
Automatic Domain Ontology Mapping

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Outline

- **Introduction**

- ontology structure
- ontology aligning

- **Situation**

- ontology structure variability
- example

- **Possible solution**

- primitive structure variability
- structure part similarity
- ontology structure model
- WordNet, WordNet as a model

- **Wordnet distance**

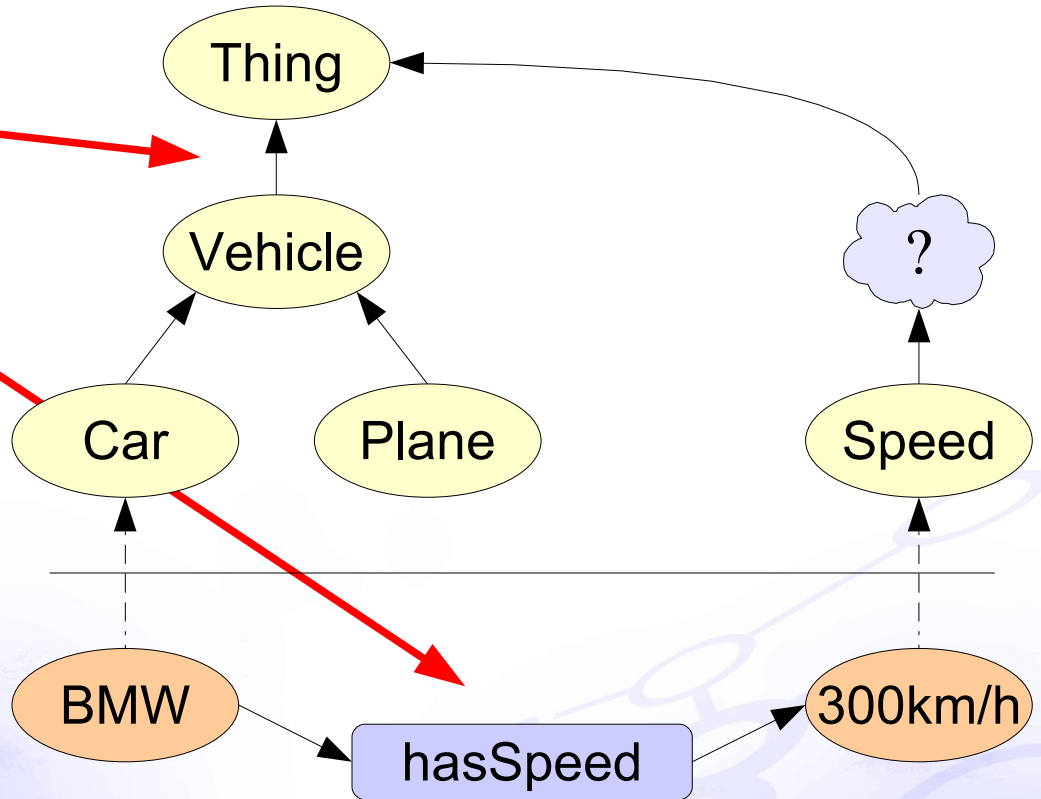
- **Schema of automatic mapping tool**



Introduction / Basic Ontology Structure

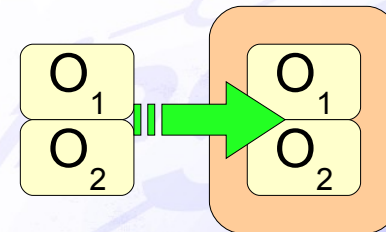
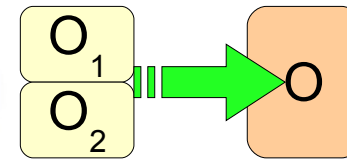
■ Structure

