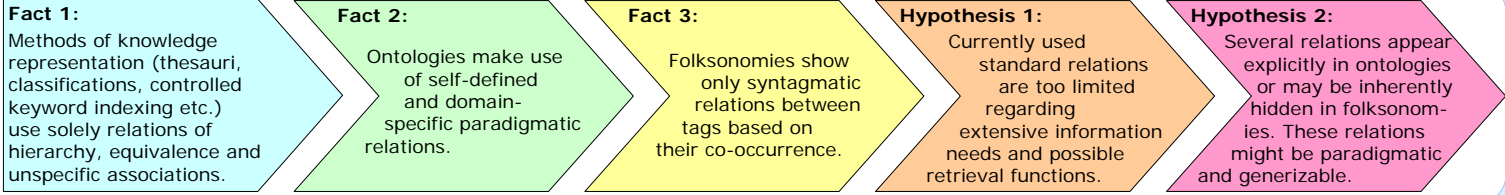
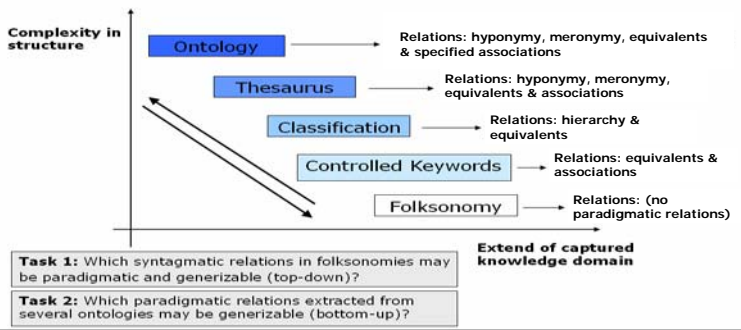


Reconsidering Relationships for Knowledge Representation

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Research Approach



Hierarchical Relations

- Relations between (upper) concepts and their sub-concepts.
- Basis framework for most concept models – dominate current systems.

Hyponymy

- Logical view. Specification of features; „is a kind of“, „is_a“.
- Kind-of-relation, taxonomic relation, taxonomy.
- Examples: mammal – cat; vehicle – car.

Meronymy – Holonymy

- Objective view; „is a part of“.
- Part-whole-relation, mereology, part-of relation, partonymy.
- Examples: car – motor; England – London.

Relation of equivalence

- Synonymy (different names for the same concept).
- Quasi-Synonyms (concepts with similar meaning).
- Generativity/ generic relation (concepts, whose meanings have changed slightly in course of time (Leningrad – St Petersburg)).

Associative Relations

- They are unspecified connections of concepts that can have any kind of relation – except synonyms and hierarchical relations.

Examples:

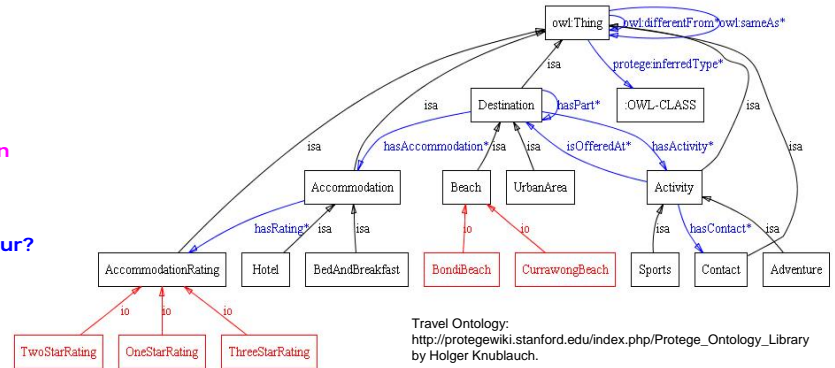
Folksonomies: hidden relations in tags on www.Flickr.com.



Tags
Bochum
VfL
VfL Bochum
Fussball
Rewirpowerstadion
Ruhrstadion
Blau
Weiß
Blau-Weiß
Bielefeld
Fans
Soccer
Ruhrgebiet

- (geographic) hierarchy (quasi-) synonyms
- generic relation (former-later)
- has_team colour?
- has_rival?
- (cross-language) synonyms

Ontologies: domain-specific relations within an ontology of travelling.



Research Goal

To discover new and elaborated relationships between concepts instead of unspecific “associations”. As shown in Winston et al. (1987) and Storey (1993) for meronymic relations, a reconsideration may also concern standard hierarchic relations.

Part	Whole	Example
component	integral object	handle – cup
member	collection	tree – forest
portion	mass	slice – pie
stuff	object	steel – bike
feature	activity	paying – shopping
phase	activity	adolescence – growing up
feature	event	trapeze act – circus
place	area	Everglades – Florida
unit	organisation	controlling division – enterprise
component	complex	roof – house
dimension sub-unit	dimension unit	millilitre – litre

Further differentiations of associative relations may regard the following dimensions:

location	geographical information (is_situated), locations in comparison to other objects (inclusion, adjacency, is_near_to)...
perception	color, shape, taste, sound, haptics, surface, texture, smell...
measures	length, weight, height, density, temperature, time (duration)...
others	functions, actions, task, behavior, processes, events, motions, material, effect-cause, product-producer, recipient-sender, usefulness-harmfulness...

Possible applications

- May be applied in Description Logic for automatic reasoning.
- Query expansion within a user/ search engine dialog to enlarge/ to reduce the amount of search results → aim: to gain better search results.

Caution: transitivity has to be considered in query expansions!

A relation may be regarded as transitive if following three-level relation holds:

- concept *x* is related to another concept *y* in a relation *R*;
- y* is also related to a third concept *z* in the same relation *R*;
- x* also relates to *z* via the same relation *R*.

Transitive relations can be used to expand the query with more than one path upwards or downwards respectively.

Examples with part-of relations:

a) working transitivity: Duesseldorf is a part of the Rhineland, Rhineland is a part of North Rhine-Westphalia, so Duesseldorf is a part of North Rhine-Westphalia.

b) false expansion: a nose is a part of you, you are a part of this poster session, so your nose is a part of the poster session?

→ **Solution for the transitivity problem:** we have to specify the different meronymic relations and, as possible, the associative relations as well, and to add information about whether single relations are transitive or not.

References

- Storey, V.C.: Understanding semantic relationships. In: VLDB Journal, 2, 1993, 455-488.
 Winston, M.E., Chaffin, R., & Herrmann, D.: A taxonomy of part-whole-relations. In: Cognitive Science, 11, 1987, 417-444.