

Generic Model and Preliminary Specifications for a Graph-Based Knowledge Representation Toolkit

GRIWES

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PRONOUNCE GRIWES

[grēv] « greev »

FR: grive

EN: thrush

ES: tordo

DE: drossel

JP: ツグミ



WHAT IS GRIWES

an initiative towards...

... a specification of a common model



... an open-source freeware platform



shared by different graph-based frameworks



FOR WHOM

developers of knowledge-based applications

research teams



YET ANOTHER PLATFORM ?

Cogitant, Corese, WebKB, OntoSeek, Amine, ...

Jena, On2Brocke, Triple, Sesame, OWLJessKB,
KAON, Racer, Pellet, ...



WHY GRIWES

Conceptual Graphs (CGs),
RDF, RDFS, RDFa, OWL, GGG,
SKOS, μ Formats, GRDDL, RIF,
Topic Maps, FOAF, SCOT, MOAT, etc.



WHY GRIWES

many graph models on the Web

similarities in semantics and reasoning

common “graph abstraction”

simplify, factorize, capitalize, share, reuse



WHY GRIWES

a graph model is at the core of Web standards



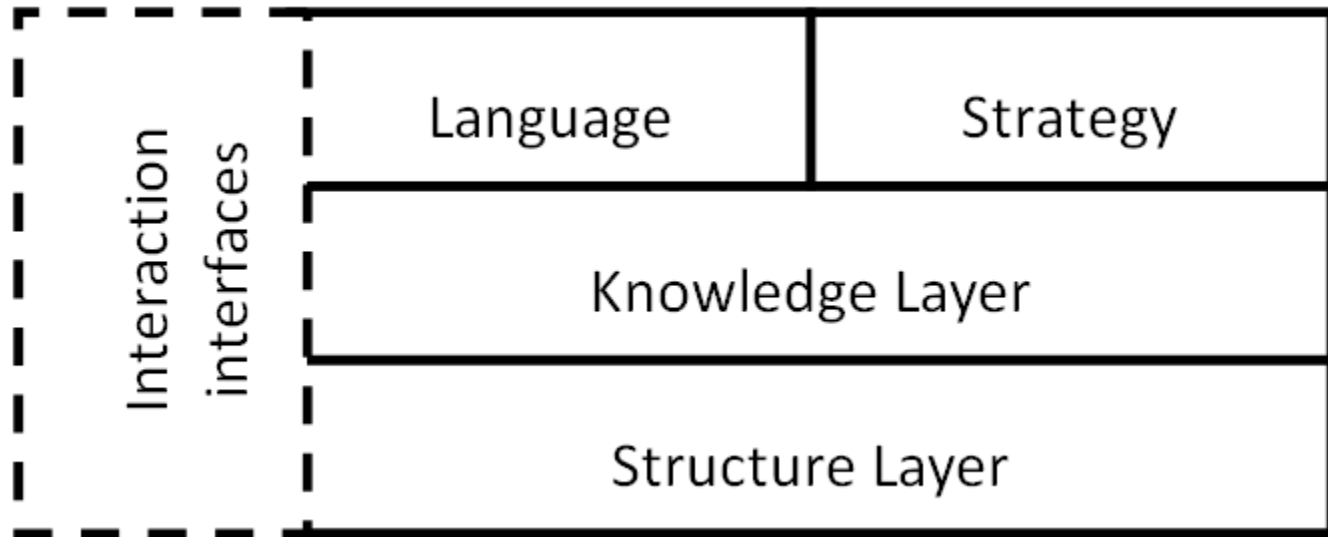
ESSENCE OF GRIWES

high-level overview and some examples of the details



LAYERS

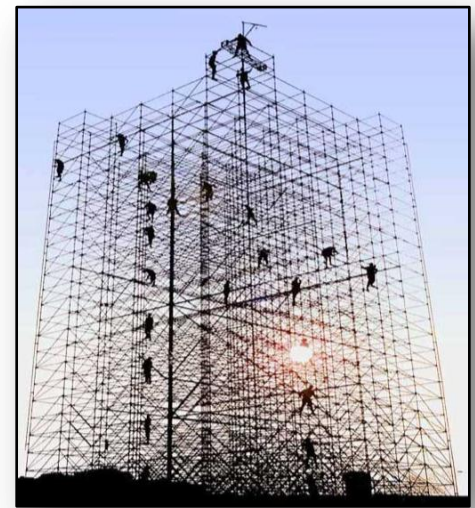
of abstraction



STRUCTURE LAYER

define basic mathematical structures
(e.g. oriented acyclic labeled graph)

to characterize knowledge representation primitives
(e.g. type hierarchy)



