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Abstract

The Unit Graphs (UGs) framework is a graph-based knowledge representation (KR) formalism that is designed to allow for the representation, manipulation, query, and reasoning over linguistic knowledge of the Explanatory Combinatorial Dictionary of the Meaning-Text Theory. One crucial advantage of this new formalism over other KR formalisms is that it is designed to represent valency-based predicates, and lexicographic definitions of lexical units in the form of semantic graphs. The goal of this paper is twofold. It both introduces the core of the UGs framework, and illustrates how it may be used to represent lexicographic definitions in the RELIEF lexicographic edition project.

Keywords

Linguistic Knowledge Representation, Meaning-Text Theory, Unit Graphs, Explanatory Combinatorial Dictionary, Lexicographic Definitions, Deep Semantic Representation level

1 Introduction

We are interested in the benefits of using a graph-based Knowledge Representation (KR) formalism to enable the formalization (from a knowledge engineering perspective), of linguistic knowledge of the Explanatory Combinatorial Dictionary (ECD) (Mel'čuk, 2006).

In this paper we focus on lexicographic definitions in the RELIEF lexicographic edition project (Lux-Pogodalla and Polguère, 2011), which aims at representing a lexical system graph named RLF (Polguère, 2009) where lexical units are interlinked by paradigmatic and syntagmatic links of lexical functions (Mel'čuk, 1996). The RELIEF is already based on different formalization works to represent lexicographic definitions, namely: a hierarchy of semantic labels (Polguère, 2011), the markup type that has been developed in the Definiens project (Barque and Polguère, 2008; Barque et al., 2010) to specify genus and specific differences, and the disambiguation of meaningful words in the definition.

Adding to these formalization works, our goal is to propose a formalization from a knowledge engineering perspective, compatible with standard KR formalisms. The term *formalization* here means not only *make non-ambiguous*, but also *make operational*, i.e., *such that it is adapted to logical operations* (e.g., knowledge manipulation, query, reasoning). We thus adopt a knowledge engineering approach applied to the domain of the Meaning-Text Theory (MTT).

At first sight, two existing KR formalisms seem interesting for this job: semantic web formalisms (e.g., RDF[1], RDFS[2], OWL[3], SPARQL[4]), and Conceptual Graphs (CGs) (Sowa, 1984; Chein and Mugnier, 2008). Both of them are based on directed labelled graph structures, and some research has been done towards using them to represent dependency structures and knowledge of the ECD (OWL in (Lefrançois and Gandon, 2011; Boguslavsky, 2011), CGs at the conceptual level in (Bohnet and Wanner, 2010)). Yet Lefrançois (2013) showed that neither of these KR formalisms can represent valency-based predicates, therefore lexicographic definitions.

These issues led to the introduction of the new *Unit Graphs (UGs)* KR formalism, which is a graph-based KR formalism originally designed to formalize hierarchies of unit types that have an actantial structure. Term *unit* is used in a generic manner and may refer to linguistic units of different nature (e.g., semantic units, lexical units, grammatical units, words).

Apart from introducing the UGs framework and implications for the MTT, this paper details an application scenario for the edition of lexicographic definitions in the RELIEF project. This paper first describes the current scenario of lexicographic definition edition in the RELIEF project (§2), then successively overviews three important aspects of the UGs formalism, and the added value for the RELIEF project:

- the core of the UGs framework which is the hierarchy of unit types. We will justify the introduction of a deep semantic representation level for the MTT. At this level one may refine the semantic labels hierarchy so that every semantic label (= deep semantic unit types in this paper) is assigned an actantial structure (§3).
- UGs and unit types definition, which enable the formal definition of lexical units in the form of an equivalence between two deep-semantic UGs (§4).
- rules, which enable the specification of the correspondence between deep and surface semantic actant slots (§5).

2 Current Scenario

The lexicographic edition software developed in the RELIEF project is named MVSDicet. Let us sketch a scenario where Alain, the leader of the project, assigns the task of defining French lexical unit PEIGNE$_{\mathbf{2A}}$, which is defined in (Mel'čuk et al., 1999) by:

PEIGNE$_{\mathbf{2A}}$: ⌜comb⌝≡⌜Weaving tool that a person X uses to untangle object Y⌝.

