Ontology Summit 2013:
Ontology Evaluation Across the Ontology Lifecycle
Virtual Panel Session 06 – February 21, 2013

Track A: Intrinsic Aspects of Ontology Evaluation: Synthesis 1

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Partitioning the Space: Intrinsic to Extrinsic

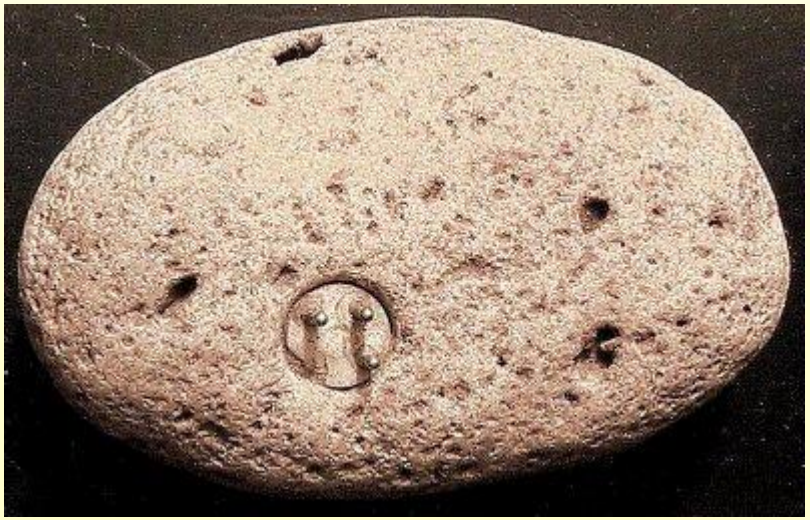
- It is useful to partition the ontology evaluation space into three regions:
  - Region 1: Intrinsic Evaluation: Little or no domain knowledge needed
  - Region 2: The Land of In-Between: Some domain knowledge and exploration of the ontology
  - Region 3: Extrinsic Evaluation: Ontology is black box to external requirements and interactions

Region 1: Intrinsic Evaluation

- Does not depend at all on knowledge of the domain being modeled,
- Can draw upon mathematical and logical properties, e.g.
  - Graph-theoretic connectivity, logical consistency, model-theoretic interpretation issues, inter-modularity mappings and preservations, etc.
- Example intrinsic metrics:
  - Branching factor, density, counts of ontology constructs, averages…
- Example meta-properties:
  - Transitivity, symmetry, reflexivity, equivalence…

Region 3: Extrinsic Evaluation

- The structure and design of the ontology is opaque to the tester
- Evaluation is determined by the correctness of answers to various interrogations of the model.

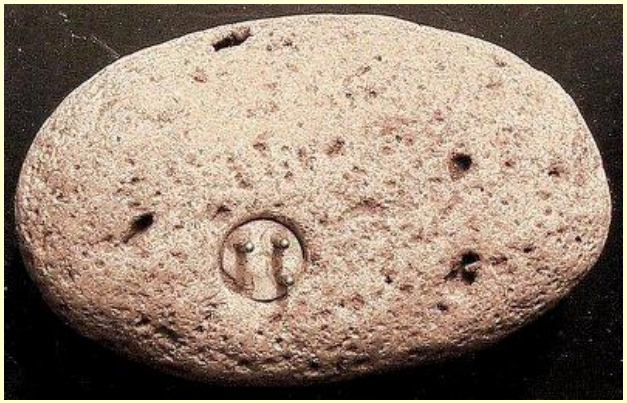


Region 2: The Land of In-Between

- Evaluation where some understanding of the domain is needed
  - e.g. determine that a particular modeling construct is in alignment with reality
- Meta-properties such as rigidity, identity, unity, etc., suggested by metaphysics, philosophical ontology, and philosophy of language/formal semantics are used to gauge the quality of the subclass/isa taxonomic backbone of an ontology and other structural aspects of the ontology.
- For the purposes of developing reasonable expectations of different evaluation approaches, the challenge mainly lies in clarifying the preponderance of work that falls within Region 2, where some domain knowledge is employed and combined with the ability to explore the ontology being evaluated.