- concepts + hierarchy
- relations + hierarchy
- instances



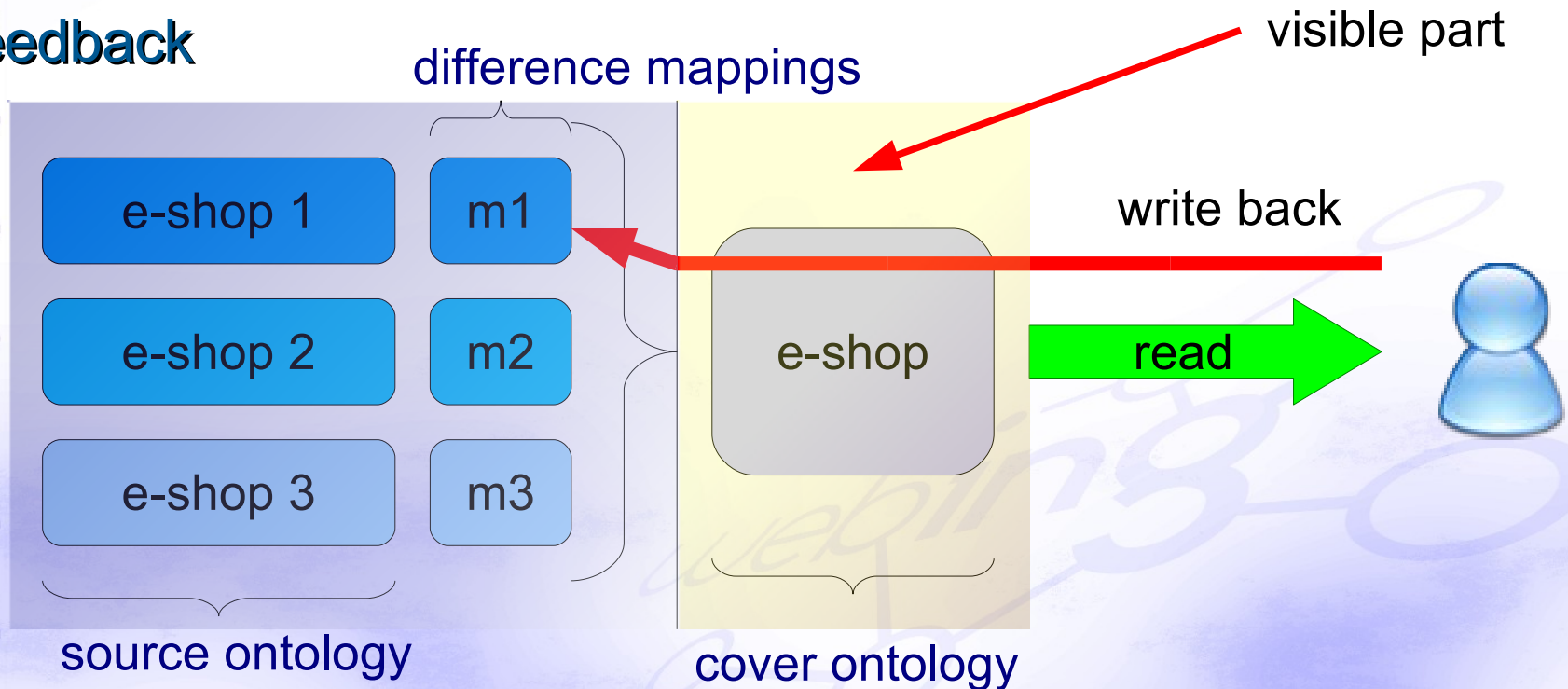
Introduction / Ontology aligning

- **why ?**
 - to put together different sources
- **mismatches**
 - conceptualization (model coverage and granularity)
 - explication (style, terminological, units)
- **alignment**
 - discovering similarities
 - correspondences
- **merging**
 - create new ontology
- **integrating**
 - original concepts unchanged
 - namespaces



Situation / Example

- two or more e-shops ontology
- cover ontology → over all input ontologies
- user work **only** with cover ontology
- feedback



Situation / Ontology Structure Variability

■ situation

- structure variability → mismatches
- mismatches → complicate aligning
- internet → big variability

■ aligning process

- manual → solve every mismatch, complicated
- semi-automatic
- (fully) automatic → solve only primitive mismatch, very easy