1. Sophie first seeks for a semantic label in the hierarchy of semantic labels (Polguère, 2011). She chooses /outil\ (⌜tool⌝).
2. Sophie determines that PEIGNE$_{\mathbf{2A}}$ has two obligatory semantic actants: a person X, and an object Y. She then seeks for a fitting propositional form in a hierarchy that only Alain develops. She may choose: ∼ de X [pour Y] (∼ of X [for Y]).

[1]RDF - Resource Description Framework, c.f., `http://w3.org/RDF/`
[2]RDFS - RDF Schema, c.f., `http://www.w3.org/TR/rdf-schema/`
[3]OWL - Web Ontology Language, c.f., `http://www.w3.org/TR/owl2-overview/`
[4]SPARQL, c.f., `http://www.w3.org/TR/sparql11-overview/`

3. Sophie then writes the lexicographic definition markuped with genus and specific differences as in the Definiens project (Barque and Polguère, 2008; Barque et al., 2010). Finally for each of the meaningful words of the lexicographic definition, Sophie specifies to what lexical unit in the RLF it refers to.

```
<CC label="outil">outil de tissage</CC>
<PC role="utilisation">que X utilise pour peigner#2 Y</PC>
```

3 Refinement of the Semantic Labels Hierarchy

First, for a specific Lexical Unit L, Mel'čuk (2004, p.5) distinguishes considering L in language (i.e., in the lexicon), or in speech (i.e., in an utterance). KR formalisms and the UGs formalism also do this distinction using types. In this paper and in the UGs formalism, there is thus a clear distinction between *units* (e.g., semantic unit, lexical unit), which will be represented in the UGs, and their *types* (e.g., semantic unit type, lexical unit type), which are described in the ECD.

The core of the UGs framework is a structure called *hierarchy of unit types* and noted $\mathcal{T}$, where unit types and their actantial structure are described. This structure is thoroughly described in (Lefrançois and Gandon, 2013a) and studied in (Lefrançois and Gandon, 2013b).

Whether they are semantic, lexical or grammatical, unit types are assigned a set of *Actant Slots (ASlots)*, and every ASlot has a so-called *Actant Symbol (ASymbol)* which is chosen in a set denoted $\boldsymbol{S}_\mathcal{T}$. $\boldsymbol{S}_\mathcal{T}$ contains numbers for the semantic unit types, and other "classical" symbols for the other levels under consideration (e.g, roman numerals $\textsc{i}$ to $\textsc{vi}$ for the Deep Syntactic actants). The set of ASlots of a unit type t is represented by the set $\boldsymbol{\alpha}(t)$ of ASymbols these ASlots have. Moreover,

- some ASlots are obligatory, they form the set $\boldsymbol{\alpha_1}(t)$ of *Obligatory Actant Slots (OblASlots)*;
- other are prohibited, they form the set $\boldsymbol{\alpha_0}(t)$ of *Prohibited Actant Slots (ProASlots)*;
- the ASlots that are neither obligatory nor prohibited are said to be optional, they form the set $\boldsymbol{\alpha_?}(t)$ of *Optional Actant Slots (OptASlots)*.

Finally, every unit type $t \in \boldsymbol{T}$ has a signature function ς_t that assigns to every ASlot of t a unit type, which characterises units that fill such a slot.

The set of unit types is then pre-ordered[5] by a specialization relation $\lesssim$, and for mathematical reasons as one goes down the hierarchy of unit types the actantial structure may only become more and more specific: (i) some ASlot may appear, be optional a moment, and at some points become obligatory or prohibited; (ii) the signatures may only become more specific.

As semantic ASymbols are numbers, the pre-order over semantic unit types cannot represent a specialization of meanings (Lefrançois and Gandon, 2013a). Let us give an example to justify this.

