

Rationale, Concepts, and Current Outcome of the Unit Graphs Framework

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Research question: how to represent the linguistic knowledge according to the Meaning-Text Theory ?

Proposed approach: a new graph-based Knowledge Representation Formalism: the Unit Graphs Framework.

Knowledge Representation

answers recurrent needs: represent, manipulate, query, reason, share, ...
Applied to the Meaning-Text Lexicology

Choose the formalism

Populate

Applications

t

Need 1: Representation of Formal Lexicographic Definitions

In the RELIEF lexicographic edition project (Polguère, 2009; Lux-Pogodalla & Polguère, 2011)

PEIGNE_{2a} French Lexical Unit = COMB

(Weaver tool a person X uses to untangle fibers of an object Y)

~ of person X for object Y

<CC label="tool">weaver tool</CC>

<PC role="use">a person X uses to untangle fibers of Y</PC>

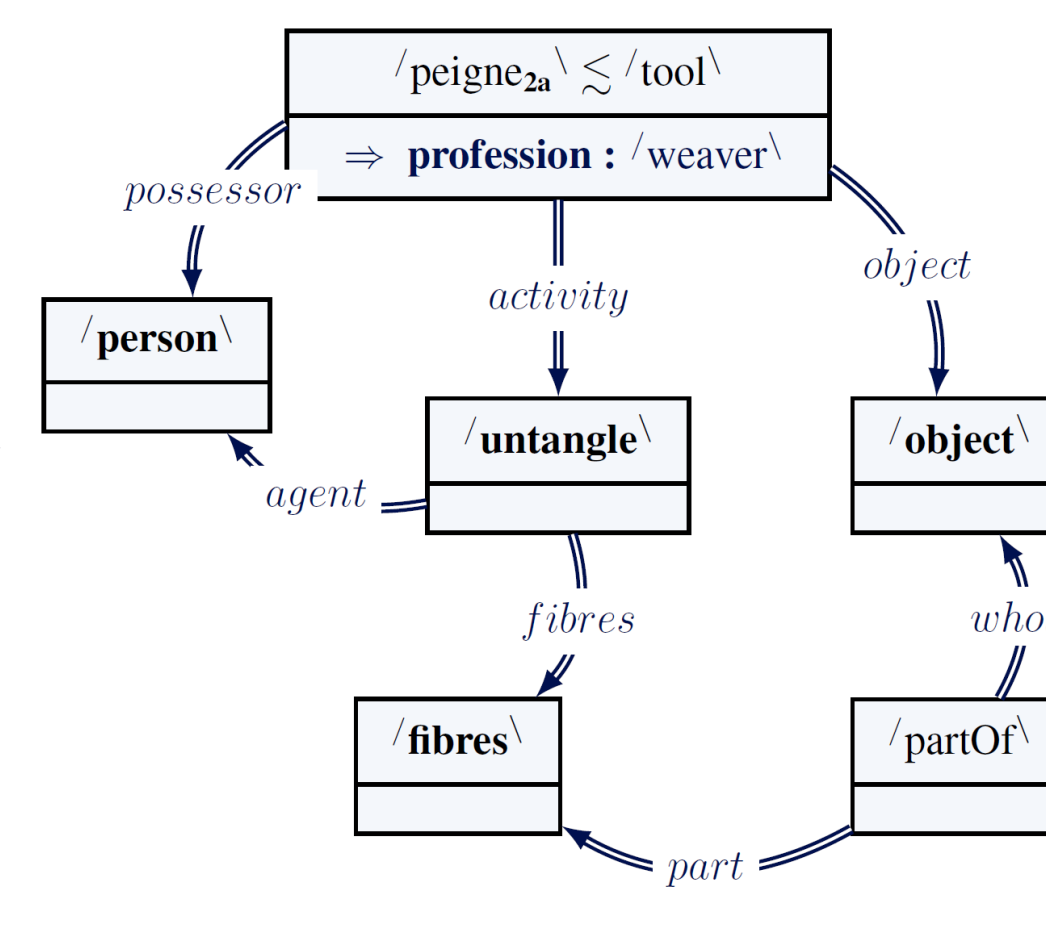
Definiens project (Barque & Polguère, 2008)

TOOL

~ of person X for activity Y

UNTANGLE :

person X ~ fibres Y



note: example and numbering taken from the DEC IV (Mel'cuk et. al., 1999), and simplified

Need 2: Representation of Linguistic Predicates

in conformity with the theory of Actants (Mel'cuk, 2004)

Linguistic Predicates $P(; \dots ;) \neq$ Logical predicate

Semantic Actant Slots (SemASlots)

= participants of the linguistic situation denoted by L that have a favoured position in sentences constructed with L.