ERGraph

$$G=(E_G, R_G, n_G, l_G)$$

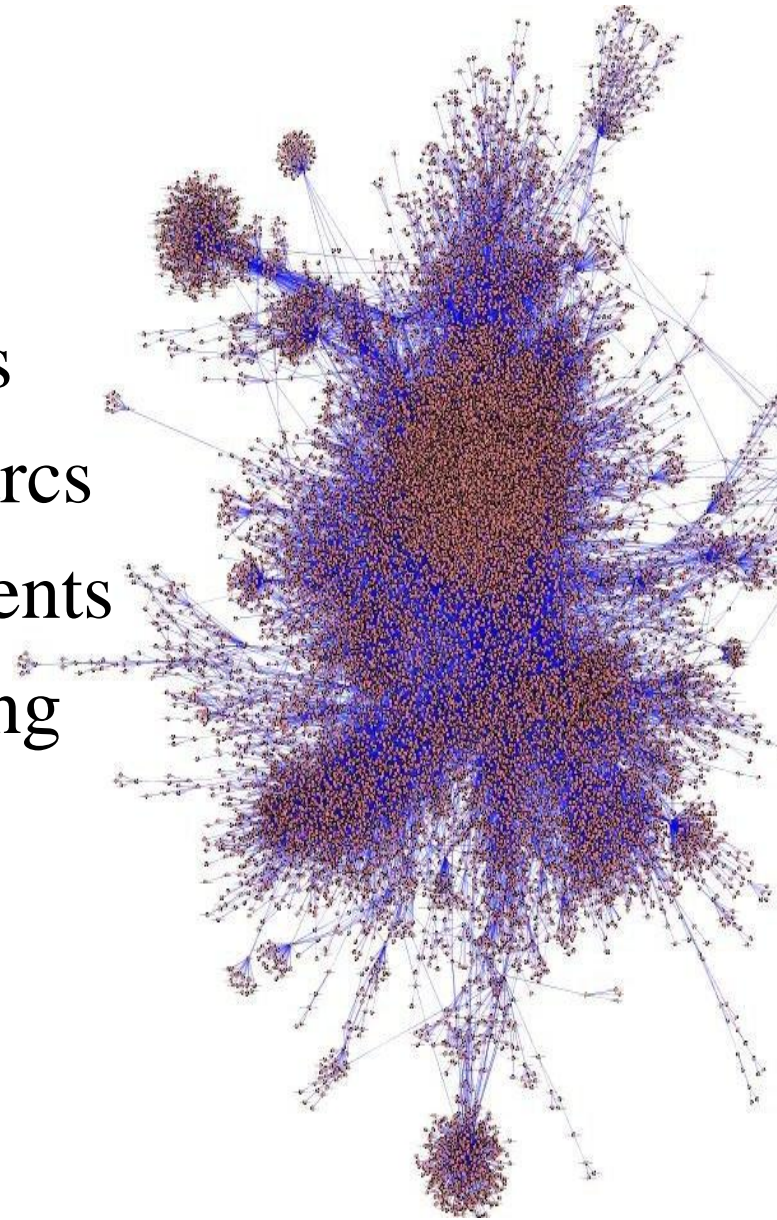
- E_G
- R_G
- $n_G : R_G \rightarrow E_G^*$
- $l_G : E_G \cup R_G \rightarrow L$

entities

hyperarcs

arguments

labelling



ERGraphs...

