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enabling distributed and autonomous **management of knowledge**

Semantic coordination in systems of autonomous agents: the approach and an implementation

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Semantic coordination

Semantic coordination is the problem of enabling agents to exchange meaningful information/knowledge across applications which:

- use **autonomously** developed conceptualizations of their domain
- need to **collaborate** to achieve their users' goals

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Semantic coordination – cont'd

Two main approaches in literature:

- **Global schema** (GAV and LAV)
- **PeerToPeer**

Global schema approaches do not seem suitable! In fact, local representations:

(i) change frequently

(ii) are managed in full autonomy

(iii) may appear and disappear at any time

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Goal

Defining and implementing an algorithm that discovers semantic relations across different and heterogeneous representations:

- **runtime**
- **automatically**

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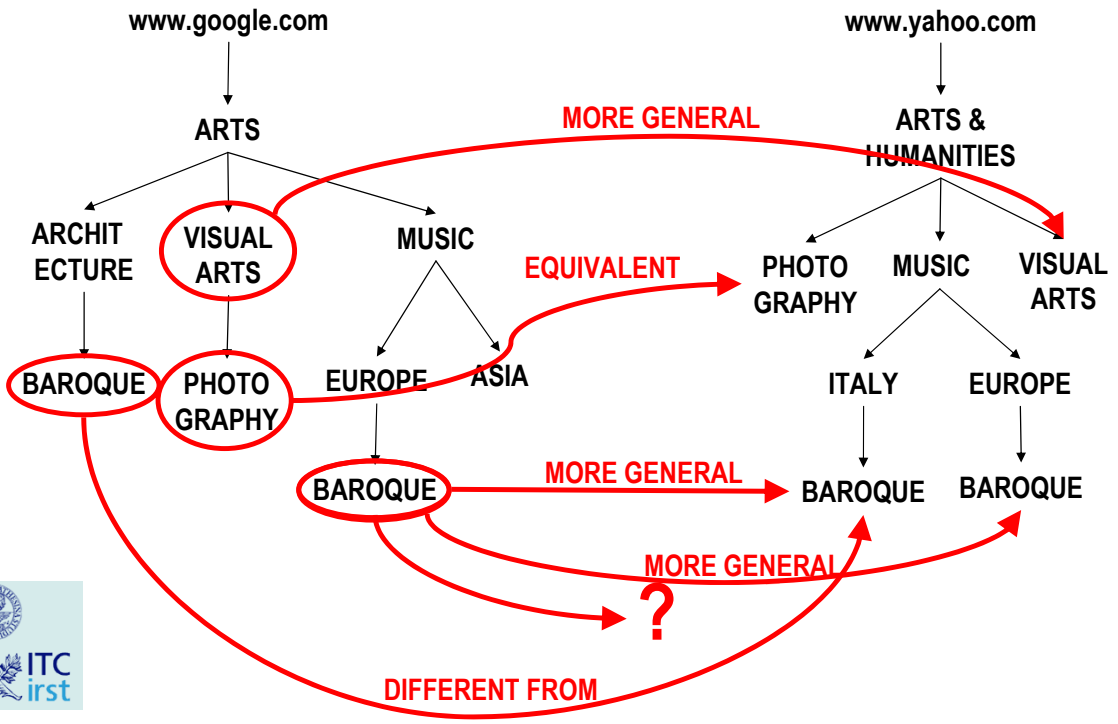
The problem



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Our approach

- **From matching to reasoning**
- **From type of structures to use of structures**
- **Language as coordination tool**

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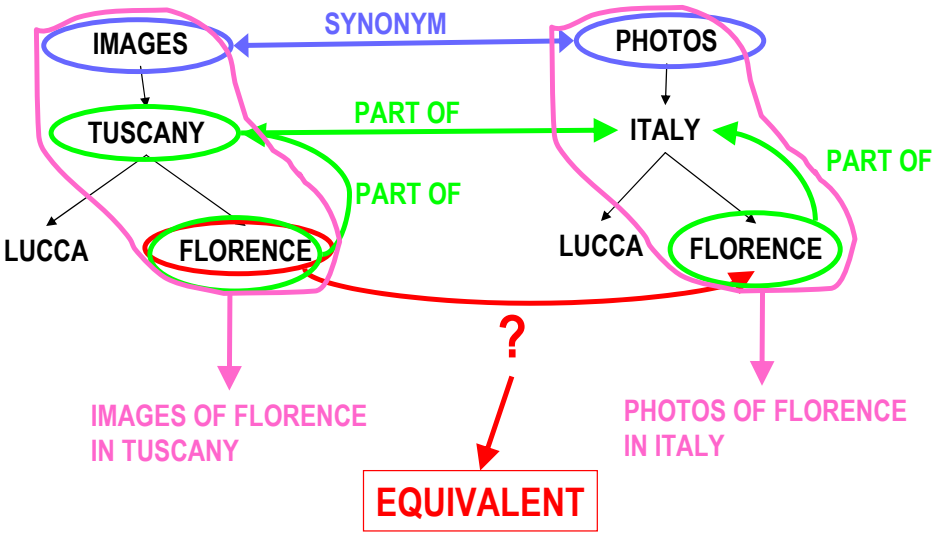
Three levels of knowledge