■ structure variability

- mismatches
- ontology design



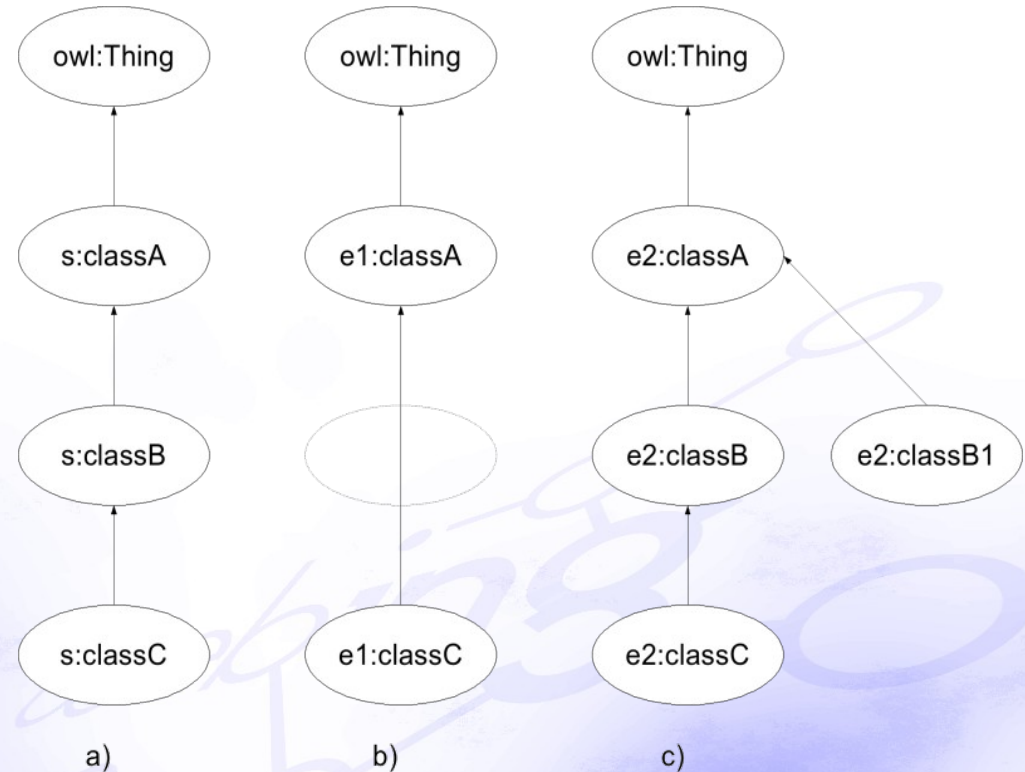
Solution / Primitive structure variability