λ -ERGraph with distinguished entities λ_G

SubERGraph of G induced by E_G ,

Merge of two λ -ERGraph G and H

EMapping

binary relation that associates each element of E_H with at most one element of E_G

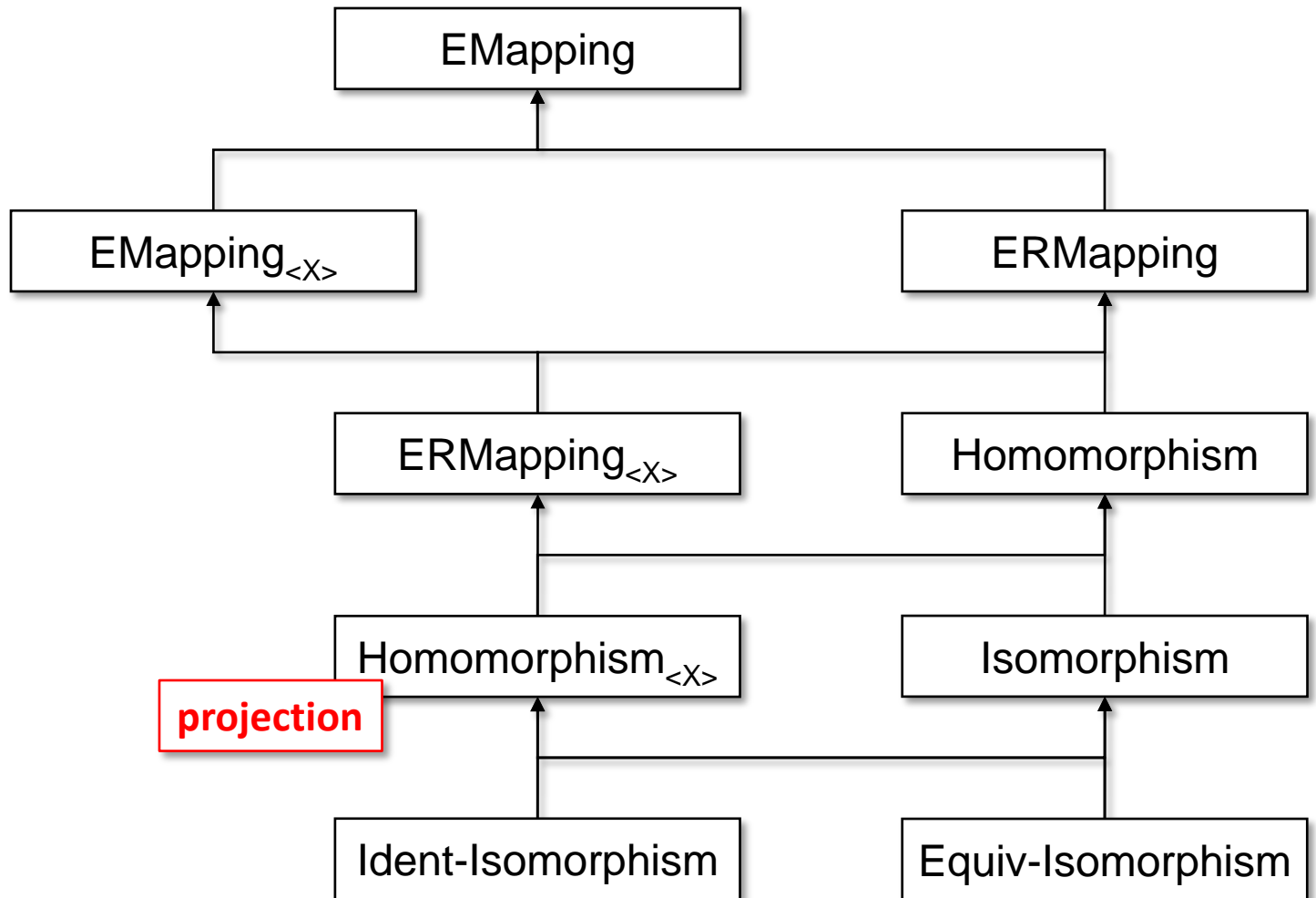


EMapping

core notion: reasoning, querying, visualization, ...