The French semantic unit type ⁽outil⁾ (⁽tool⁾) has an ASlot 1 that corresponds to the person X that uses the tool, and a split ASlot 2 that corresponds either to the activity Y_1 or to the profession Y_2 for which the tool is designed[6]. Now ⁽peigne$_{\mathbf{2a}}$⁾ (⁽comb⁾) has a stricter meaning than ⁽outil⁾, and also an ASlot 2 that now corresponds to the object Y that it is intended to

[5] A pre-order is a reflexive and transitive binary relation.

[6] See (Mel'čuk, 2004, p.43) for details on split ASlots.

untangle. Thus $^{(}\text{peigne}_{\mathbf{2a}}{}^{)}$ cannot be lower than $^{(}\text{outil}^{)}$ in the hierarchy of semantic unit types because this would imply that an object is some kind of activity or profession.

We hence propose to introduce a deeper level of representation where one may describe meanings: the *deep semantic level*. We thus establish a distinction between surface and semantic unit types. Let us precise their definition and their actantial structure.

Definition 1 (Surface Semantic Unit Types and their ASlots)**.** To every meaningful Lexical Unit Type (LexUT) L is associated a *Surface Semantic Unit Type (SSemUT)* that is denoted $^{(}\text{L}^{)}$. The ASlots of $^{(}\text{L}^{)}$ correspond to the Semantic Actant Slots (SemASlots) of L as defined in (Mel'čuk, 2004, p.39), and are numbered.

Definition 2 (Deep Semantic Unit Types and their ASlots)**.** To every meaningful LexUT L is associated a *Deep Semantic Unit Type (DSemUT)* that is denoted $^{/}\text{L}^{\backslash}$. The set of deep semantic ASymbols are semantic roles (e.g., $agent$, $experiencer$, $object$). The set of ASlots of a DSemUT corresponds to obligatory or optional participants of the linguistic situation denoted by L that are: a) SemASlots of L, or b) SemASlots of a LexUT whose meaning is more generic than that of L.

Actually, one may need to introduce a new ASymbol every time a SemASlot that conveys a new meaning is introduced. The set of semantic roles thus cannot be bound to a small set of universal semantic roles.

In the RELIEF project, the set of semantic labels are pre-ordered with respect to the specialization of meanings, as is the hierarchy of DSemUT in the UGs framework. We thus propose to identify semantic labels and DSemUTs, and to augment them with actantial structures. One major implication is that one need one DSemUT per meaningful LexUT.

Let us sketch the extension of the scenario described in section 2. Sophie wants to define the French LexUT PEIGNE$_{\mathbf{2A}}$. She thus needs to characterize its associated DSemUT $^{/}\text{peigne}_{\mathbf{2a}}{}^{\backslash}$. She first opens a new tab in which $^{/}\text{peigne}_{\mathbf{2a}}{}^{\backslash}$ appears in a void box as illustrated in figure 1a. Sophie needs to choose the nearest parent in the hierarchy of DSemUTs. She clicks on the question mark and the current hierarchy of DSemUTs appears like in figure 1b. She chooses $^{/}\text{tool}^{\backslash}$. The box that was void now contains the inherited actantial structure of $^{/}\text{tool}^{\backslash}$ as illustrated in figure 1c. $^{/}\text{tool}^{\backslash}$ has three arbitrarily symbolized ASlots:

- $possessor$ for variable X is obligatory and has signature $^{/}\text{person}^{\backslash}$;
- $activity$ for variable Y_1 is obligatory and has signature $^{/}\text{activity}^{\backslash}$;
- $profession$ for variable Y_2 is optional and has signature $^{/}\text{profession}^{\backslash}$.

Now Sophie may restrict the actantial structure of $^{/}\text{peigne}_{\mathbf{2a}}{}^{\backslash}$.