- suppose two ontologies

- source
- examined

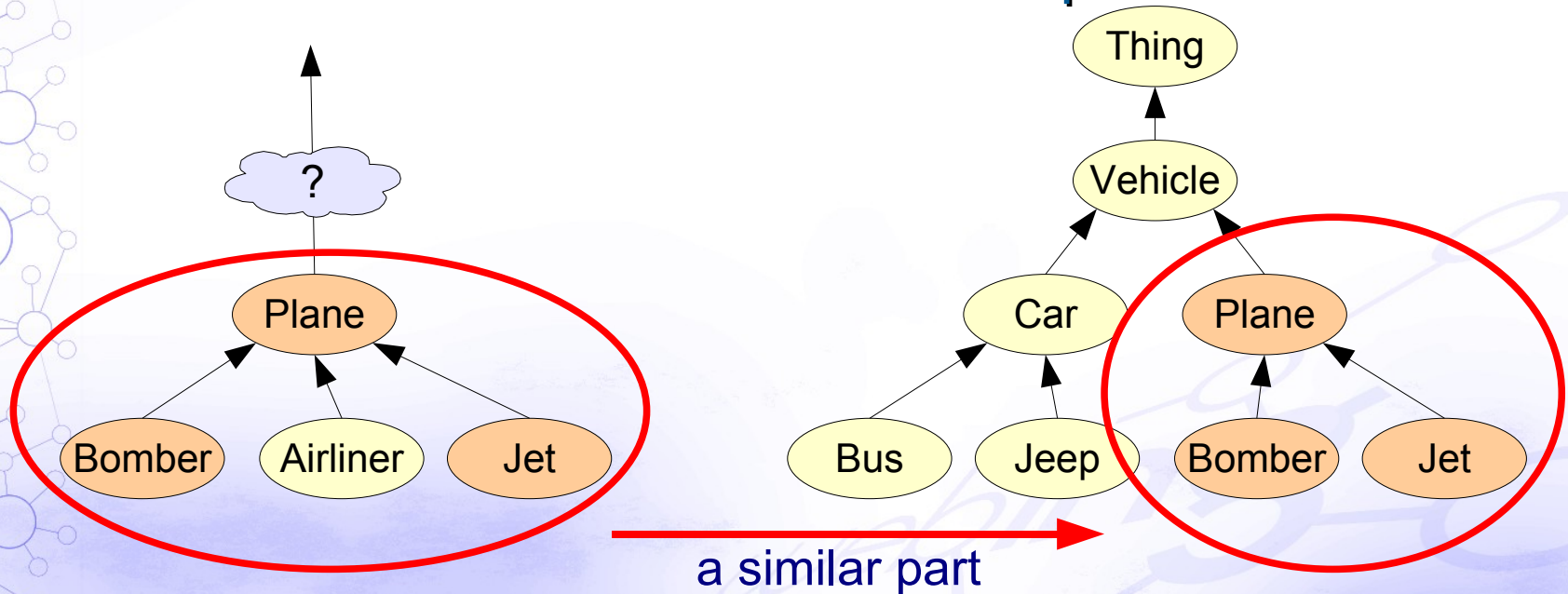
- primitive variability

- missing class
- extra class



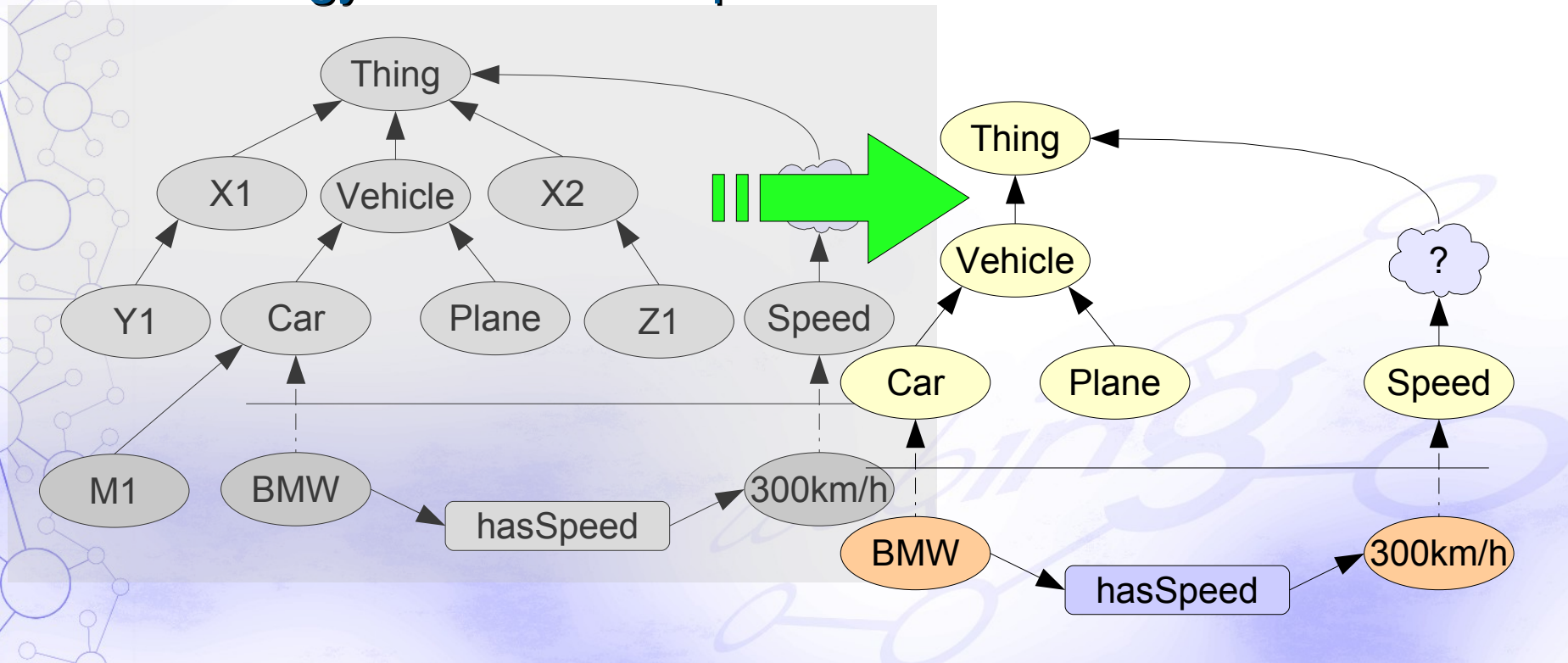
Solution / Ontology Structure Similarity