EMappings

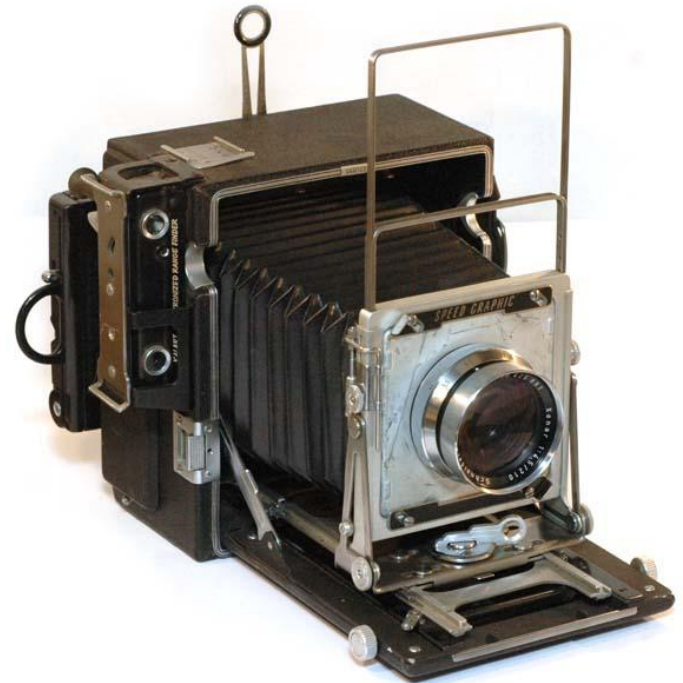


Proof

a kind of reification of the mapping

a picture of the dynamic operation of mapping

$$M_E = \{ (e_H, e_G) \in E_H \times E_G \mid e_G = M(e_H) \}$$



Proofs

a parallel hierarchy for each kind of mapping



Constraints

additional conditions that an EMapping must satisfy in order to be correct



e.g.

```
1. PREFIX inria: <http://www.inria.fr#>
2. SELECT ?student ?name
3. WHERE {
4.   ?student rdf:type inria:Student
5.   ?student inria:name ?name .
6.   ?student inria:age ?age .
7.   FILTER (xsd:integer(?age) > 22 && regex(?name, "A.*")) }
```

```
] [Student] -
    (name) -> [?name]
    (age) -> [?age] .
```



KNOWLEDGE LAYER

factorizes knowledge representation primitives
(e.g. a rule)

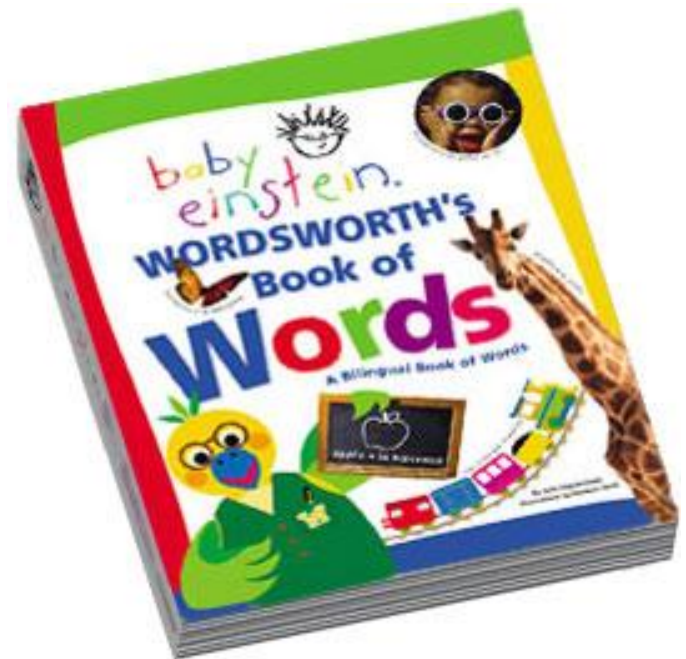
shared across specific representation languages
(e.g. RDF/S, Conceptual Graphs)



Vocabulary



- V_i k sets of elements
- \leq_i q preorders on U



Fact

an ERGraph



Base of facts

set of ERGraphs such that $l_G : E_G \cup R_G \rightarrow L$ where is constructed from U the set of elements of the vocabulary V of the knowledge base.