1. $^{/}\text{peigne}_{\mathbf{2a}}{}^{\backslash}$ is designed to untangle, so Sophie clicks on $^{/}\text{activity}^{\backslash}$ and chooses $^{/}\text{untangle}^{\backslash}$ in the hierarchy of DSemUTs.
2. $^{/}\text{peigne}_{\mathbf{2a}}{}^{\backslash}$ is designed for the weaver profession, so Sophie clicks on $^{/}\text{profession}^{\backslash}$ and chooses $^{/}\text{weaver}^{\backslash}$ in the hierarchy of DSemUTs.
3. the ASlot $profession$ is obligatory for $^{/}\text{peigne}_{\mathbf{2a}}{}^{\backslash}$, so Sophie clicks on symbol ($\Rightarrow$), which becomes $\Rightarrow$.
4. $^{/}\text{peigne}_{\mathbf{2a}}{}^{\backslash}$ introduces a new obligatory ASlot $object$ for variable Y with signature $^{/}\text{object}^{\backslash}$. So Sophie clicks on $\boxplus$ New actant slot , and fills a form where she defines a new ASymbol $object$, specifies that this ASlot is obligatory, and specifies the signature: $^{/}\text{object}^{\backslash}$.

Thus the description of the actantial structure of /peigne$_{\mathbf{2a}}$\ looks like in figure 1d.

Let us go back to how lexicographic definitions are currently defined in the RELIEF project. The DSemUT /tool\ has no actantial structure for the moment. Yet,

- the central component of the definition (element CC) specifies the profession for which /peigne$_{\mathbf{2a}}$\ is designed: /weaver\.
- in the peripherical component (element PC), a human reader immediately understands that the activity (PC role *utilisation* here) for which /peigne$_{\mathbf{2a}}$\ is designed is: /peigner$_{\mathbf{2}}$\ (/untangle\).
- /peigner$_{\mathbf{2}}$\ has a SemASlot Y that does not correspond to a participant of /tool\, but that is related to a participant of /untangle\.

Providing /peigne$_{\mathbf{2a}}$\ with an actantial structure that specializes that of /tool\ enables to explicit some of this knowledge, and to give a partial but formal lexicographic definition to /peigne$_{\mathbf{2a}}$\. To complete the formalization of the lexicographic definition of /peigne$_{\mathbf{2a}}$\, one need for instance to represent the fact that the SemASlot X of /peigne$_{\mathbf{2a}}$\ corresponds to the SemASlot X of /untangle\ for instance.

/peigne$_{\mathbf{2a}}$\ $\lesssim$?
⊞ New actant slot

(a) Starting point to define PEIGNE$_{\mathbf{2A}}$

▽ /entity\ [(⇒)1]
  ▽ /physical object\ [(⇒)1]
    ▽ /artefact\ [(⇒)1]
      ▽ /instrument\ [⇒2]
        ▷ /tool\ [(⇒)1, ⇒2]

(b) List view of the hierarchy of DSemUTs

/peigne$_{\mathbf{2a}}$\ $\lesssim$ /tool\
⇒ **possessor :** /person\
⇒ **activity :** /activity\
(⇒) **profession :** /profession\
⊞ New actant slot

(c) Inherited actantial structure of /tool\

/peigne$_{\mathbf{2a}}$\ $\lesssim$ /tool\
⇒ **possessor :** /person\
⇒ **activity :** /untangle\
⇒ **profession :** /weaver\
⇒ **object :** /object\
⊞ New actant slot

(d) Actantial structure of /peigne$_{\mathbf{2a}}$\

Figure 1: Definition of the actantial structure of /peigne$_{\mathbf{2a}}$\.

4 Definition of Unit Types and Lexicographic Definitions

Now the actantial structure as defined in previous section is not sufficient to represent the lexicographic definition. For instance, /untangle\ has an *agent* ASlot, an this *agent* must correspond to the *possessor* of /peigne$_{\mathbf{2a}}$\. One thus need UGs to fully represent the definition of /peigne$_{\mathbf{2a}}$\. Let us first introduce the definition of UGs.

UGs include actantial relations, which are considered of type predicate-argument and are described in the hierarchy of unit types that we introduced in section 3. Now UGs also include circumstantial relations which are considered of type instance-instance. Example of such relations are the deep syntactic representation relations **ATTR**, **COORD**, **APPEND** of the MTT, but we may also use such relations to represent the link between a lexical unit and its associated surface semantic unit for instance. Circumstantial relations are labelled by symbols chosen in a set of so-called *Circumstantial Symbols (CSymbols)*, denoted $\boldsymbol{S_C}$, and their categories and usage are described in a hierarchy denoted $\mathcal{C}$.

