

Thesauri and ontologies: similarities and differences

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Outline

- Interpretations of Ontology
 - From Semantic Web to philosophy
- Relata – the entities related by relationships
 - Concepts vs.
Classes, Universals, Individuals and Collections
- Relationships
 - Hierarchy, associations

Interpretations of „Ontology“

- *Classical ontology*
 - Plato, Aristoteles, Chisholm, Lowe
- *Formal ontology*
 - Husserl, Hartmann
 - Top-level Ontologies (DOLCE, BFO, GFO, SUMO)
- *Complex Domain-Ontologies: ? Method ?*
 - IAOA: Applied Ontology journal, FOMI, FOIS
- *Semantic Web: syntactic, data model*

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Approach

Comparison of *relata* thesaurus vs. ontology

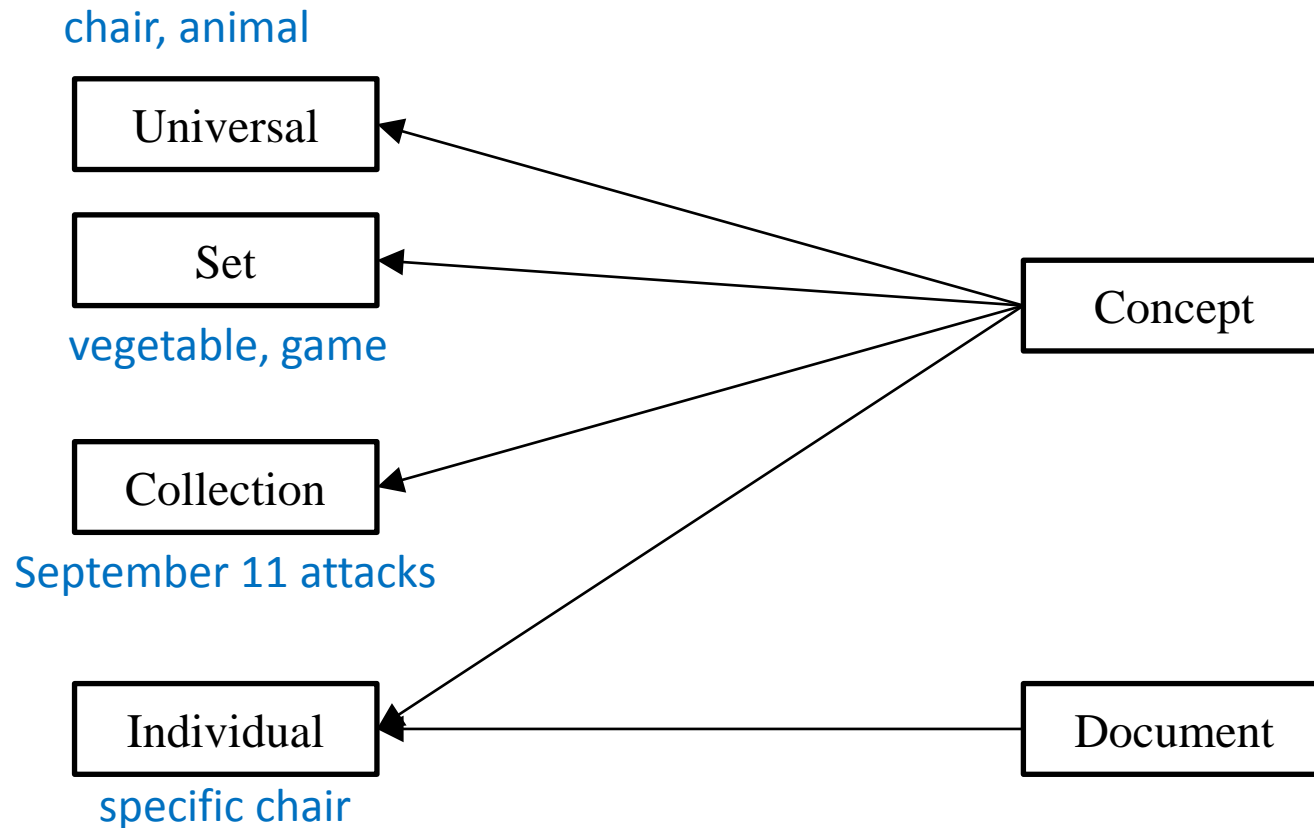
- Based on entity definitions
 - Thesaurus: standard ISO 25964-1
 - Ontology: Scientific realism (literature)
- Mappings (not exhaustive)
- Focus: Intensionality vs. extensionality of definitions