Why 3 Regions?

- Region 1, purely intrinsic evaluation
  - Highly amenable to automation and thus to scaling to many ontologies of any size.
  - The other partitions may be automatable eventually, with more effort
- Region 3, purely extrinsic evaluation, implies no ability whatsoever to peer inside a model
  - It depends entirely on model behavior through interactions.
  - Extrinsic evaluation criteria might sometimes be considered as intrinsic criteria with additional, relational arguments
    - e.g., precision with respect to a specific domain and specific requirements



Region 1: Intrinsic Evaluation Tools

- OOPS!: Reports on suspected improper uses of various OWL DL modeling practices
  - http://oeg-lia3.dia.fi.upm.es/oops/index-content.jsp
  - Described by MariaPovedaVillalon
- OntoQA to develop metrics for any ontology based on structural properties and instance populations
  - Described by SamirTartir

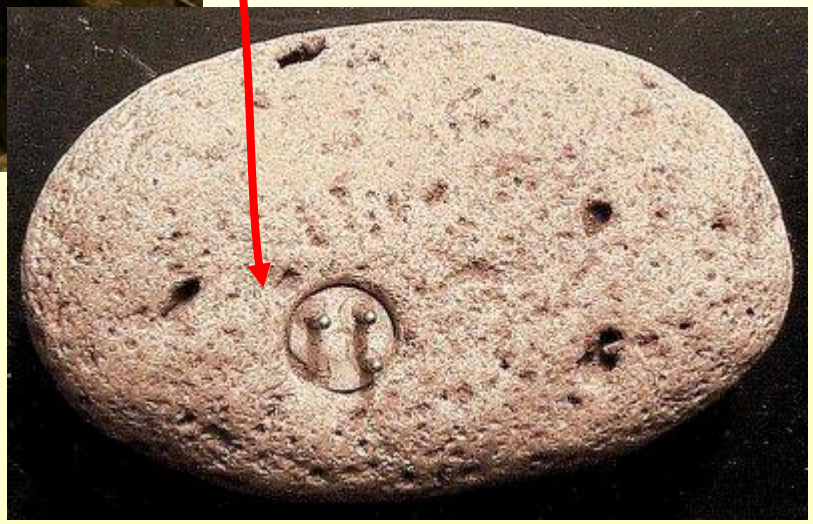
Region 2: The Land of In-Between Tools

- The OQuaRE framework combines both context dependent and independent metrics
  - Described by AstridDuqueRamos
  - The OQuaRE team has stated their desire to better distinguish between these two categories of metrics

- The OntoClean methodology
  - Not reported on in Ontology Summit 2013, but generally well-known [1, 2]
  - Draws upon meta-domain knowledge, the use of meta-properties, i.e., standard evaluative criteria originating from the practices of ontological analysis

[1] N. Guarino, C. Welty. 2002. Evaluating Ontological Decisions with OntoClean. Communications of the ACM. 45(2):61-65. New York: ACM Press. http://portal.acm.org/citation.cfm?doid=503124.503150.
[2] Guarino, Nicola and Chris Welty. 2004. An Overview of OntoClean. In Steffen Staab and Rudi Studer, eds., The Handbook on Ontologies. Pp. 151-172. Berlin:Springer-Verlag. http://www.loa-cnr.it/Papers/GuarinoWeltyOntoCleanv3.pdf.

The 3 Regions



Conclusions

- Mathematical, logical, structural integrity, consistency are kinds of evaluation to be performed, even in a domain-context-free setting
- Entailments, model theories and subtheories, interpretability and reducibility are just a few of the other properties that should be examined
- The use of ontological analysis derived from metaphysics, philosophical ontology, and philosophy of language/formal semantics and the use of meta-properties should be examined.
- It is the goal of this summit to define a framework in which these examinations can take place, as part of a larger goal of defining the discipline of ontological engineering.