+ linguistic criteria

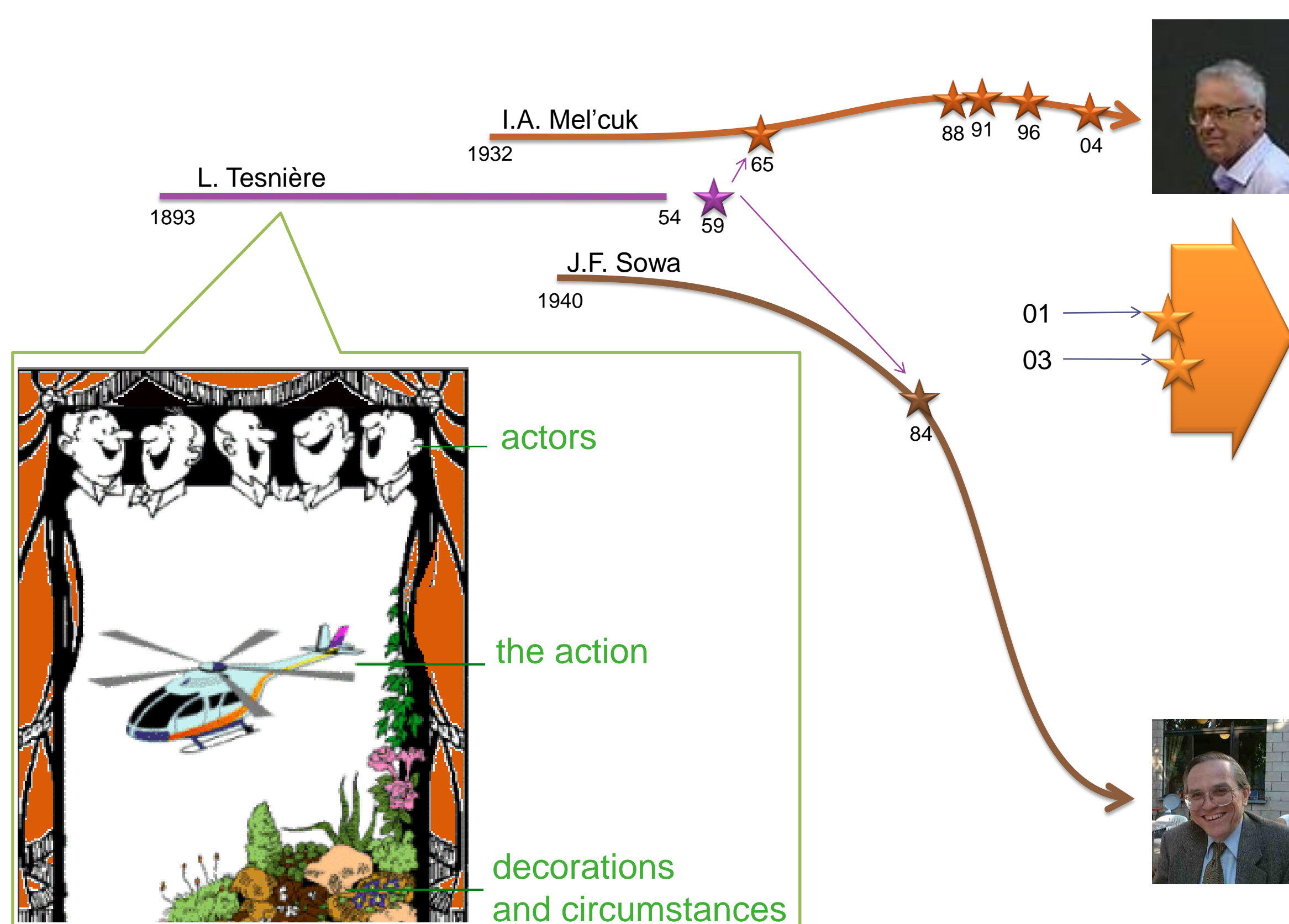
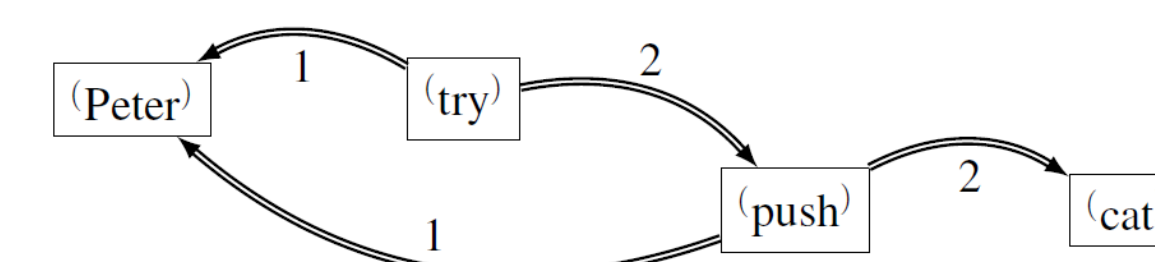
! optional