Results

Comparison of *relata* thesaurus vs. ontology

Formal ontology
in ontological realism

Thesaurus
in standard ISO 25964-1



Discussion

Comparison of *relata* thesaurus vs. ontology

- Distinction of concepts into universals and “other things” necessary to map relations
- Difficult due to lack of definitions – unclear intension / intrinsic properties
- Universals useful basis for reasoning

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Approach

Comparison of *relationships* thesaurus vs. ontology

- Based on relationship definitions
 - Thesaurus: standard ISO 25964-1
 - Ontology: Lowe (2005) + Paper by Bittner et al. (2004), Keet & Artale (2008) for part-of relations
- Correspondences thesaurus → ontology
 - Analysis with increasing level of detail
- Focus: transitivity, categories of relata
 - Ontology categories: DOLCE (Gangemi et al. 2002), Lowe (2005)
 - Thesaurus categories: informal in standard
 - Mapping of categories ... just word-meaning based

Thesaurus relationships

Comparison of *relationships* thesaurus vs. ontology

- ~~Equivalence relationship~~
- Hierarchical relationship (BT/NT)
 - Generic relationship
 - Hierarchical part-of relationship
 - Instance relationship
- Associative relationship

Hierarchical part-of relationship

Comparison of *relationships* thesaurus vs. ontology

1st relata	2nd relata	Example
Systems of the body	Organs of the body	Cardiovascular system – Blood vessels – Arteries
Geographical location	Geographical location	Canada – Ontario – Ottawa
Discipline or field of discourse	Discipline or field of discourse	Science – Biology – Botany
Social entity	Social entity	Armies – Corps – Divisions

Table 1

Associative relationship

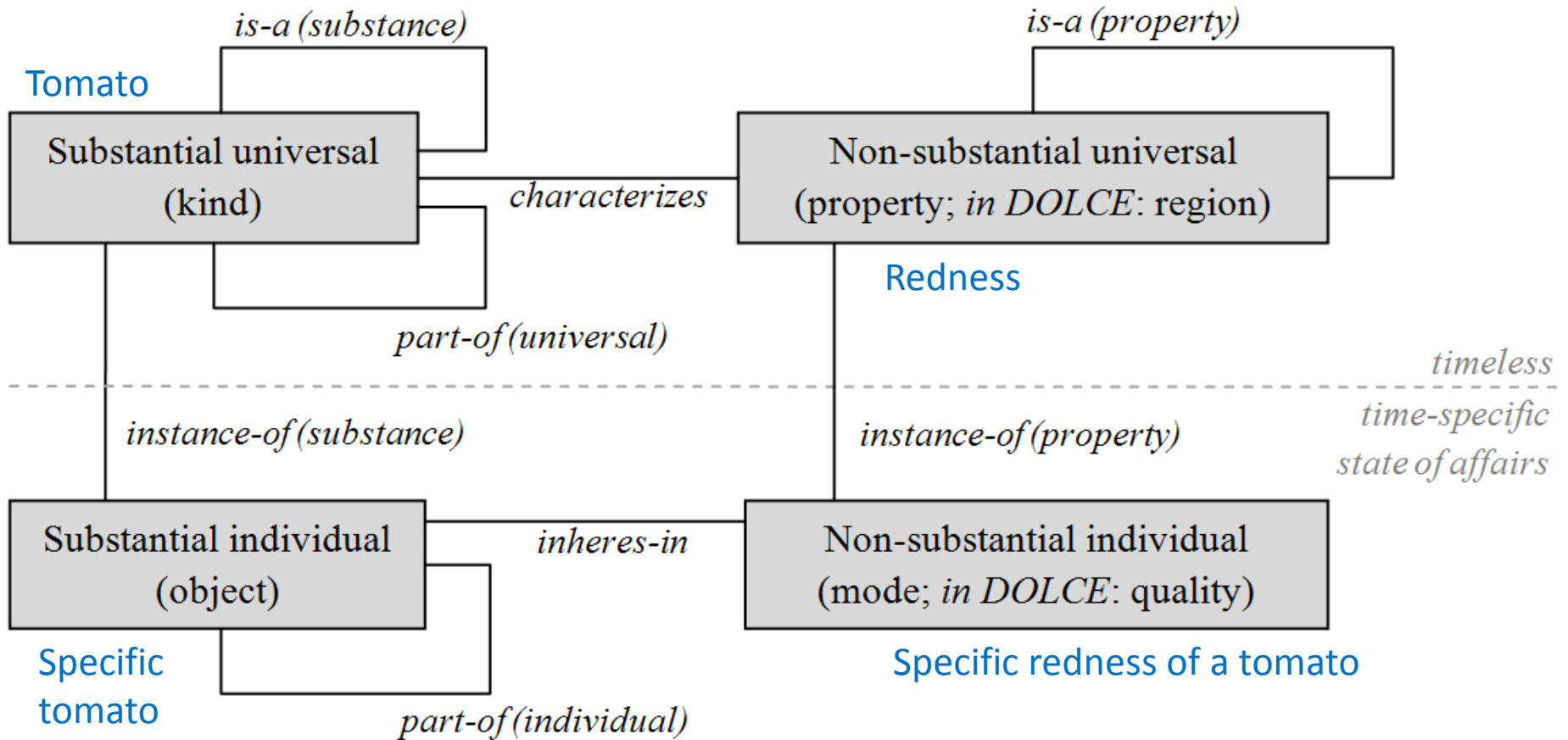
Comparison of *relationships* thesaurus vs. ontology

