A prototype for ontology driven on-demand mapping of urban traffic accidents

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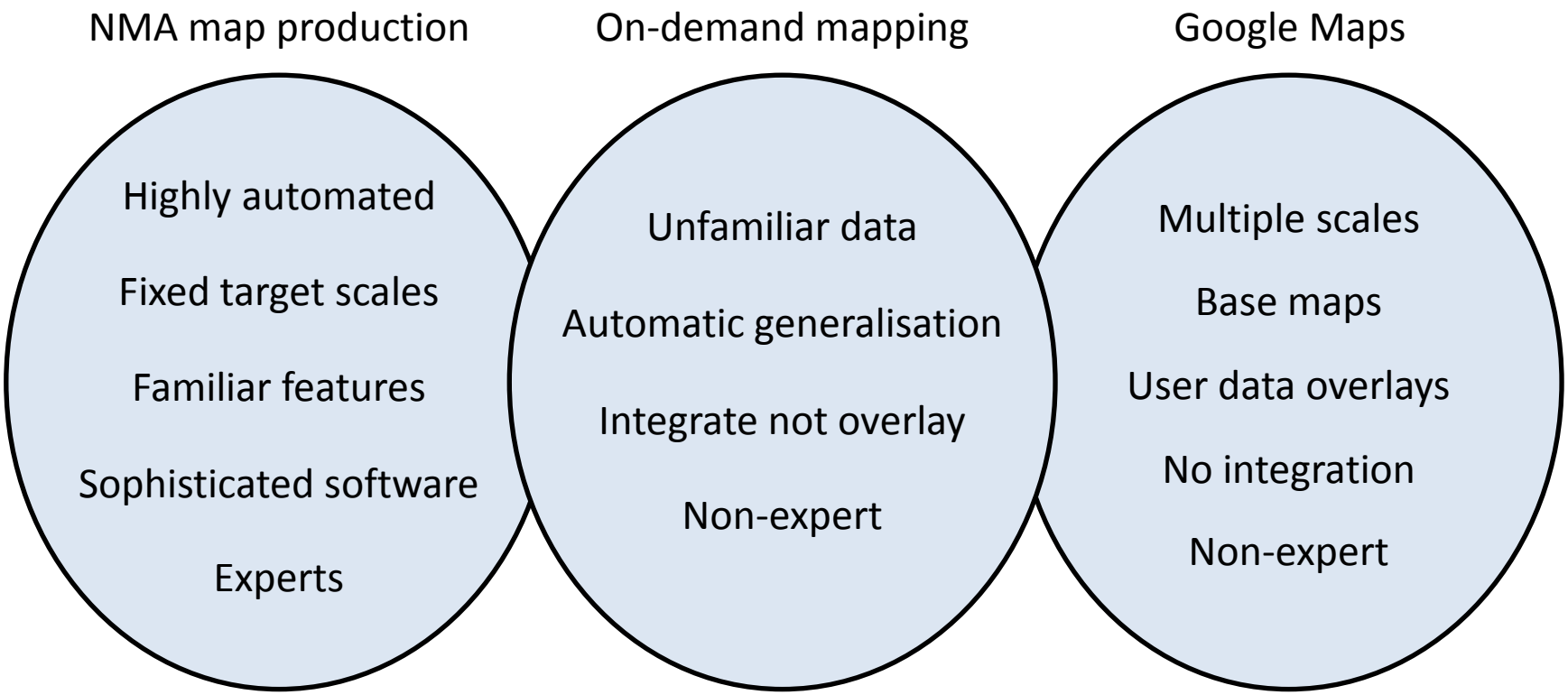
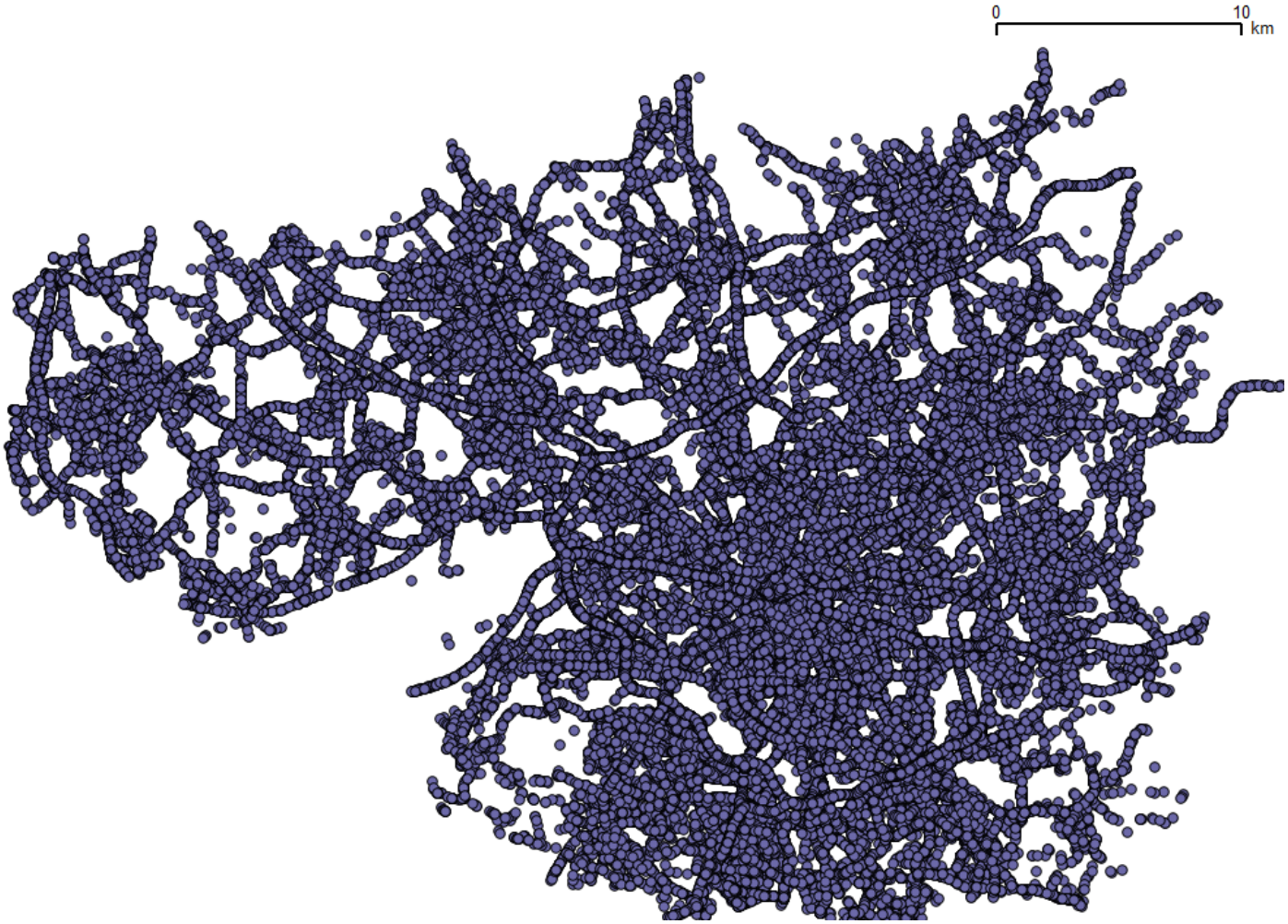
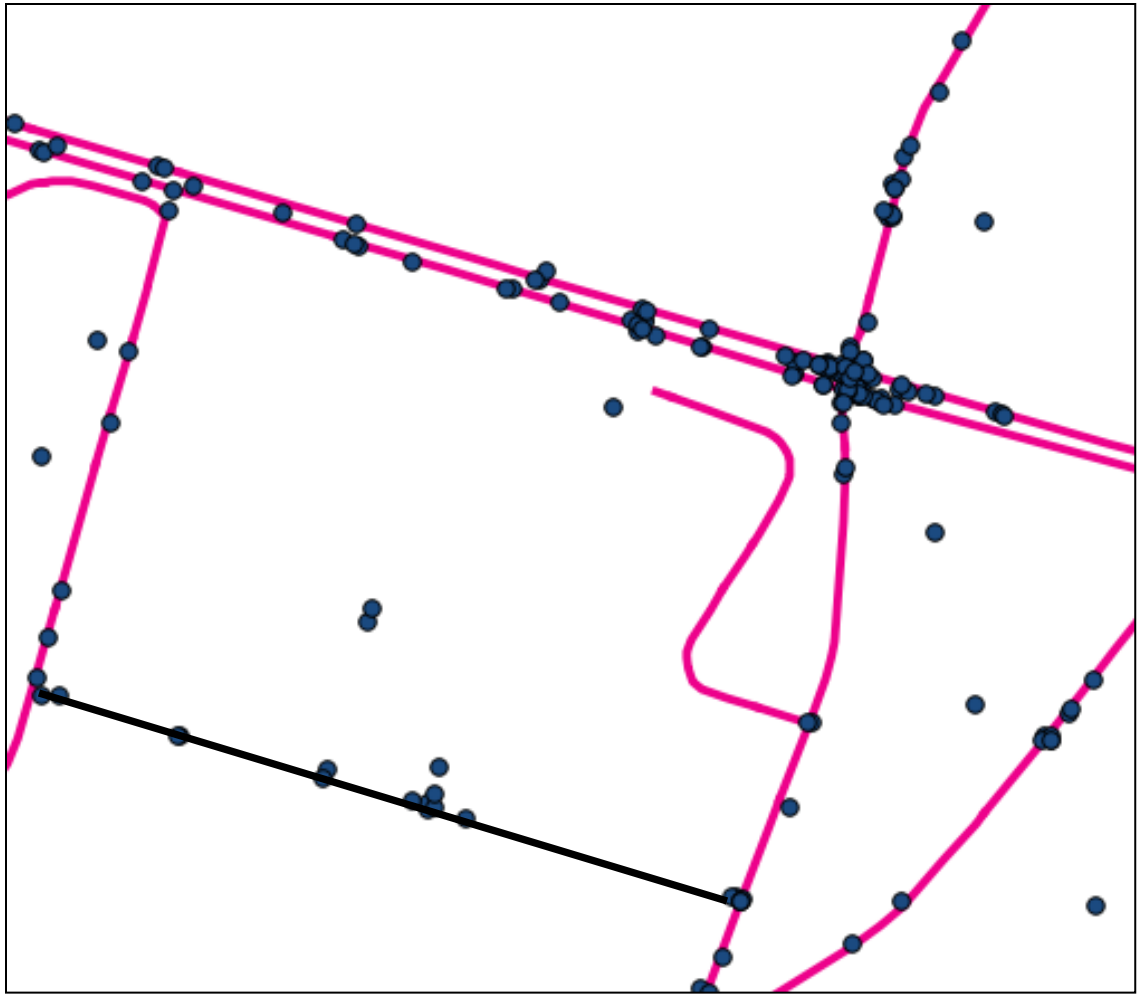
Project context