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We use **lexical**, **structural** **and** domain knowledge

The Matching Algorithm

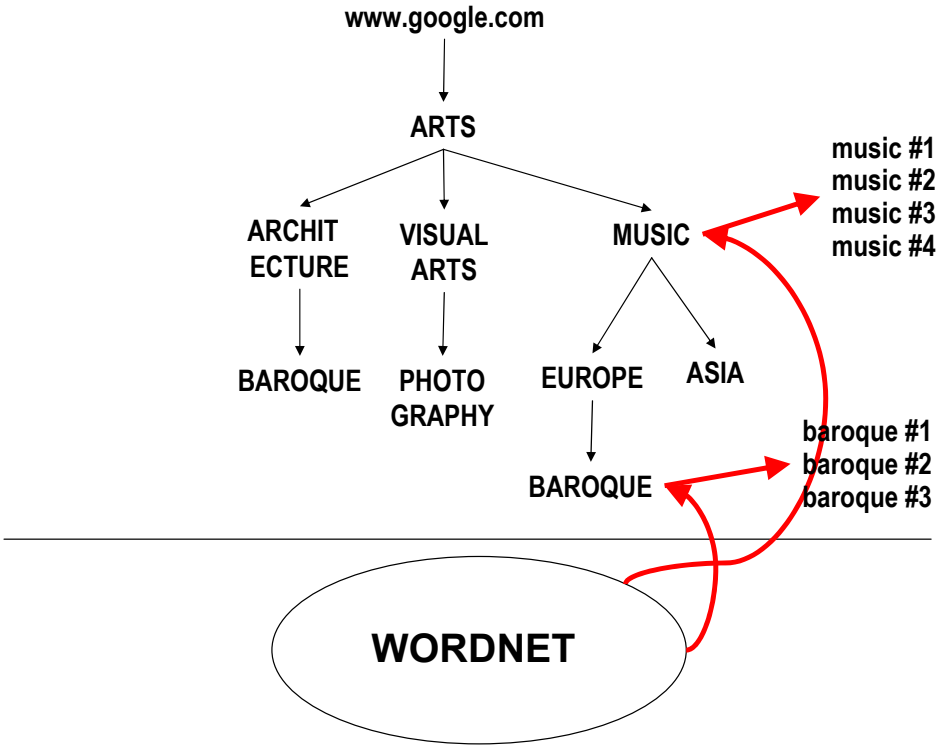
Step 1 (offline)

- Semantic explicitation
  - Linguistic Interpretation
  - Contextualization
    - Sense filtering
    - Sense composition