1st relata	2nd relata	Example
Operation or process	Agent or instrument	Crime investigation – Detectives Temperature control – Thermostats
Action	Action product	Weaving – Cloth Ploughing – Furrows
Action	Patient or Target	Harvesting – Crops Imprisonment – Prisoners
Discipline or field of study	Object or phenomenon studied	Ornithology – Birds Forestry – Forests

Table 2

Fundamental ontology relationships

Comparison of *relationships* thesaurus vs. ontology



Mereological relations in ontologies

Comparison of *relationships* thesaurus vs. ontology

- Ground mereology
(transitive, reflexive, symmetric)
not always basis for linguistic part-of
- Just some part-whole are transitive
(mereological relations)
 - Distinction of relationships requires categories
(domain and range specification)
here: DOLCE categories (top-level ontology)

Table 1

DOLCE main categories

Comparison of *relationships* thesaurus vs. ontology

- Endurant... change over time, keep identity
- Perdurant... do not change, no identity
- Most relata categories of thesauri and ontologies can be mapped

Figure 1

Table 2

Comparison results: General relations

Comparison of *relationships* thesaurus vs. ontology

Table 3

Thesaurus relationship	Ontological relationship	Level	Transitivity
Hierarchical relationship	Different relationships	n/a	Non-transitive
<i>Hyponymy / Generic relationship</i>	Is-a	Universal	Transitive
<i>Meronymy / Hierarchical part-of relationship</i>	Different part-whole relationships	Universal or Individual	Non-transitive
<i>Instance relationship</i>	Instance-of	Betw. universal and individual	n/a
Associative relationship	Different custom relationships	n/a	Non-transitive

Results: General relations

Comparison of *relationships* thesaurus vs. ontology

- *Particular* hierarchical part-of relations in thesauri match *transitive* ontological part-of relations Table 4
- *Particular* thesaurus associations generally match *intransitive* ontological relations Table 5

Discussion

Comparison of *relationships* thesaurus vs. ontology

- Transitivity does not hold across different (transitive) relationships, e.g.

Plant reproductive organs

Seed (hyponym)

Kernels (meronym)

Endosperm (meronym)

Testa (meronym)

Fruit (hyponym)

Discussion

Comparison of *relationships* thesaurus vs. ontology

- Thesaurus hierarchy appears – in one form or another – in ontologies as well
 - appear similar
 - Need for detailing thesaurus relationships
- Cursory usage of terms such as ‘class’, ‘instance’, ‘property’ or ‘category’ in definitions of thesaurus relationships, e.g.
 - Geopolitical entity → Country → Canada
 - Special structural importance in ontologies
- Inadequate to regard ontologies simply as a more formalized type of thesaurus

Discussion: Why are the differences

Comparison of *relationships* thesaurus vs. ontology

Purpose thesaurus relations

- Pointing indexers or searcher to related, broader or more specific terms/concepts
- Allowing searchers and indexers to navigate a thesaurus
- Automatic expansion of search queries

Purpose ontology relations

- Predicating
(*explain or account for* phenomena of philosophical interest)
- Reasoning

Discussion: Why transitivity?

Comparison of *relationships* thesaurus vs. ontology

- Automatic expansion of search queries over greater path lengths (thesauri)
 - Lack of quantitative proof
for suitability of relationship definitions
- Maintainability

Discussion: Choose ontologies?

Comparison of *relationships* thesaurus vs. ontology

- Is-a relation diagonal/independent from part-of relation
 - Navigability possibly impeded (as opposed to thesauri)
 - Need for compensation in user interface
- Logical structure often less familiar to users
 - Expect concepts in “traditional groupings” of disciplines and subject fields

Conclusions

- Many apparent similarities
- Difference in detail
 - Distinguishing relations
 - Fundamental structure (universal vs. individual)
 - Special importance of high-level categories
 - Definition of intrinsic properties**
- No „easy“ mapping or reengineering possible, if goal is reasoning and wider integration