UGs are defined over a so-called support, $\mathcal{S} \stackrel{\text{def}}{=} (\mathcal{T}, \mathcal{C}, \boldsymbol{M})$ where $\mathcal{T}$ is a hierarchy of unit types, $\mathcal{C}$ is a hierarchy of CSymbols, and $\boldsymbol{M}$ is a set of *unit identifiers*. To make a long story short, UGs have an underlying oriented labelled graph structure. Nodes are called *unit nodes* and are labelled by a unit type and one or more unit identifier. Every arc is labelled and represents an actantial (resp. circumstantial) relation if its symbol belongs to the set of ASymbols (resp. CSymbols). Finally some unit nodes may be asserted to be equivalent, i.e., to represent the same unit. Lexicographic definitions are to be represented at the deep semantic level, as an equivalence between two deep semantic UGs.

Definition 3 (Definition of a unit type, Lexicographic definition of a LexUT)**.** Let $^{/}\mathrm{L}^{\backslash}$ be the DSemUT associated with lexical unit L. The lexicographic definition of L corresponds to the definition of $^{/}\mathrm{L}^{\backslash}$, which is a triple $D_{/\mathrm{L}\backslash} \stackrel{\text{def}}{=} (D^-_{/\mathrm{L}\backslash}, D^+_{/\mathrm{L}\backslash}, \kappa)$, where:

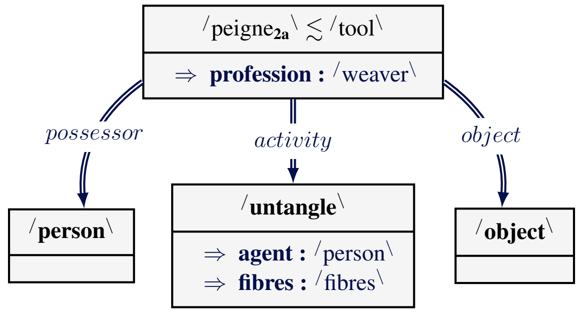
- $D^-_{/\mathrm{L}\backslash}$ represents only a central unit node typed with $^{/}\mathrm{L}^{\backslash}$, and some other unit nodes that fill some of the ASlots of $^{/}\mathrm{L}^{\backslash}$;
- $D^+_{/\mathrm{L}\backslash}$ is a UG called the *expansion* of $^{/}\mathrm{L}^{\backslash}$, with no circumstantial triple in these two λ-UG because circumstantials must not be part of the lexicographic definition of a LexUT.
- κ is a mapping from the unit nodes of $D^-_{/\mathrm{L}\backslash}$ to some unit nodes of $D^+_{/\mathrm{L}\backslash}$.

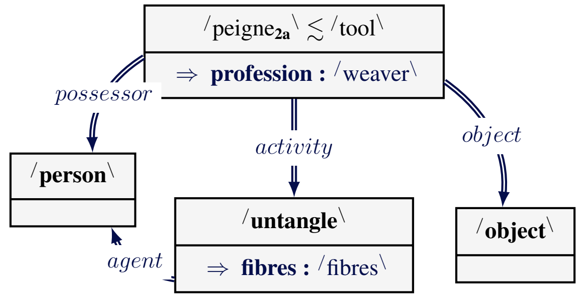
Let us sketch how Sophie may define the lexicographic definition of PEIGNE$_{\mathbf{2A}}$, i.e, the definition of $^{/}\mathrm{peigne}_{\mathbf{2a}}{}^{\backslash}$.

The starting point is the box that represents the actantial structure of $^{/}\mathrm{peigne}_{\mathbf{2a}}{}^{\backslash}$ as illustrated in figure 1d.