Use case: mapping road accidents

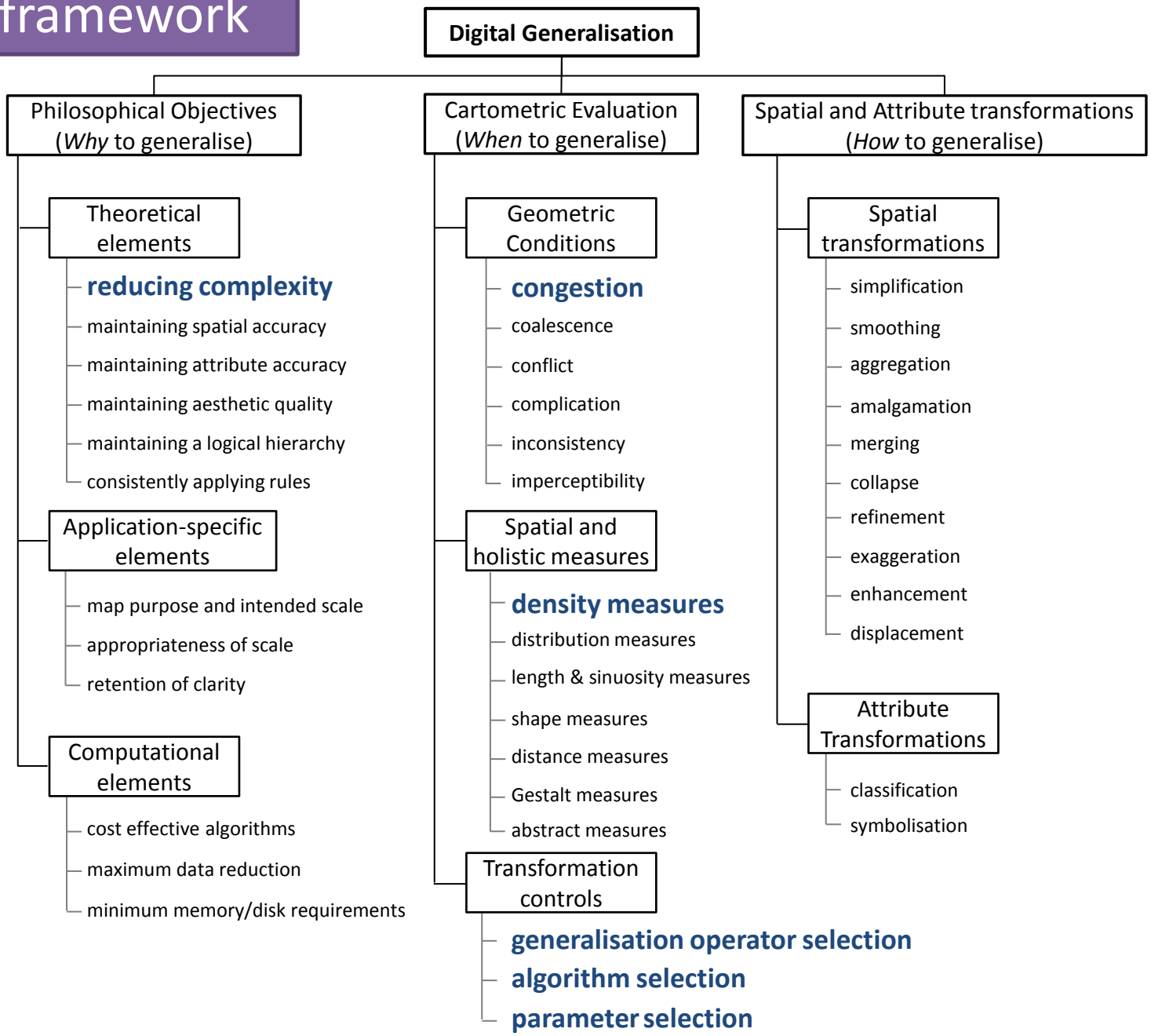


Respecting relations



Conceptual framework

Describe these concepts in an ontology

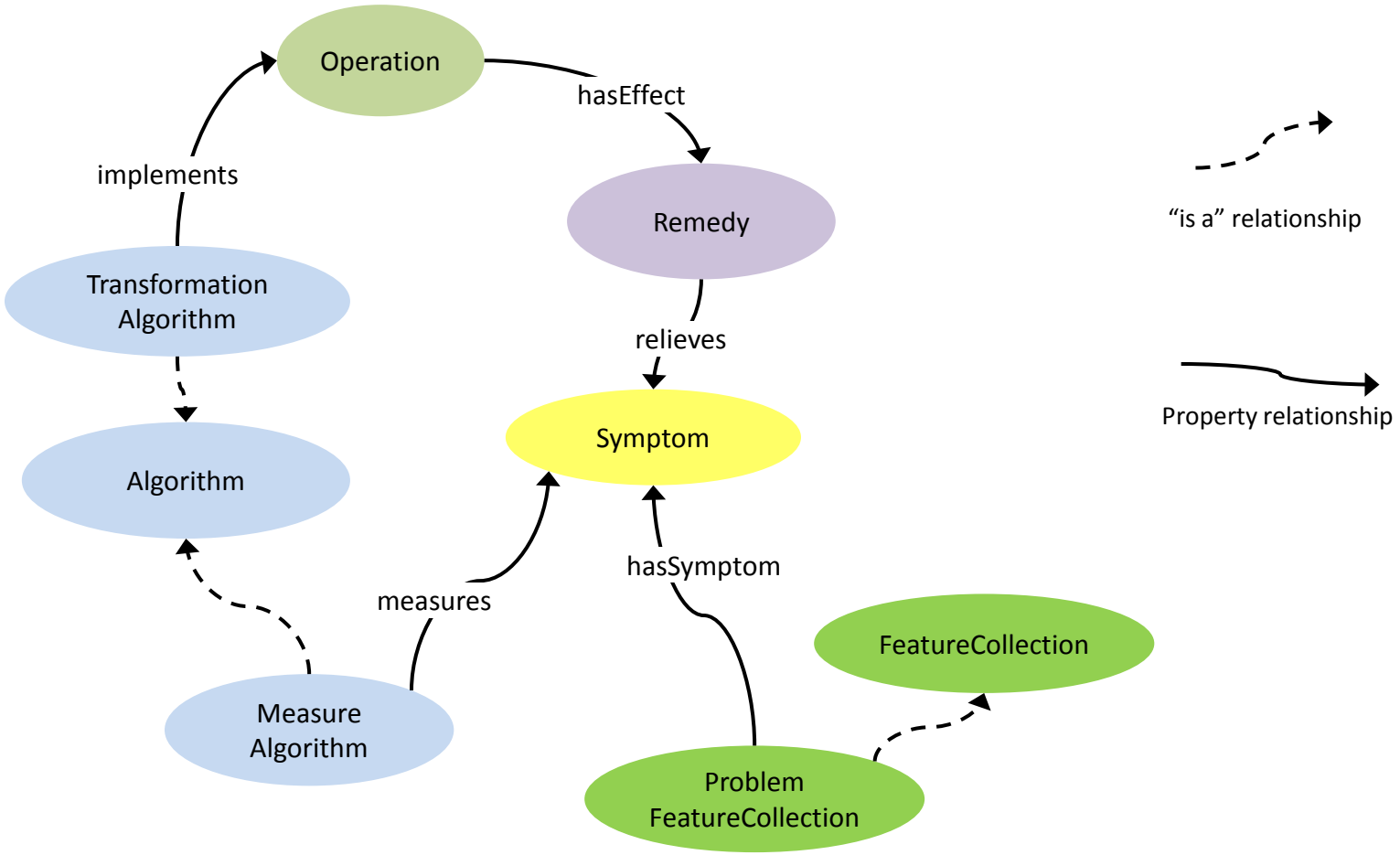


McMaster & Shea, 1992

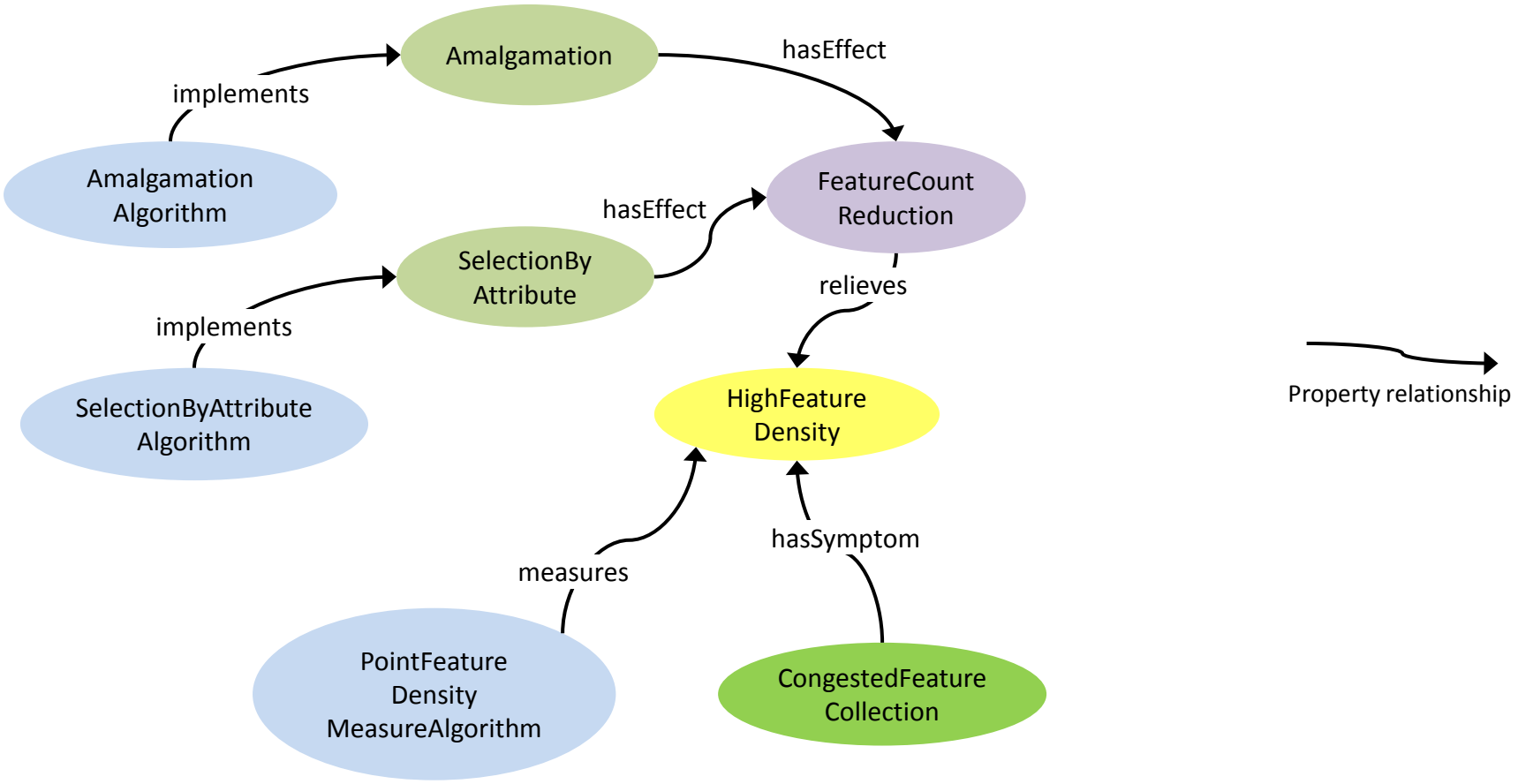
Question

- Can the concepts of cartographic generalisation be formalised in an ontology with sufficient detail to allow the process to be automated?