- suppose → domain ontology, similar structure
- distance → similarity
- similar class names → similar structure parts



Solution / Ontology Structure Model

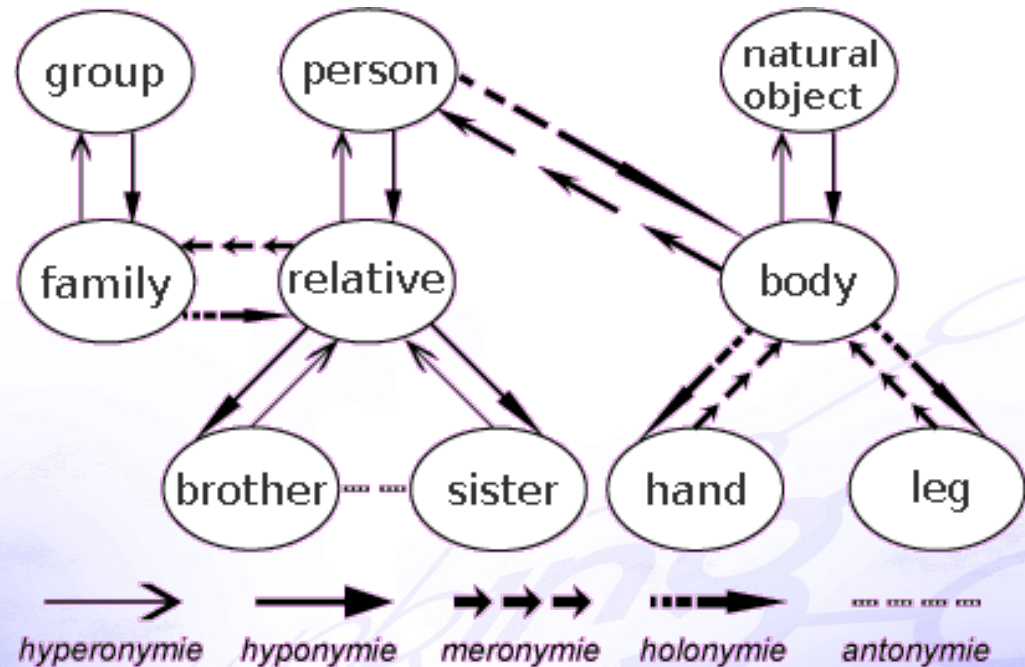
- an ontology structure → a common graph
- a model behind → a full graph
- an ontology structure → a part of the model