(to eat)(Paul ; eggs ; plate)

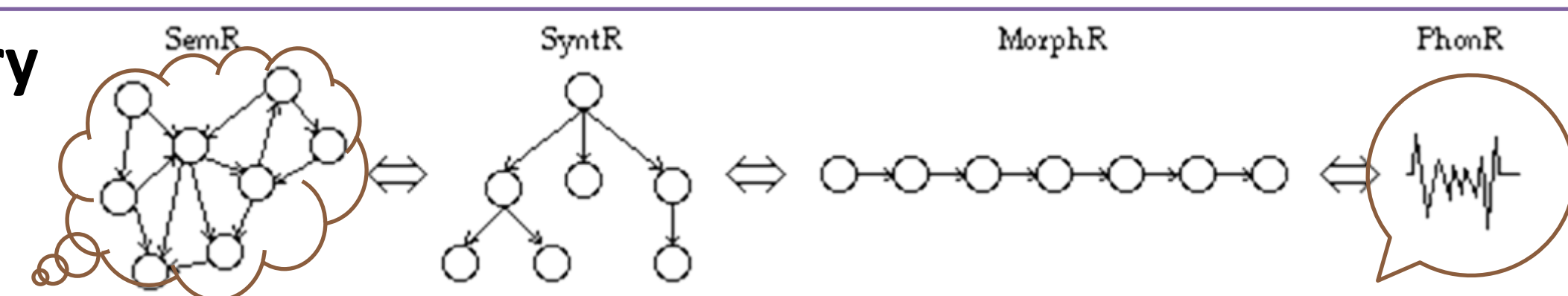
! split

(outil)(Paul ; Measuring)
(outil)(Paul ; Weaver)