Query

$$Q=(q, \mathcal{C})$$

- $q=((e_1, \dots, e_k), G)$
- \mathcal{C}

λ -ERGraph

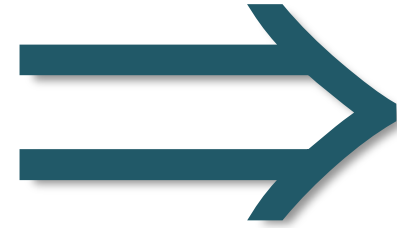
constraint system



X-Answer

$A=(a_1, \dots, a_k)$ for $Q=((e_1, \dots, e_k), G), \mathcal{C}$ such that there is a mapping of type X from G to F satisfying \mathcal{C} such that $M(e_i)=a_i$

Rule



$$R=(H,C)$$

- $H=(G, \mathcal{C})$ a query called hypothesis
- C a λ -ERGraph of same size, called conclusion

X-Applicable

to a fact F iff there exists an X-Answer to H in F .

X-Applying

R on F with respect to A merges C in (A,F)

LANGUAGE & STRATEGY

definitions specific to languages (e.g. RDF triple)

strategies to be applied (e.g. validation, completion)



Validation

first step with two languages

- Simple Graphs (easy of course)
- RDF (some problems)
(e.g. datatyped literals & their values)



INTERACTION INTERFACES

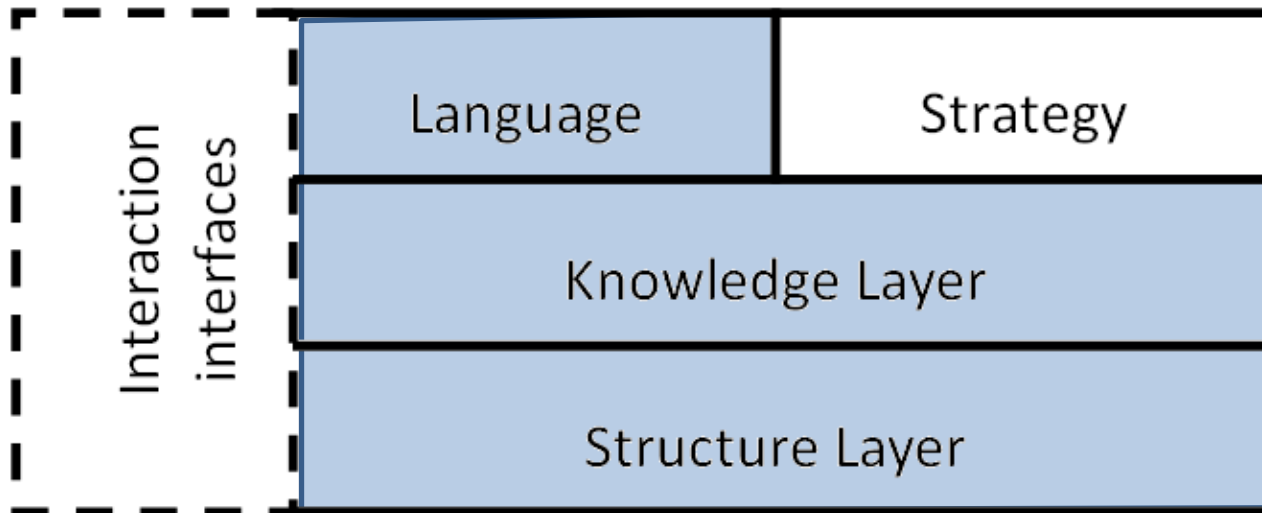
transversal component gathering events
(e.g. additional knowledge needed)
reporting capabilities(e.g. validity warning)
to synchronize conceptual representations and
interface representations.



SUMMARY

first draft of three layers
to refine and extend

to start the open-source design of APIs



VILLAGE GAVIOIS

PETIBONVM

AQVARIVM

LAVDANVM

BABAORVM

ARMORIQUE





FOR MORE

research report, working draft v. 14

<http://www-sop.inria.fr/acacia/project/griwes/>

to Rose Dieng-Kuntz.