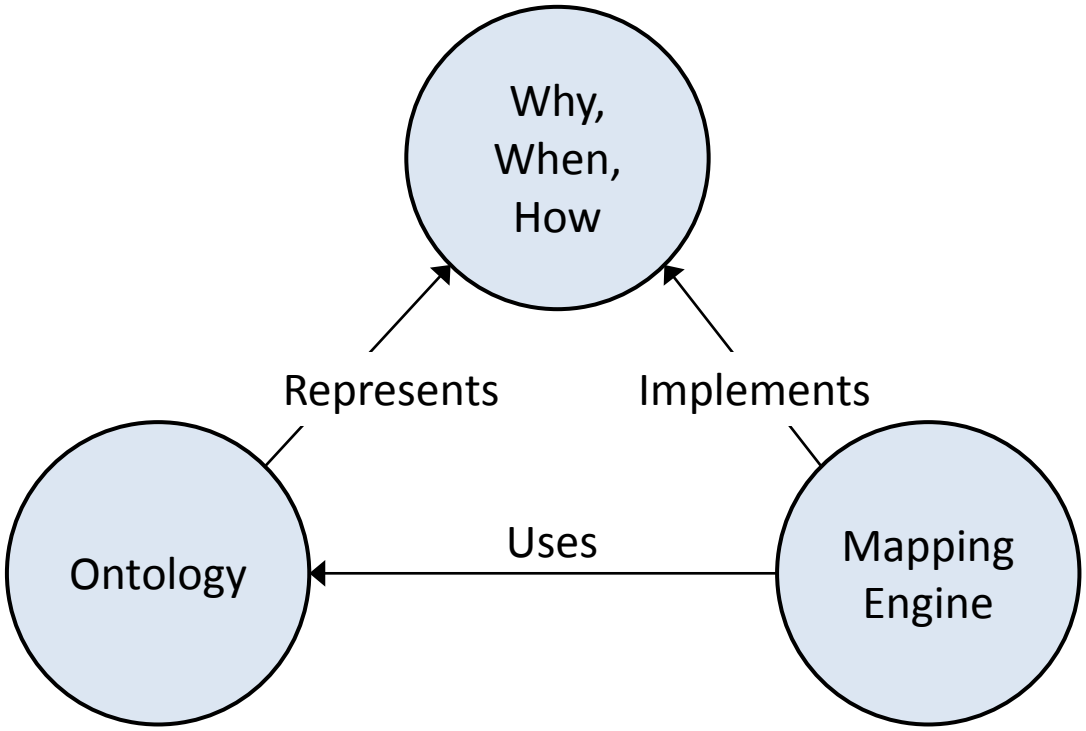
Ontological concepts: general



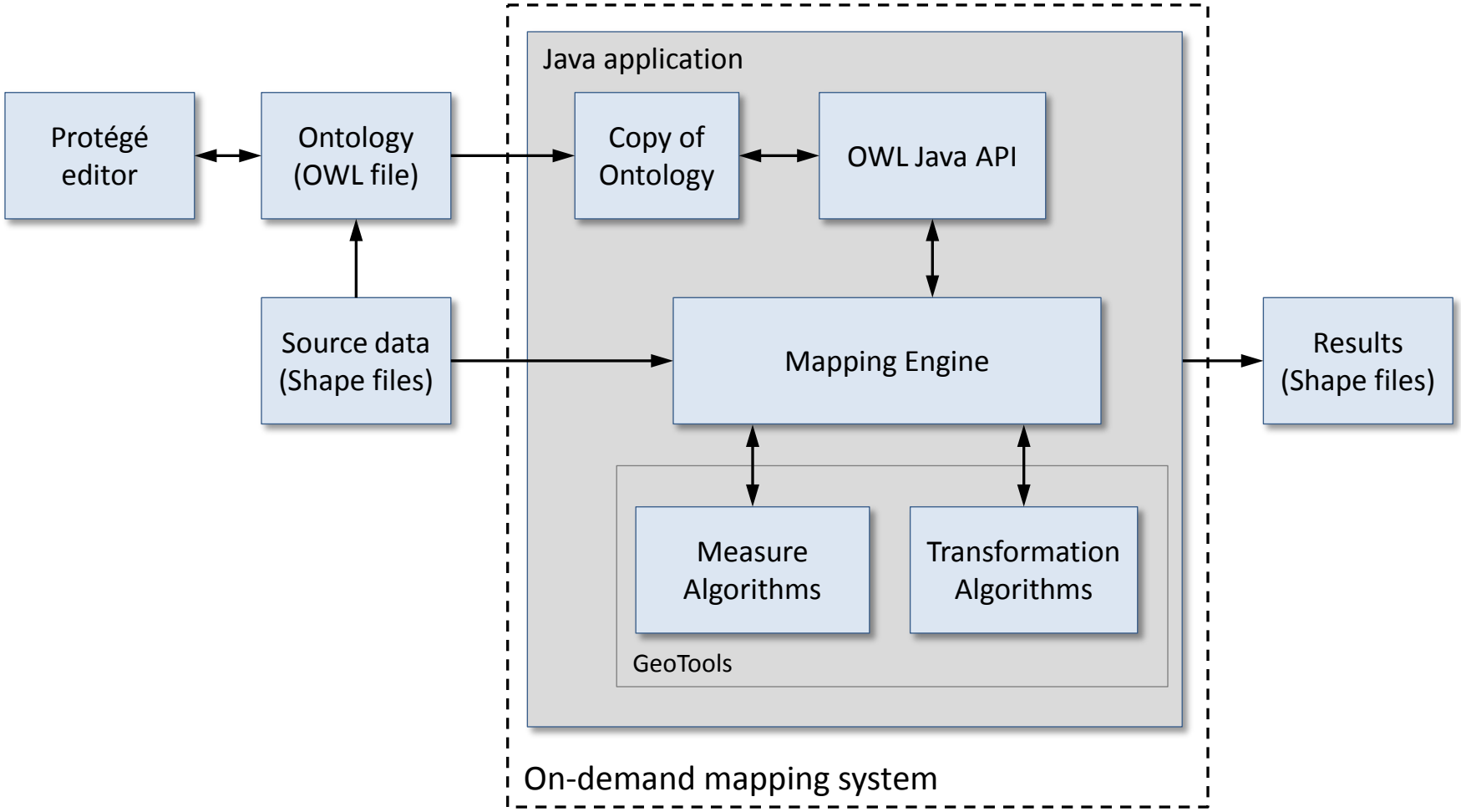
Ontological concepts: particular



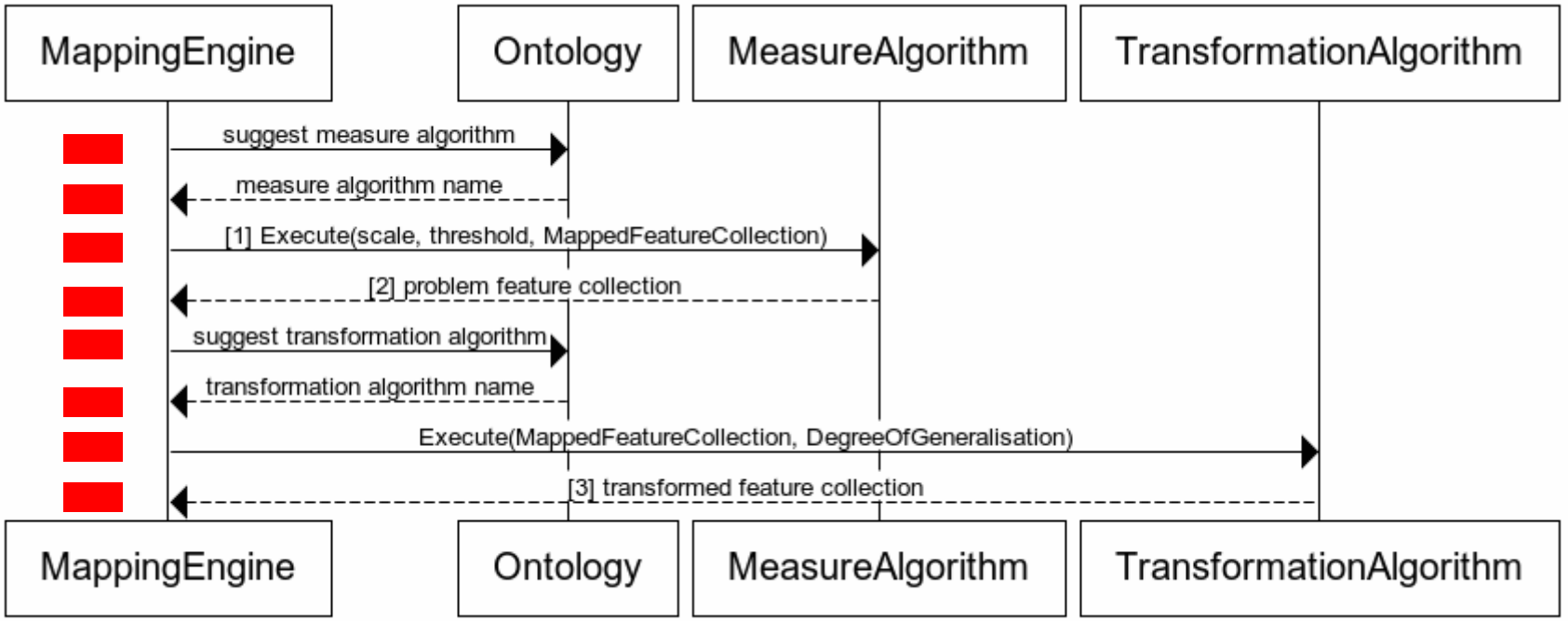
System overview



System architecture

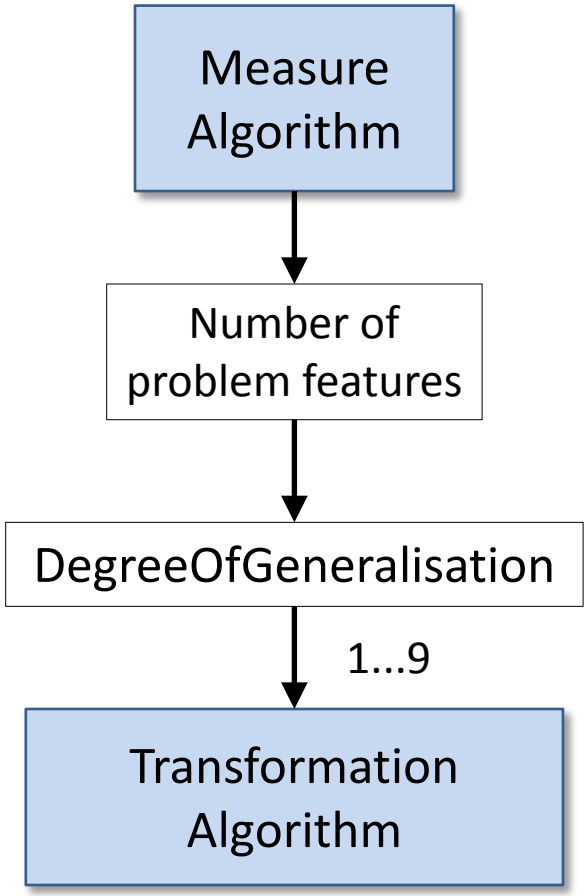


Process


MappingEngine
Ontology
MeasureAlgorithm
TransformationAlgorithm
suggest measure algorithm
measure algorithm name
[1] Execute(scale, threshold, MappedFeatureCollection)
[2] problem feature collection
suggest transformation algorithm
transformation algorithm name
Execute(MappedFeatureCollection, DegreeOfGeneralisation)
[3] transformed feature collection
MappingEngine
Ontology
MeasureAlgorithm
TransformationAlgorithm

Degree Of Generalisation

- The ontology identifies transformation (generalisation) algorithm… but…
- … how to automatically provide parameter values for the algorithm?