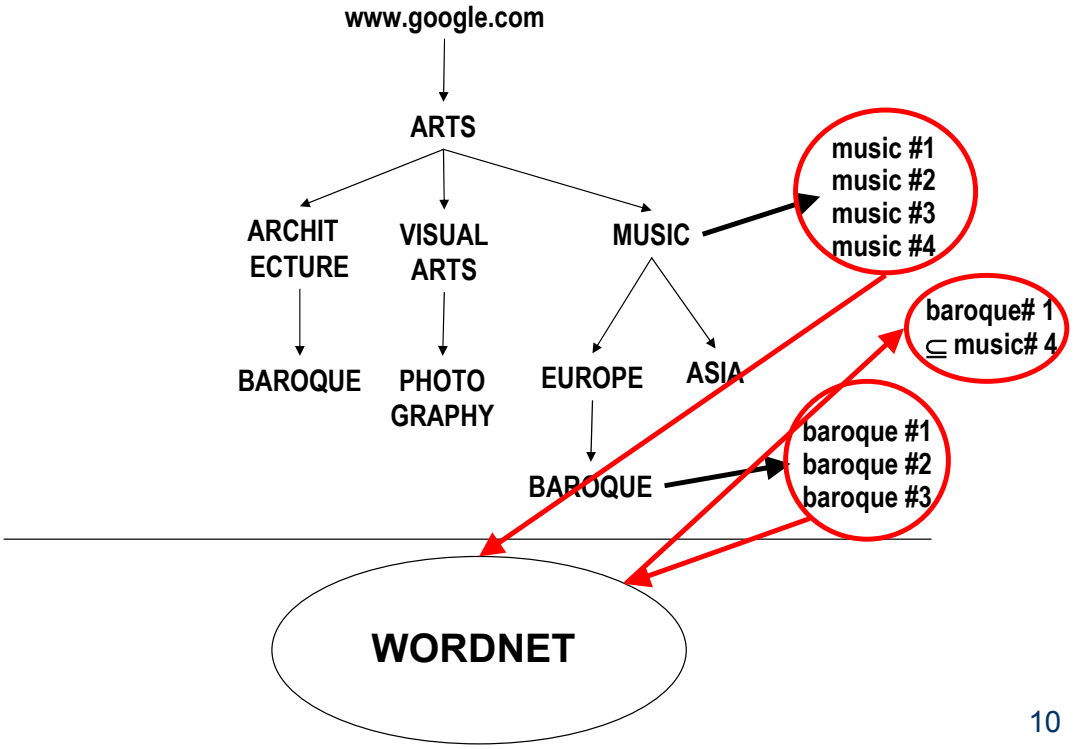
Step 2 (on line)