1. Sophie first drags and drops some ASlots outside the box. This enables to make explicit for instance that $^{/}\mathrm{untangle}^{\backslash}$ has two obligatory ASlot. The result of this process is illustrated in figure 2a.
2. Sophie may then drag the ASlot $agent$ of $^{/}\mathrm{untangle}^{\backslash}$ and drop it over the box of $^{/}\mathrm{person}^{\backslash}$. This merges participants as illustrated in figure 2b.
3. The $object$ of $^{/}\mathrm{peigne}_{\mathbf{2a}}{}^{\backslash}$ and the $fibres$ of $^{/}\mathrm{untangle}^{\backslash}$ must be linked by a meronymy relation. For the sake of illustration, we assume there exists a DSemUT $^{/}\mathrm{partOf}^{\backslash}$ that carries this meaning. Sophie clicks on a "add a unit node" button, and seeks for $^{/}\mathrm{partOf}^{\backslash}$ in the hierarchy of DSemUTs. A unit node typed $^{/}\mathrm{partOf}^{\backslash}$ is then added as in figure 2c.
4. Sophie drags the $whole$ of $^{/}\mathrm{partOf}^{\backslash}$ and drops it over the $object$ of $^{/}\mathrm{peigne}_{\mathbf{2a}}{}^{\backslash}$; and drags the $part$ of $^{/}\mathrm{partOf}^{\backslash}$ and drops it over the $fibres$ of $^{/}\mathrm{untangle}^{\backslash}$. The result of this process is illustrated on figure 2d.

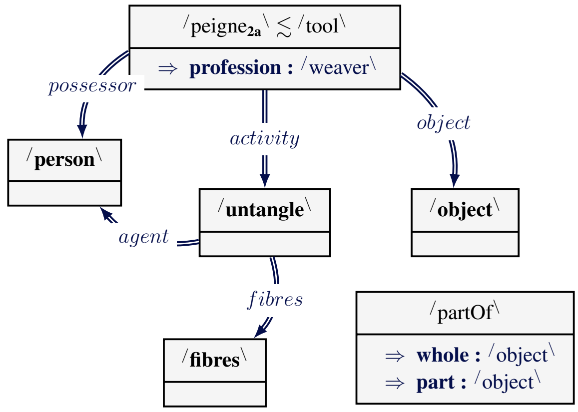
From this graph one may automatically build the definition $D_{/\mathrm{peigne}_{\mathbf{2a}}\backslash} = (D^-_{/\mathrm{peigne}_{\mathbf{2a}}\backslash}, D^+_{/\mathrm{peigne}_{\mathbf{2a}}\backslash}, \kappa)$ of $^{/}\mathrm{peigne}_{\mathbf{2a}}{}^{\backslash}$ such as defined in definition 3. This definition is illustrated in figure 3.

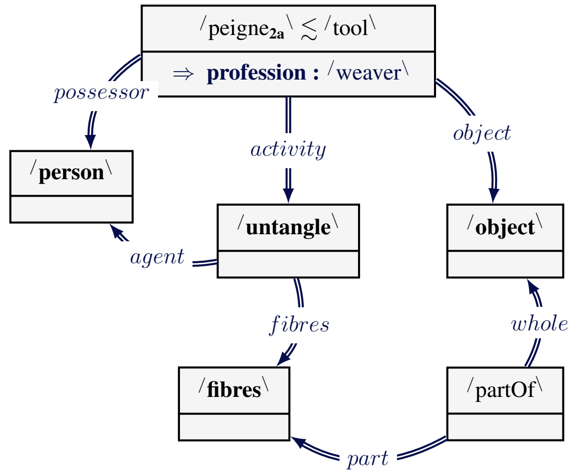




(a) Interesting participants of the definition of ${}^{/}\text{peigne}_{\mathbf{2a}}{}^{\backslash}$ may be given a node by drag and drop.

(b) One may merge participants using drag and drop.





(c) One may add nodes in the definition.

(d) Complete definition of ${}^{/}\text{peigne}_{\mathbf{2a}}{}^{\backslash}$.

Figure 2: Different steps in the definition of the Deep Semantic Unit Type ${}^{/}\text{peigne}_{\mathbf{2a}}{}^{\backslash}$.