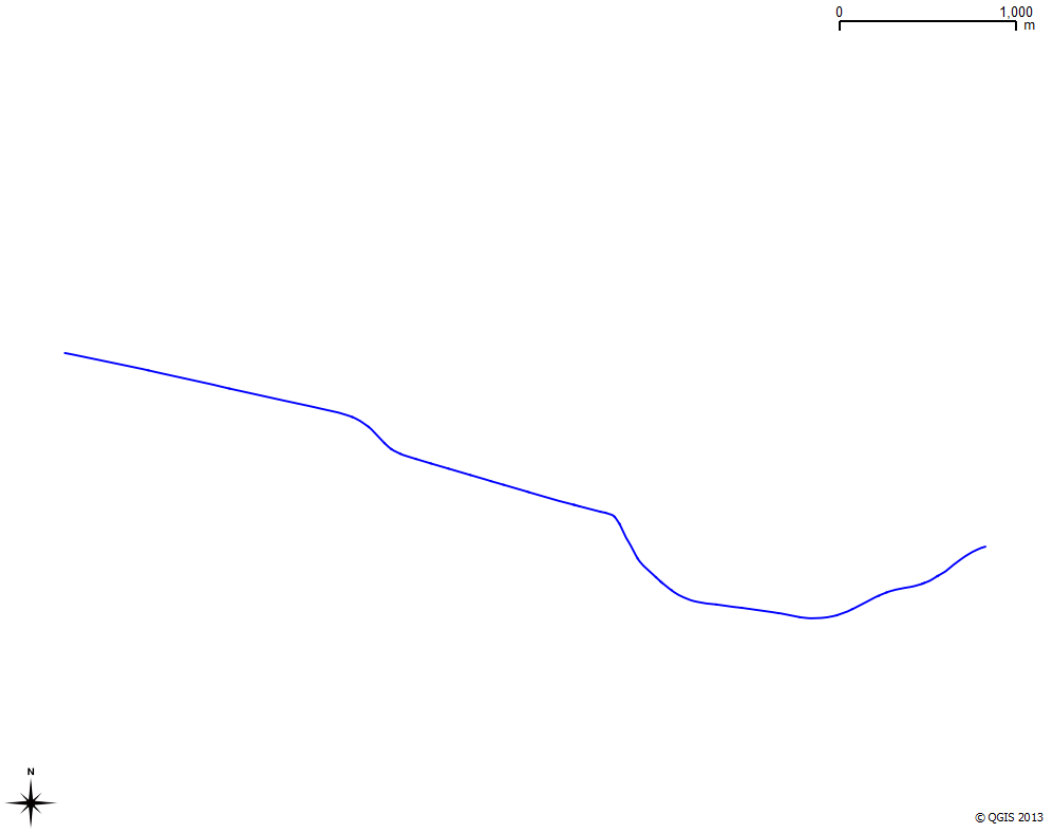
Transformation algorithm: pruning

Total length = 335413m

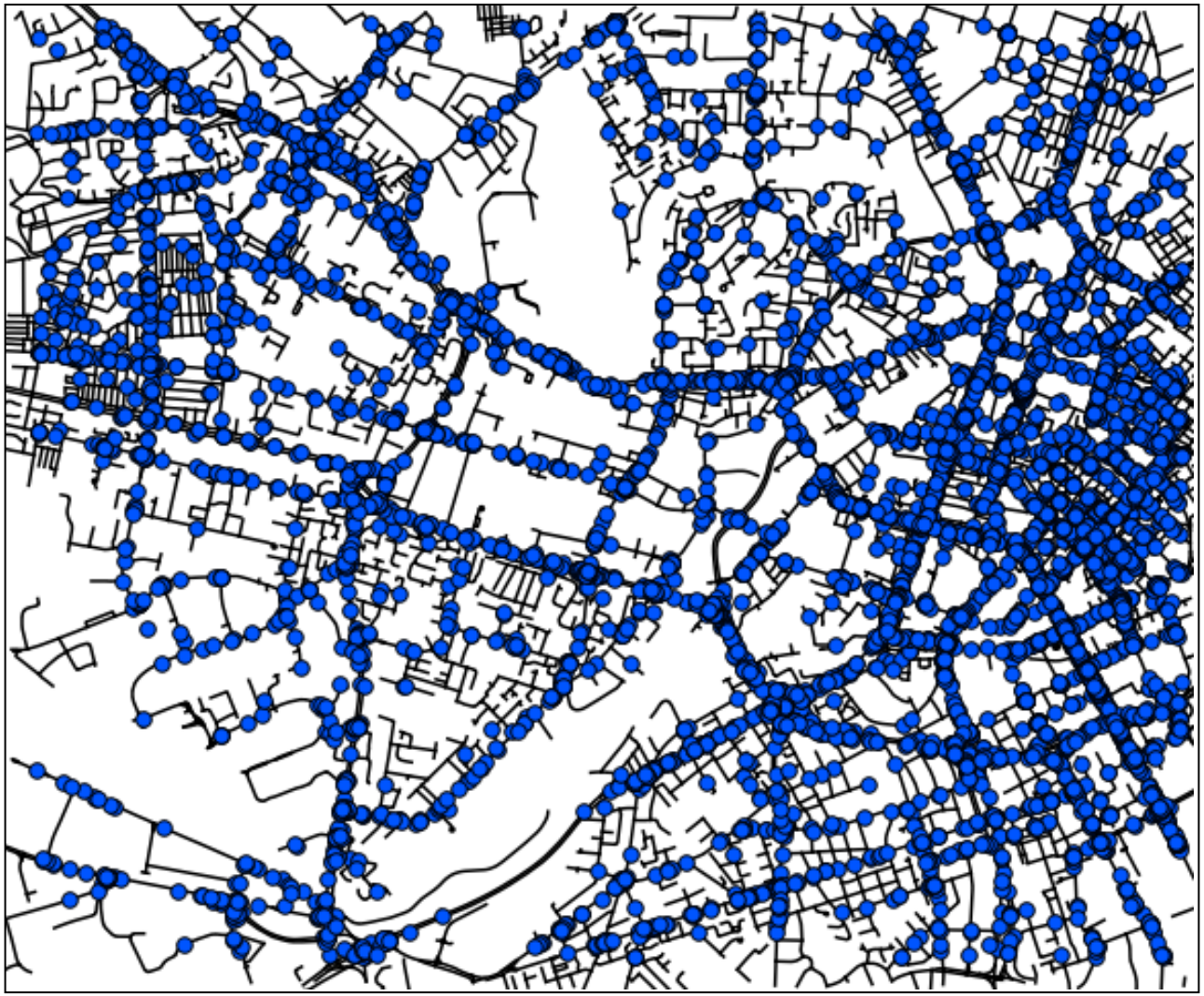
DegreeOfGeneralisation = 9

Target length = **33541**m

Current length = 3[illegible]m



Source data

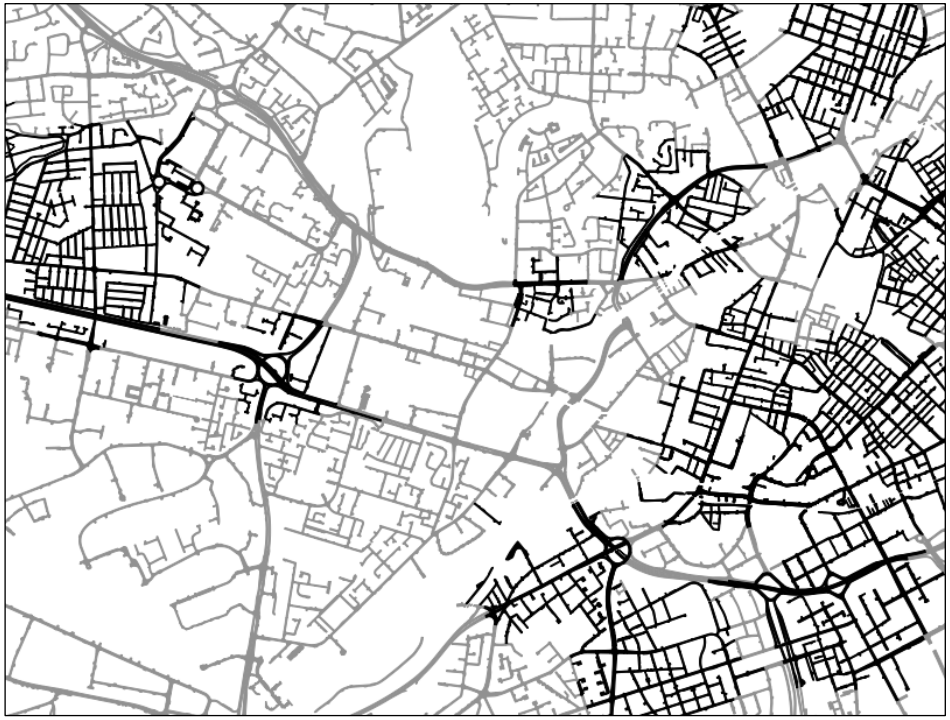


Road network and accidents at 1:30K

Conditions: accidents

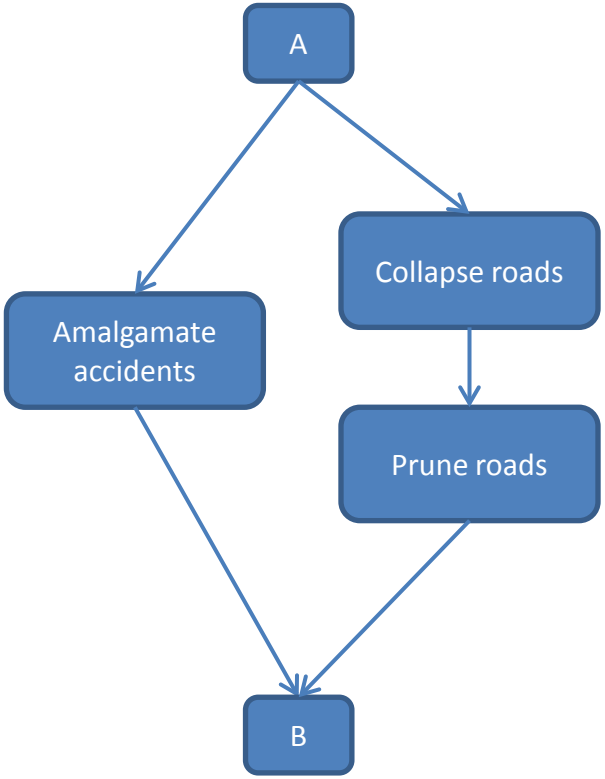
High road accident density
Identified by measure algorithm