- Semantic comparison
  - Axioms extraction
  - Calculating SAT relationships

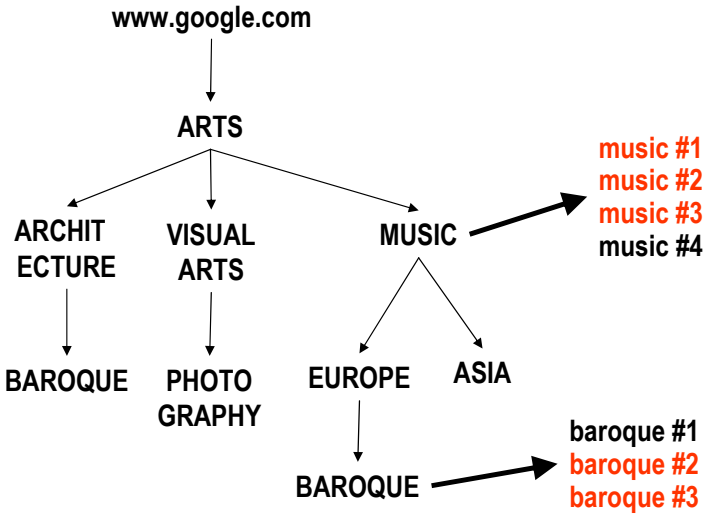
Linguistic Interpretation

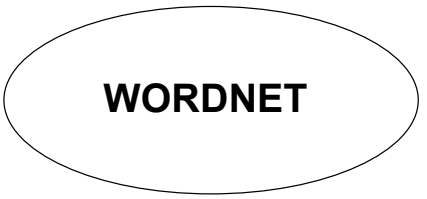


Contextualization - sense filtering

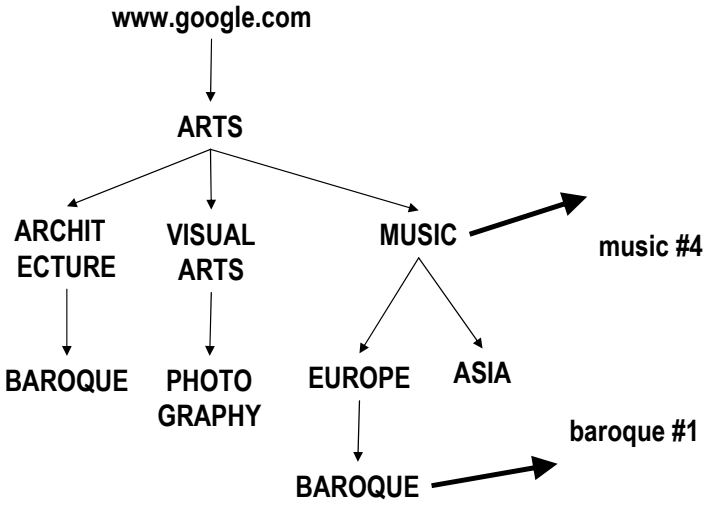


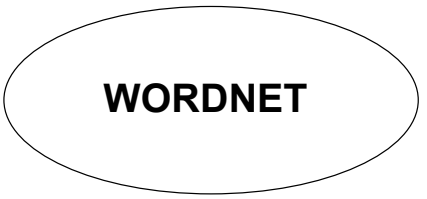
Contextualization - sense filtering