! an actant may be a predicate



Meaning-Text Theory



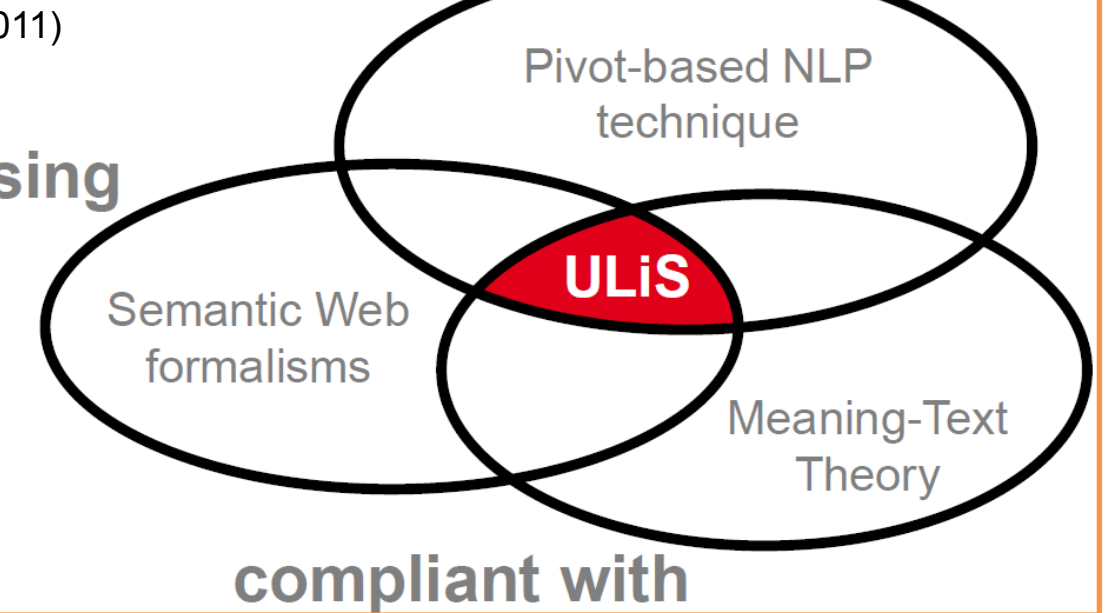
Semantic Web

RDF: oriented labelled graphs.
standard for structured knowledge representation and sharing
OWL: description logics
SPARQL: query, ...

- RDF: too generic, no semantics
OK as exchange syntax
- OWL: only binary relations
reify? -> no semantics

ULiS project: an attempt to represent lexicographic definitions with OWL
(Lefrançois & Gandon, MTT'2011, TIA'2011, MSW'2011)
ULiS needs OWL full + rules
(Lefrançois, RECITAL'2013)

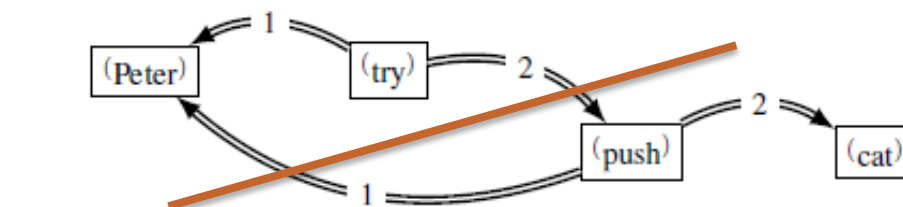
to redesign



Conceptual Graphs

- Oriented labelled graphs
- Sowa drew its inspiration from Tesnière
- Rules, reasoning, (Baget, Mugnier, Cheln, ...)
- Definition of concepts and relations, (Sowa, Leclère, ...)