Conditions: roads

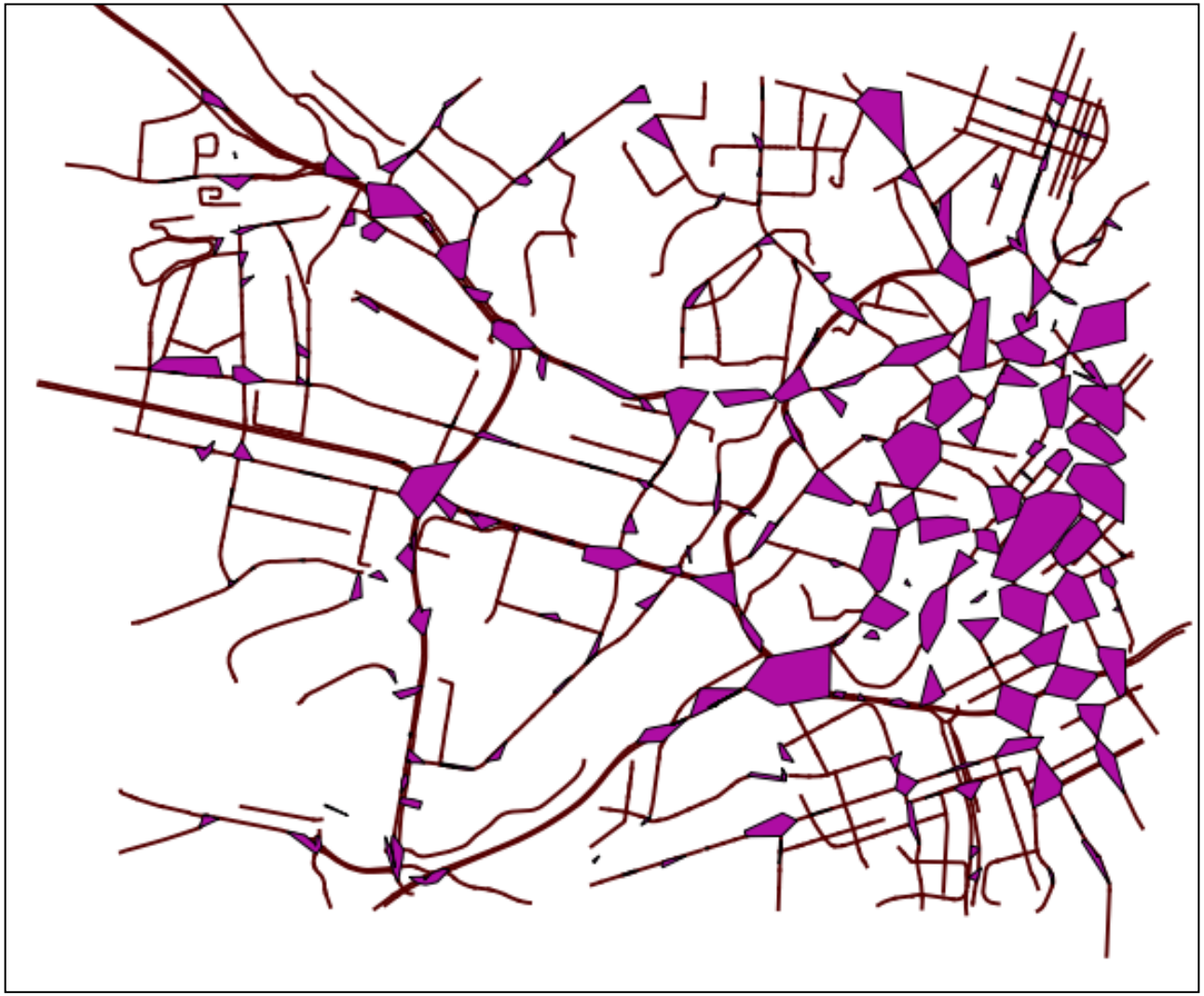


High (cross)road density
Identified by measure algorithm

Workflow



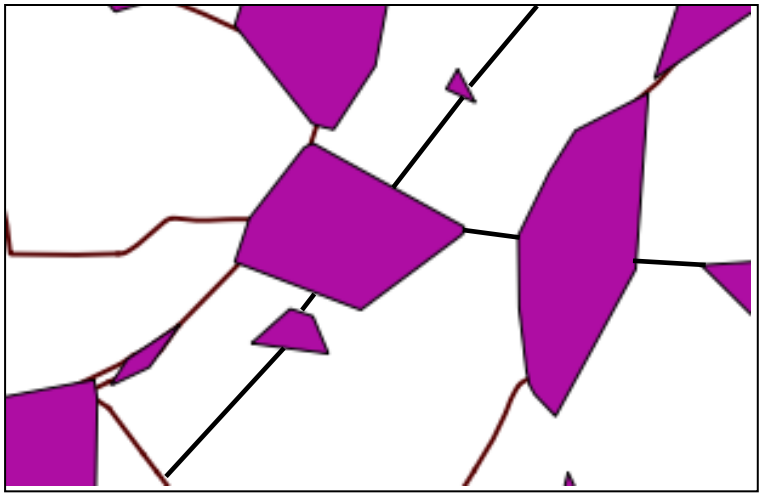
Results



Pruned road network and amalgamated accidents at 1:30K

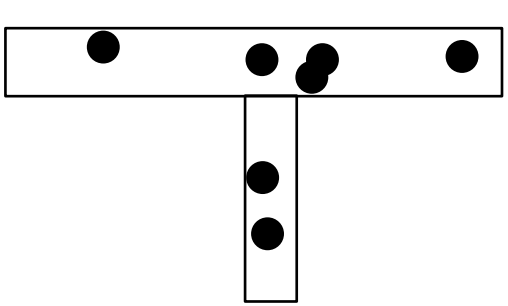
Missing context

- Road sections that provide context have been pruned

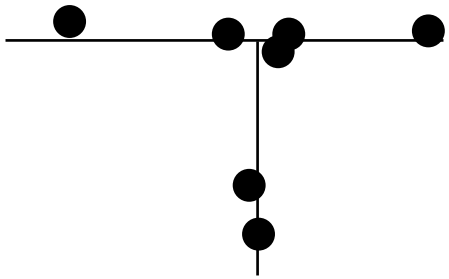


Spatial relations

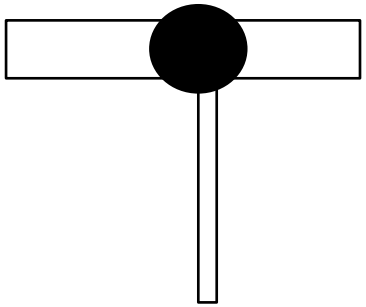
- Semantics – what is a road accident?
  - Punctual event
  - Takes place on a road
- Expressed as spatial relation