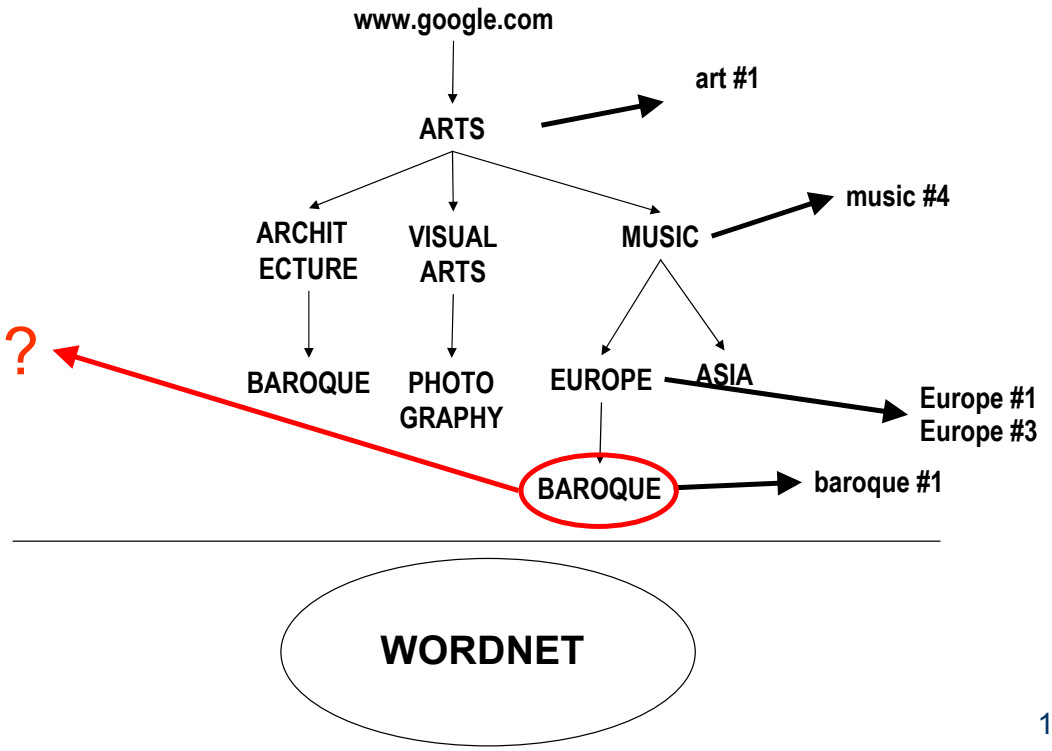


Contextualization - sense filtering

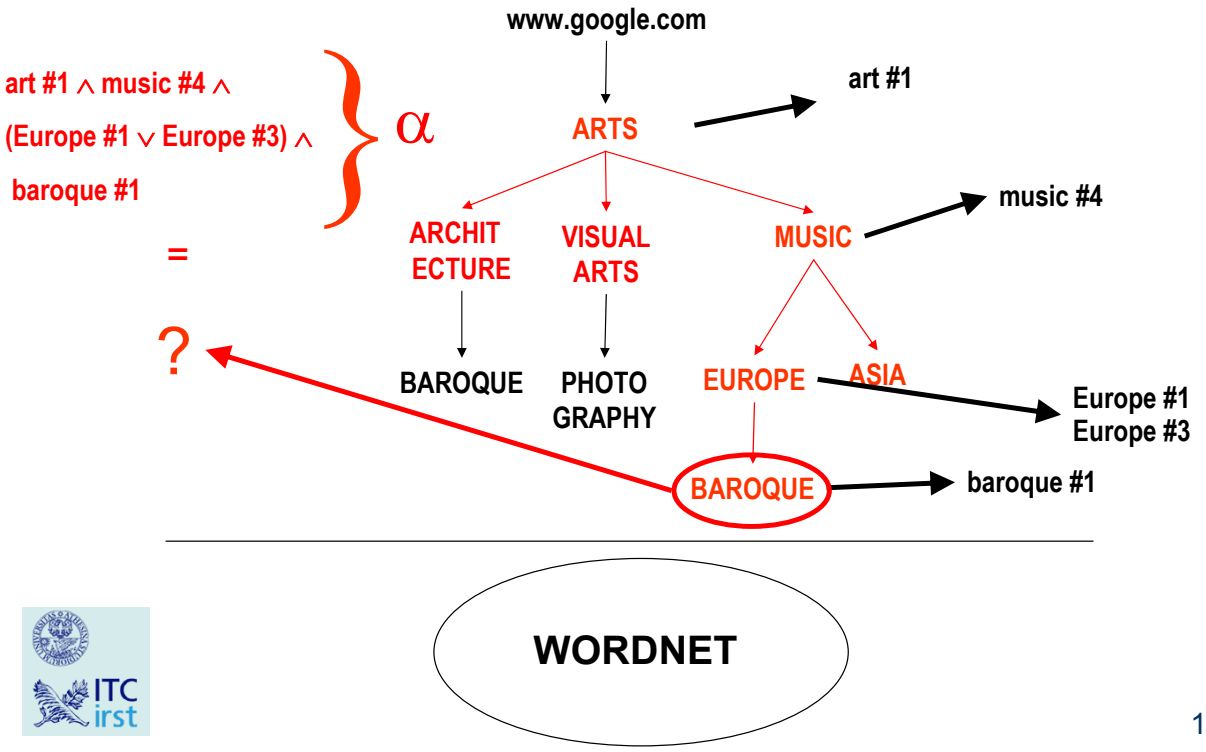




Contextualization - sense comp



edamok Contextualization - sense comp



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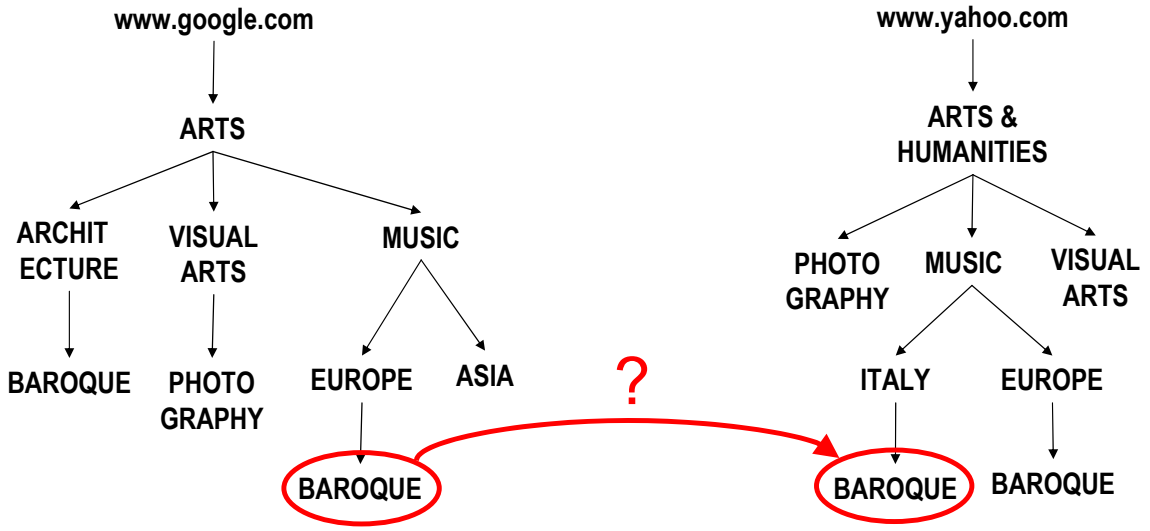
Semantic comparison – axioms