• Alternating concept-relation



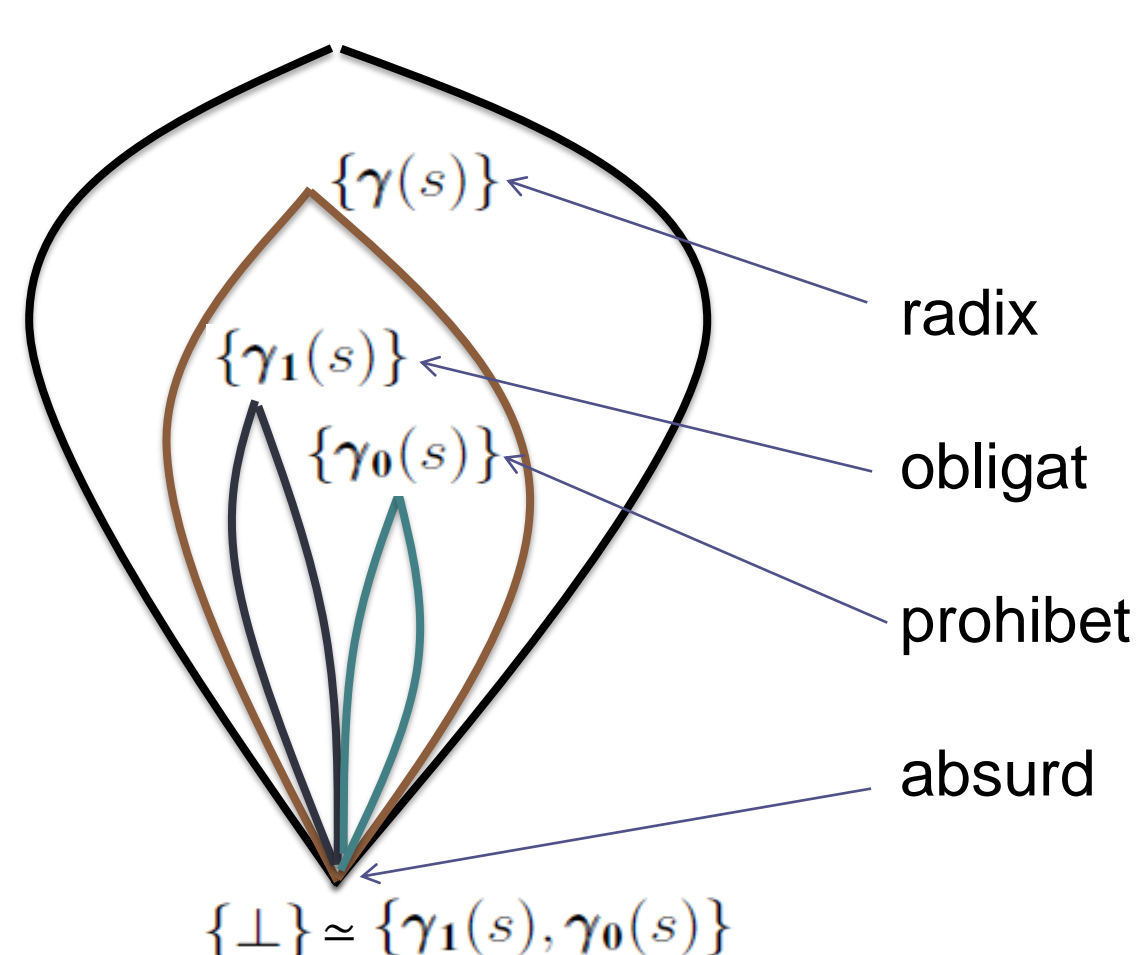
- reify? -> no relation semantics
- hierarchies: relations with different arities are incomparable !

Modify the CGs formalism basis
and define transformations to syntaxes of the Semantic Web
for sharing and querying linguistic knowledge

Unit Types

- Both a concept and a relation
- Unit Types actantial structure
 - optional, obligatory, prohibited ASlots
 - signatures
- Inheritance and specialization
 - optional ASlots may become obligatory
 - optional ASlots may become prohibited
 - ASlot signatures may be specialized
 - New ASlots may be introduced

$\mathcal{T} \stackrel{\text{def}}{=} (T_D, S_T, \gamma, \gamma_1, \gamma_0, C_A, \{s_i\}_{i \in T}, \perp_A^\square)$