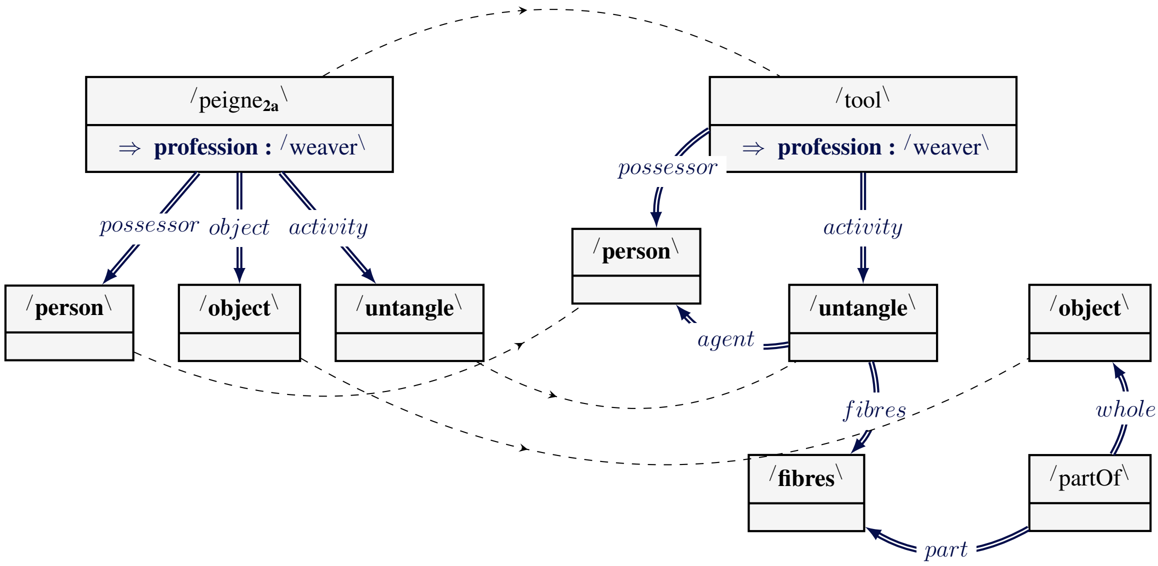


Figure 3: Illustration of the definition $D_{{}^{/}\text{peigne}_{\mathbf{2a}}{}^{\backslash}} = (D^{-}_{{}^{/}\text{peigne}_{\mathbf{2a}}{}^{\backslash}}, D^{+}_{{}^{/}\text{peigne}_{\mathbf{2a}}{}^{\backslash}}, \kappa)$ of ${}^{/}\text{peigne}_{\mathbf{2a}}{}^{\backslash}$. $D^{-}_{{}^{/}\text{peigne}_{\mathbf{2a}}{}^{\backslash}}$ is on the left, the expansion $D^{+}_{{}^{/}\text{peigne}_{\mathbf{2a}}{}^{\backslash}}$ on the right, and the dashed links represent the mapping κ.

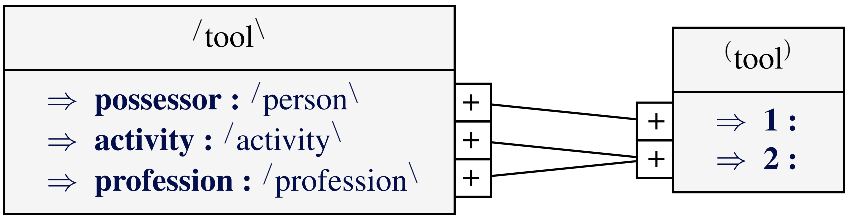
5 Rules and Deep-Surface Semantic ASlots correspondence

In the UGs formalism, a rule is composed of two UGs: a hypothesis H and a conclusion C, and a partial function from the unit nodes of H to the unit nodes of G. If the hypothesis H projects on to a UG G (the rule is applicable), then one may add C to G accordingly (apply the rule).