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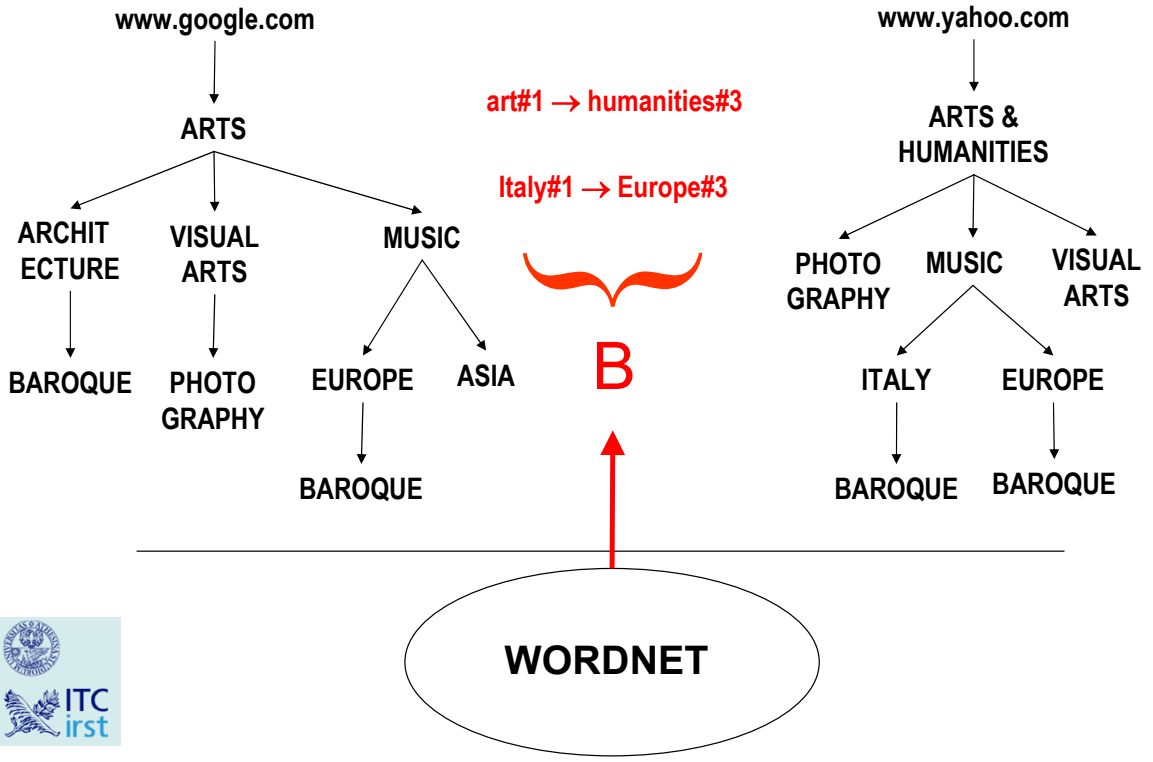
Semantic comparison – axioms



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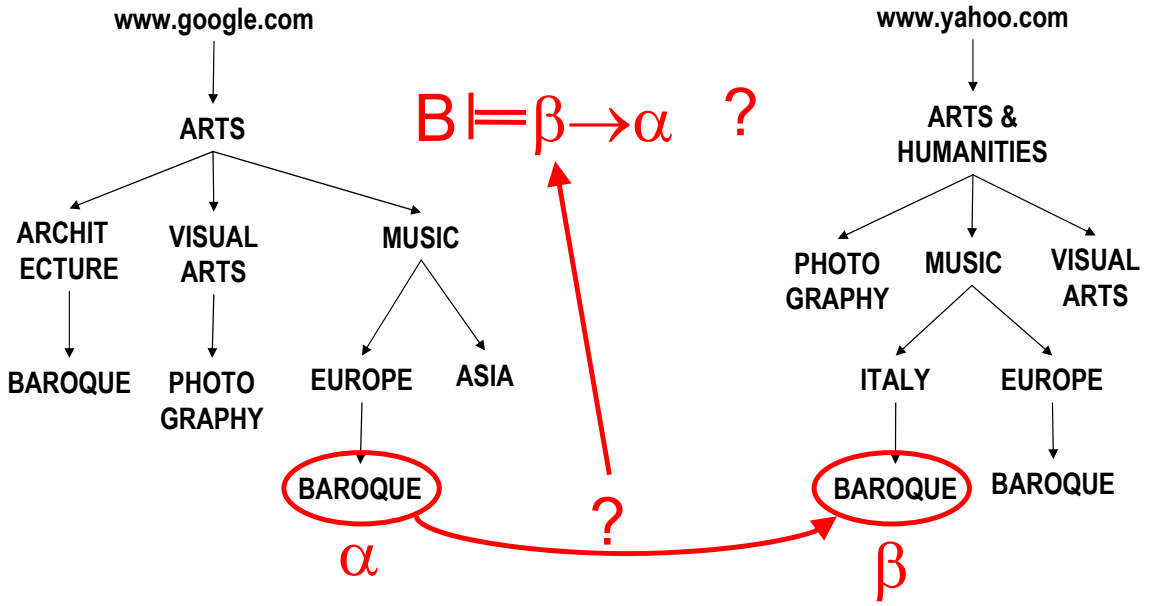
Semantic comparison – encoding