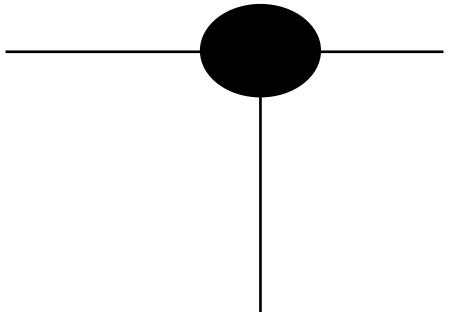
contained by



adjacent

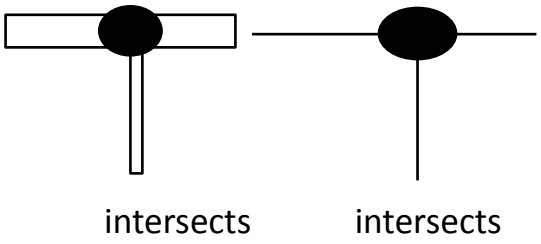


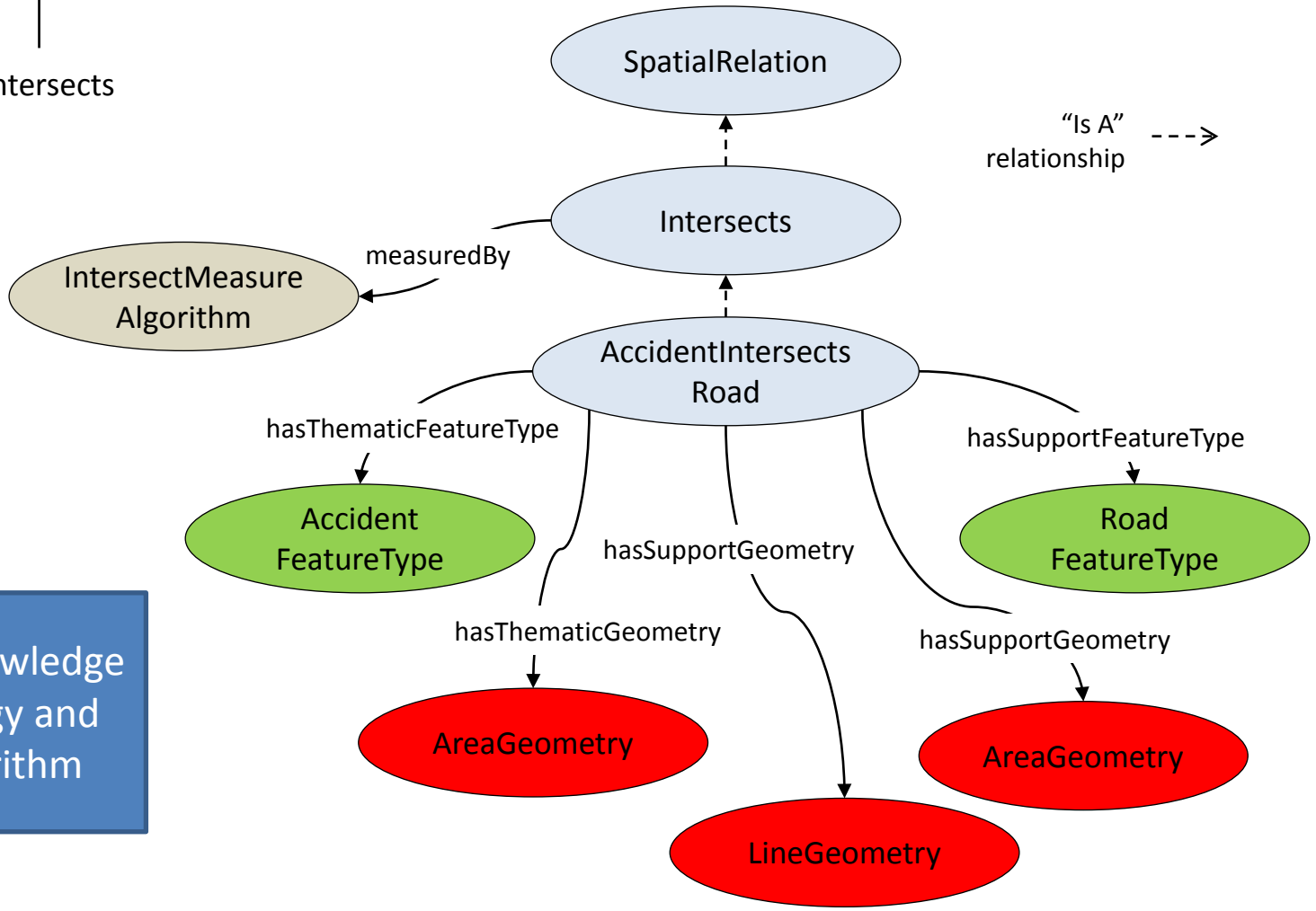
intersects



intersects

Modelling spatial relations

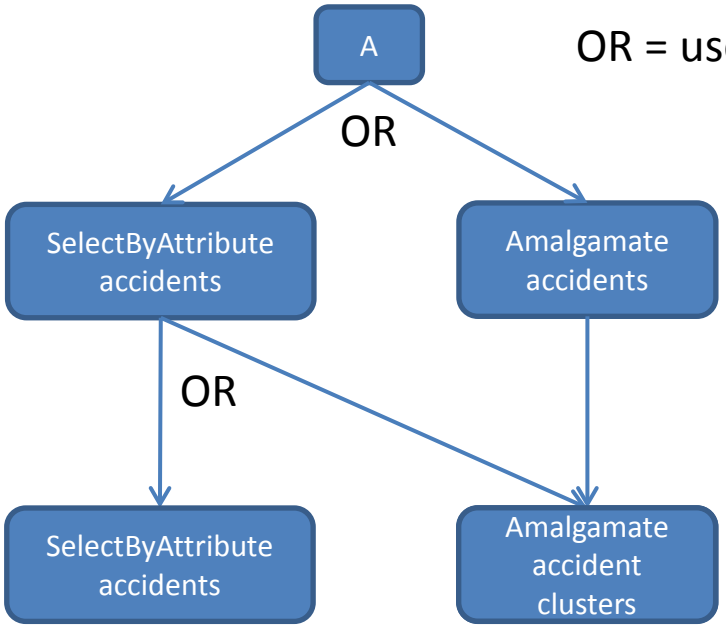




Goal: store knowledge in the ontology and not the algorithm

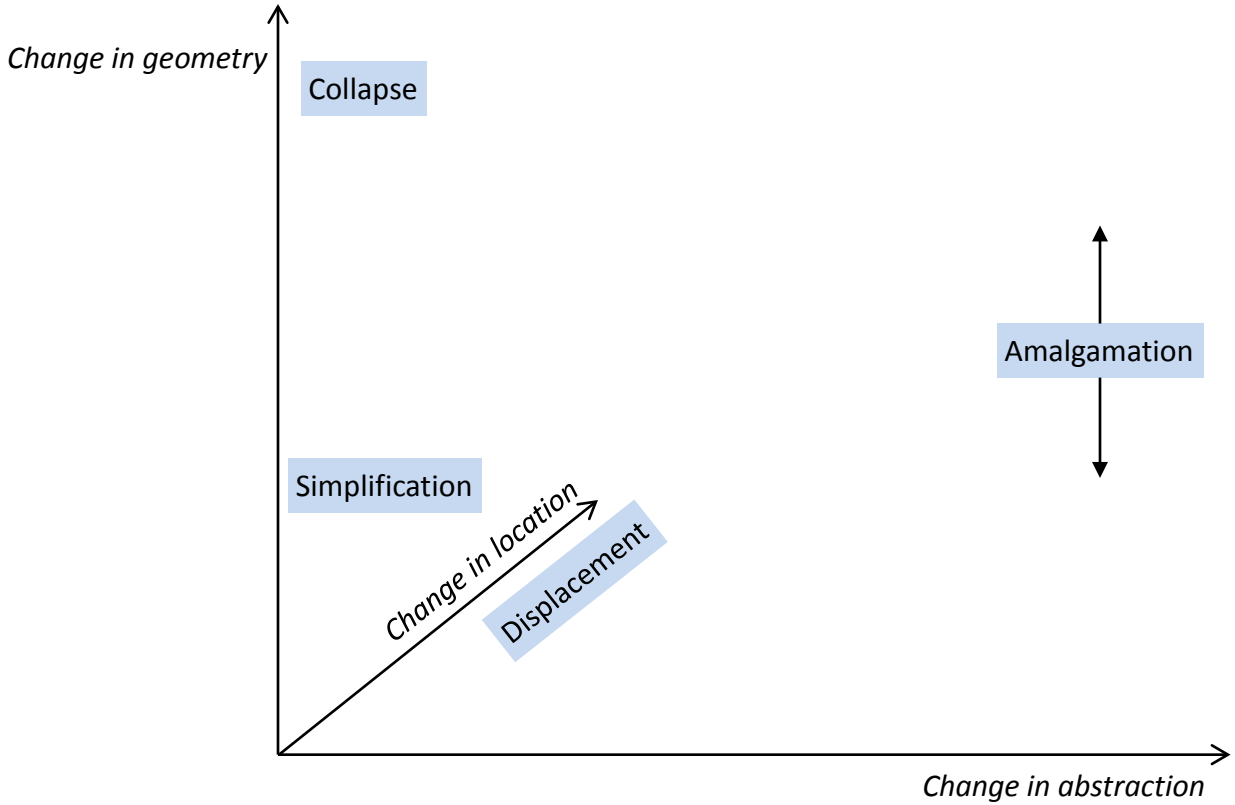
Workflow – accidents only

For a particular condition
at a particular scale



- Non-deterministic workflow
- Apply optimisation method?
- Refine the ontology….?