Solution / Lexical database WordNet

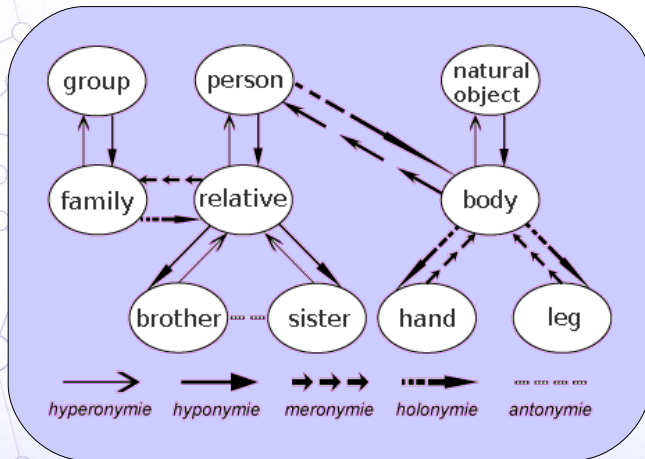
■ basic relationships

- hypernym → “is-a”
- hyponym
- antonym

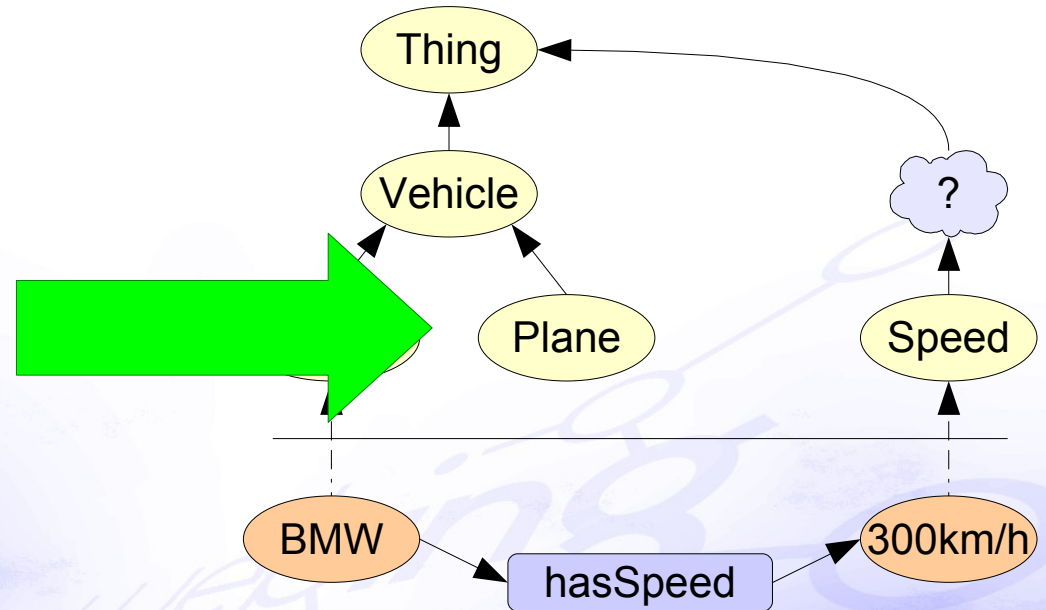


Solution / WordNet as a model

- vocabulary = items
- model = rules, relationships



items, nouns

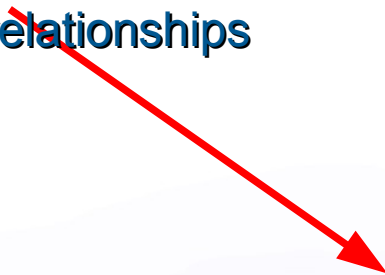


WordNet Distance

- class name similarity
- linear
 - not respect relationships
- recursive
 - respect relationships



$$WD_{A,B} = \sum_{i=0}^{n-1} WD_{x_i, x_{i+1}}$$



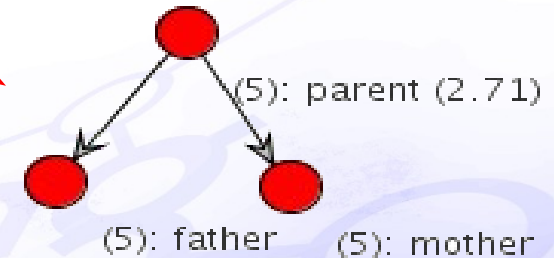
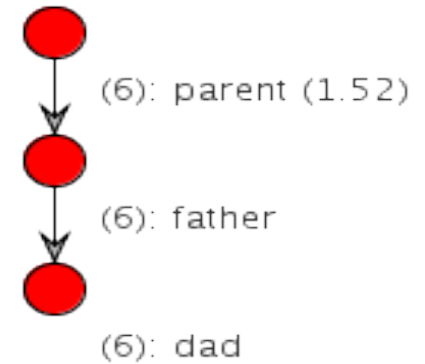
$$WD_0 = 1, \quad TWD_{A,B} = \sum_{i=1}^n (WD_n) - 1$$

$$WD_n = WN_{n-1} + s^3 \cdot \left(1 - \frac{1}{\sqrt[4]{1 + WD_{n-1}}} \right), n \geq 1$$

