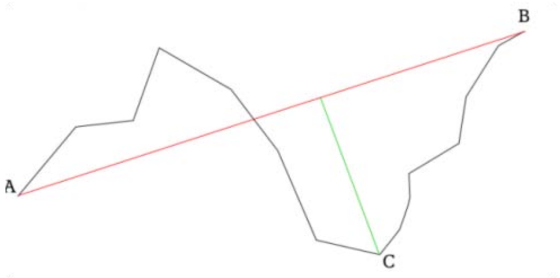
Ontology design methodology

- Methodology will provide structure
- Number of different ontology design methodologies
  - UPON, DILIGENT, NeOn, GEONTO-MET, Ontology 101
- Different approaches
  - Software design life cycle
  - Collaborative approach
- Reviews
- Hybrid methodology
- Use case



Select a use case

- Defines the scope and purpose
- For example:
  - Create an ontology that represents sufficient knowledge to allow for the automatic selection of **line simplification** algorithms *or*
  - **line simplification and smoothing** algorithms *or*
  - **building amalgamation** algorithms or
  - **road selection** algorithms

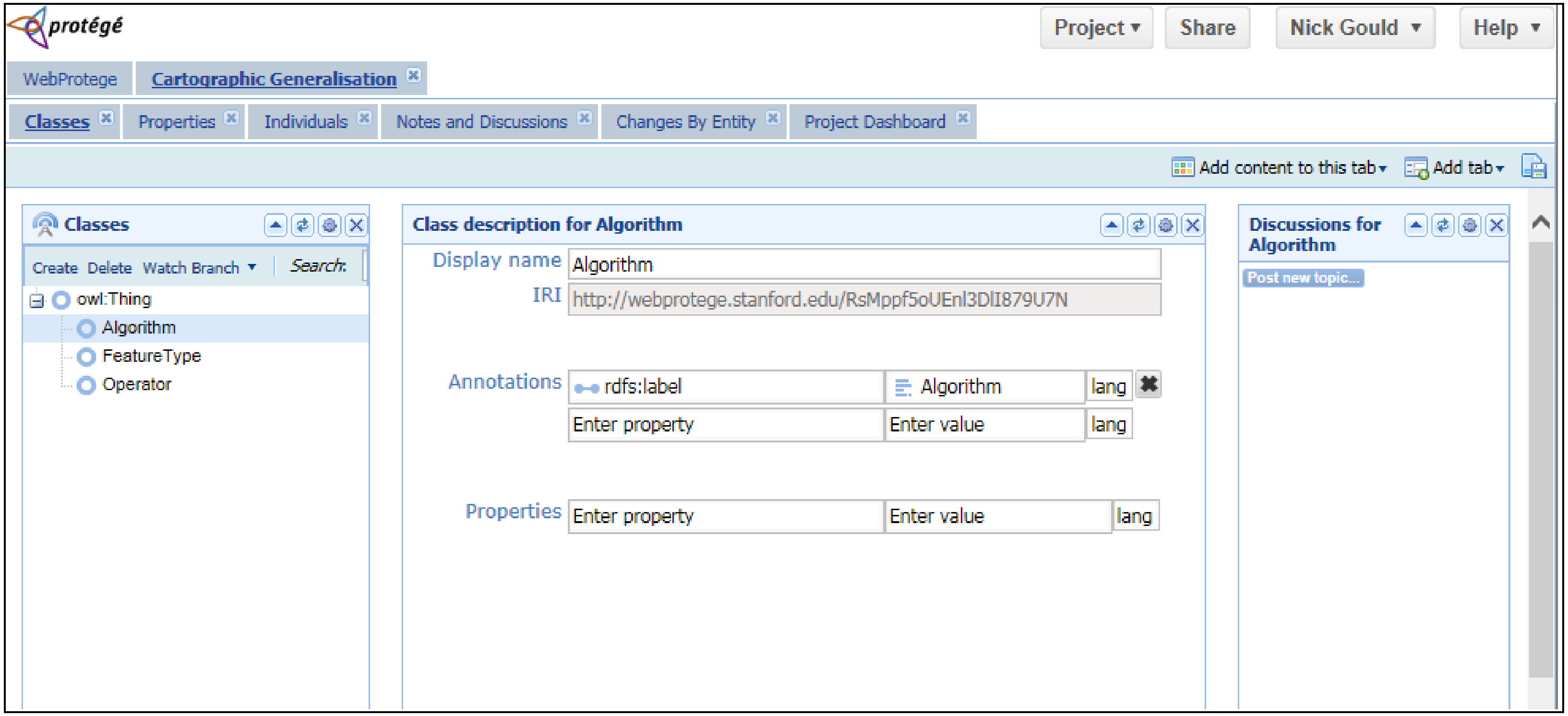


Ontological engineering

- How do we model a generalization algorithm?
  - What is an algorithm?
    - What are the common characteristics?
  - Is Douglas-Peucker a sub-class of “algorithm” or a label?
  - Is it an individual(instance) of an operator?
  - What of the variations of DP?
- What are the other concepts?
  - How do we model scale? Or the consequences of scale change?

Tools

- webProtégé
  - allows for collaboration



Display name: Algorithm

IRI: http://webprotege.stanford.edu/RsMppf5oUEnl3DlI879U7N

Annotations	rdfs:label	Algorithm	lang
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Properties	Enter property	Enter value	lang

How do we animate this?

- Identify partners
- Define scope of the ontology
- Define ontology design methodology
- Define outcomes
  - Ontology (OWL2) for the use case(s)
  - Report back to next commission workshop
- Identify tools (e.g. webProtégé)
- Define project roles
  - Conceptual
  - Methodological
  - Technical
  - Evaluation
- **Project plan**

Conclusion

- Cartographers lack the means to systematically document the knowledge required for generalization (Nyerges, 1991)
- Now have…
  - the model - ontologies
  - the language - OWL
  - the tools - Protégé and webProtégé