Refining the ontology
Describing the impact of operations

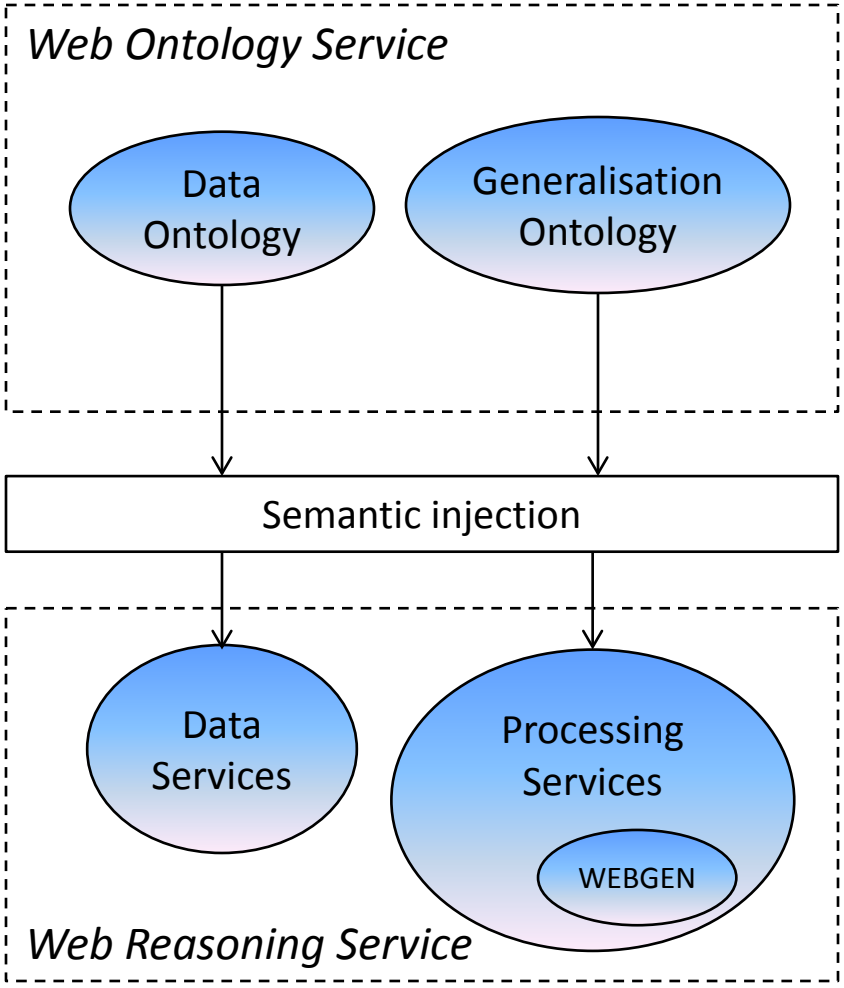


- Can impact be linked to user requirements?

Conclusion

- Difficulties building workflow with ontologies
- Role for ontologies in on-demand mapping?
- Support for agent-based systems?
  - Provide shared knowledge base
  - Make *implicit* ontologies *explicit*

Future work? - Web Ontology Services for generalisation



Thank you!

- Thanks to:
  - OSGB
  - Nico Regnauld
  - William Mackaness
  - Transport for Greater Manchester