Unit Graphs

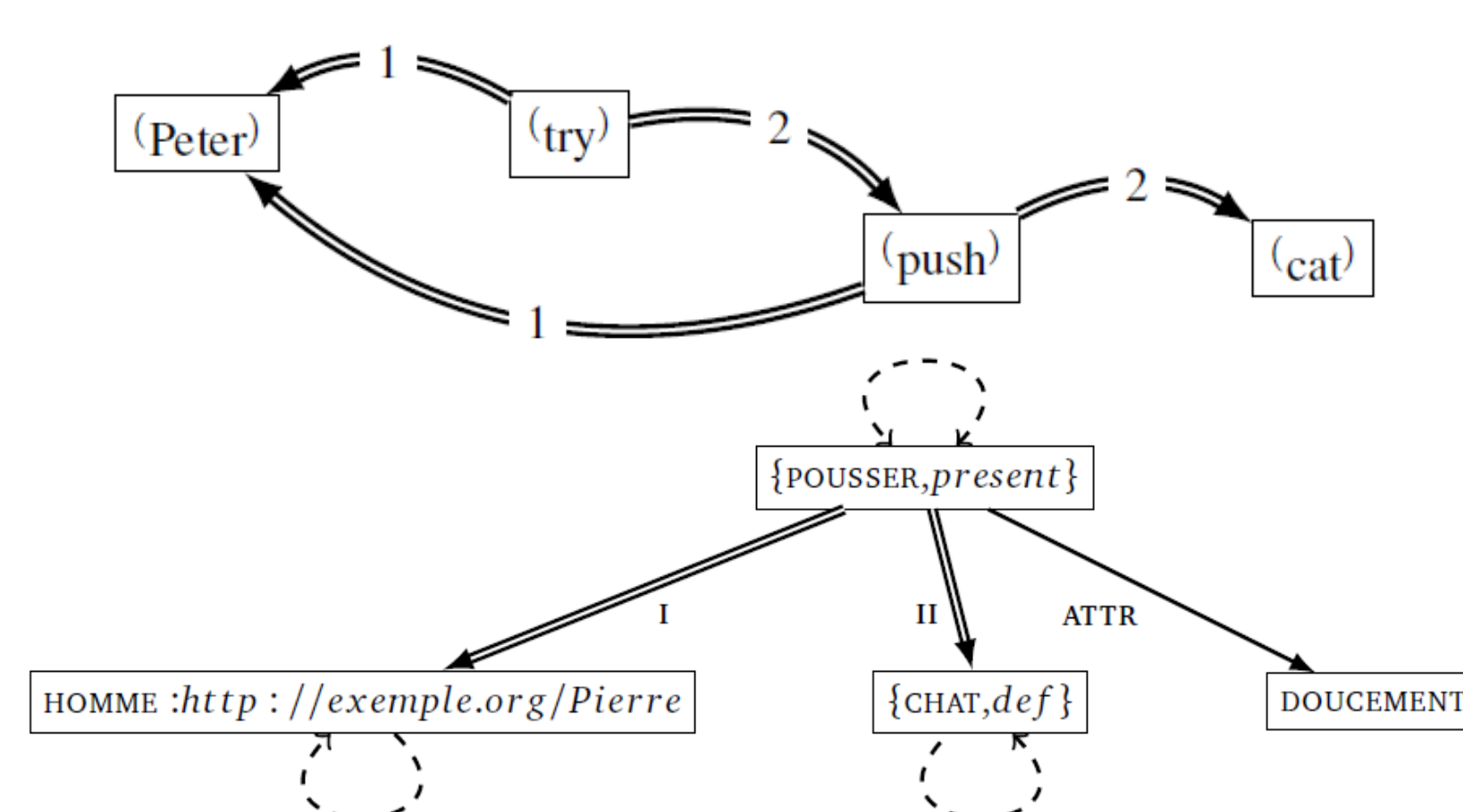
- Support

$\mathcal{S} \stackrel{\text{def}}{=} (\mathcal{T}, \mathcal{C}, M)$

- Unit Graphs

$G \stackrel{\text{def}}{=} (U, L, A, C, Eq)$

- Unit nodes
- Labels : a type + a marker
- Actantial triples
- Circumstantial triples
- Declared equivalences of unit nodes



(Lefrançois, RECITAL'2013), (Lefrançois & Gandon, MTT'2013), (Lefrançois & Gandon, Depling'2013)

A Deep-Semantic Representation Level

hierarchy of Unit Types = hierarchy of meanings

- Distinction
Surface Semantics (SSem) vs. Deep Semantics (DSem)
- + definition of actantial structures of
SSem Unit Types and DSem Unit Types
 - DSem Actant symbols = lexicalized semantic roles
(Lefrançois & Gandon, MTT'2013)

Formalized Lexicographic Definitions

- Application to the RELIEF lexicographic edition project
- A prototype web application
(Lefrançois, Gugert, Giboin, Gandon, MTT'2013)

Logical Semantics of Unit Graphs

- With inference rules + homomorphisms
(Lefrançois & Gandon, Depling'2013)
- With model semantics and relational algebra
(Lefrançois & Gandon, RANLP'2013)
- Equivalence between semantics ?
complexity of usual reasoning tasks ?

Rules

- Correspondences between representation levels
- Transformation algorithms ?
- Grammaticality ?
(Lefrançois & Gandon, Depling'2013)