Semantic comparison – encoding

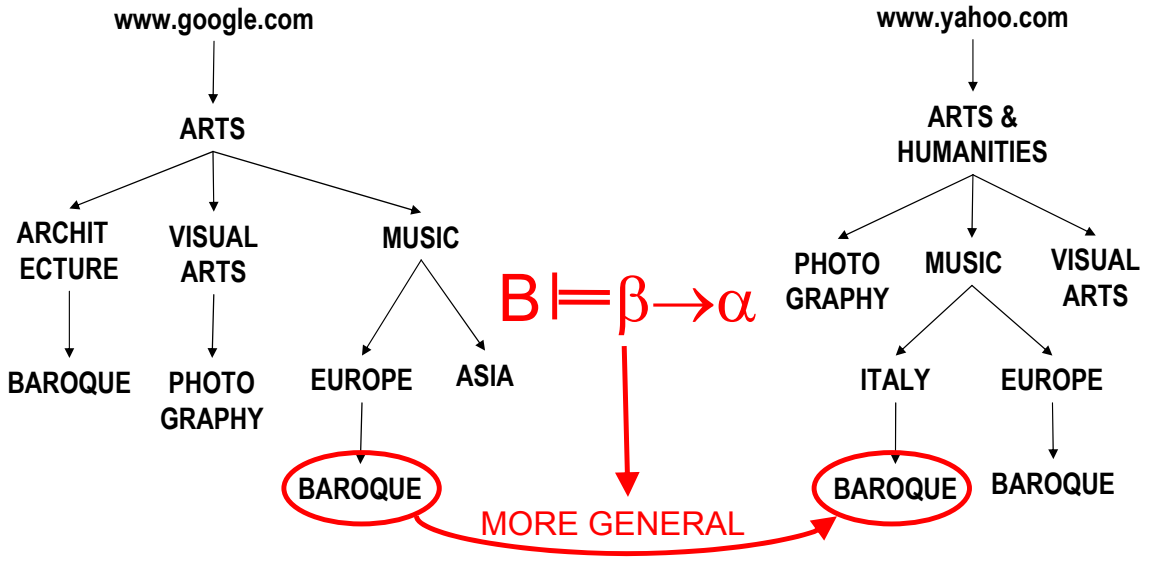
$B \models \beta \rightarrow \alpha$? ⟶ yes

Where

$\beta \rightarrow \alpha$ **= (art#1 ∧ humanities#3 ∧ music#4 ∧ Italy#1 ∧ baroque#1) → (art#1 ∧ music#4 ∧ (Europe#1 ∨ Europe#3) ∧ baroque#1)**

B **= art#1 → humanities#3**
Italy#1 → Europe#3

Semantic comparison – encoding



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Related work

	GRAPH MATCHING	CUPID	MOMIS	GLUE	CTXMATCH
STRUCTRAL KNOWLEDGE	•	•	•		•
LEXICAL KNOWLEDGE		•	•	•	•
DOMAIN KNOWLEDGE				•	•
INST-BASED KNOWLEDGE				•	
TYPE OF RESULT	Pair of nodes	Similarity measure $\in$ [0,1] between pair of nodes	Similarity measure $\in$ [0,1] between pair of nodes	Similarity measure $\in$ [0,1] between pair of nodes	Semantic relation between pair of nodes

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Future work

- Extending the algorithm beyond classifications (e.g services, automata, data types schemas)

- Going beyond WORDNET

- Distributing domain knowledge

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References

• *P. Bouquet, L. Serafini and S. Zanobini* **Semantic coordination: a new approach and an application**. In Proceedings of ISWC2003, Florida, USA

• *P. Bouquet, B. Magnini, L. Serafini and S. Zanobini* **A SAT-based algorithm for context matching**. In Proceedings of CONTEXT2003, Stanford, California, USA

• *webpage*: **edamok.itc.it**

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