WordNet distance, example

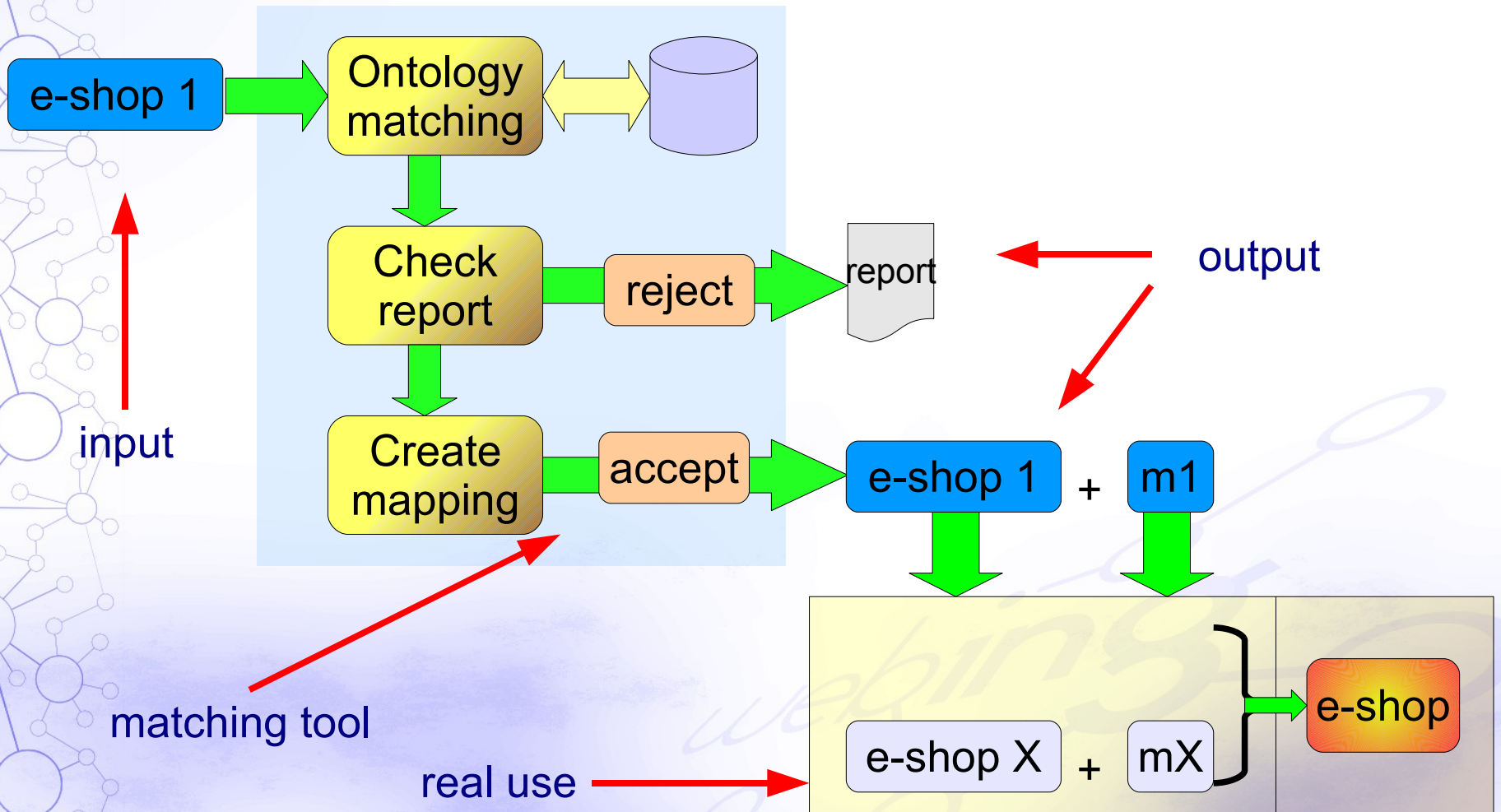
distance between words

- parent ↔ dad
- father ↔ mother



word A	word B	relationship	distance	
			linear	recursive
parent	dad	hyponym	2	1,52
father	mother	other	2	2,71

Fully Automatic Mapping



Conclusion and Future Work

■ Conclusions

- fully automatic mapping
- easy to use tool
- the use of WordNet for matching

■ Future work

- change distance → similarity
- similarity → structure similarity
- an automatic mapping tool
- specify range of ontology design variability