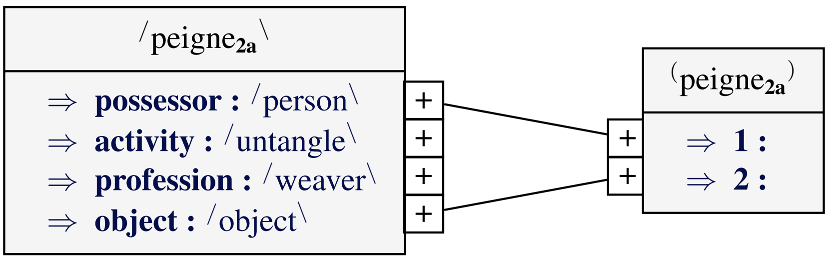
To one definition may thus correspond two reciprocal rules: one that adds $D^{+}_{/\mathrm{L}\backslash}$ to a graph where $D^{-}_{/\mathrm{L}\backslash}$ projects, and one that adds $D^{-}_{/\mathrm{L}\backslash}$ to a graph where $D^{+}_{/\mathrm{L}\backslash}$ projects. If there is the defined PUT in a UG then one may infer its definition, and vice versa.

Rules also enable to represent correspondences between representations of two adjacent levels, and some shall be automatically generated from the government pattern. In this section we will define the correspondence between ASlots of a DSemUT and ASlots of a SSemUT.

Suppose Sophie now wants to represent the correspondence between the deep and surface semantic actant slots for TOOL and PEIGNE$_{2A}$. Sophie opens a new dedicated tab for each of these tasks. The content on the tab is: on the left a box for the DSemUT with its actantial structure, and on the right a box for the SSemUT with its actantial structure. A button is situated in front of each ASlot as illustrated in figures 4a and 4b, and Sophie just needs to drag and drop one of these buttons to the other, so as to link deep semantic ASlots with surface semantic ASlots. Every ASlot of a SSemUT must be linked to at least one ASlot of a DSemUT, several in case of split SemASlots.



(a) Illustration of the deep-surface semantic ASlots correspondence for TOOL.



(b) Illustration of the deep-surface semantic ASlots correspondence for PEIGNE$_{2A}$.

Figure 4: Illustration of the correspondence between the actantial structure of a Surface Semantic Unit Type, and the actantial structure of its associated Deep Semantic Unit Type.

6 Conclusion

We thus illustrated how the UGs framework may be used to edit lexicographic definitions in the RELIEF project.

We overviewed the hierarchy of unit types that enables to describe unit types with their actantial structure: optional, obligatory and prohibited Actant Slots (ASlots) and their signature.

The pre-order over unit types is such that the actantial structure may only become more and more specific as one goes down the hierarchy of unit types. We then justified the introduction of a new representation level for the MTT: the deep semantic representation level. The deep semantic unit type /L\ associated with a LexUT L has ASlots that are symbolized by semantic roles, and that correspond to participants of the linguistic situation denoted by L which are SemASlots of L or of LexUTs whose meaning is less specific than L. We detailed an application scenario in the context of the RELIEF project: the semantic labels are deep semantic unit types and one may specify their actantial structure.

A UGs is a set of unit nodes that are typed and interlinked through actantial and cirumstantial relations. We introduced the lexicographic definition of LexUTs as definitions of their associated DSemUT. We detailed an application scenario in the context of the RELIEF project: a lexicographer may manipulate nodes so as to little by little construct a deep semantic graph that represents the decomposition of the deep semantic unit type associated with the defined LexUT.

Finally rules enable to specify correspondences between ASlots of corresponding unit types at adjacent representation levels. We illustrated our approach with a scenario at the deep-surface semantic level interface, and showed how split ASlots shall be dealt with.

There are several research directions that we currently investigate:

- Many rules may be needed to represent correspondences between the deep semantic and the surface semantic representation levels in case some SemASlot are optional or split. More research is needed to represent these cases and to generalize the definition of rules so as these cases may be factorized. Same goes for definitions of DSemUTs that have optional ASlots.
- We developed a prototype web application and produced a demonstration available online: `http://wimmics.inria.fr/doc/video/UnitGraphs/editor1.html`. We currently lead an ergonomic study in partnership with actors of the RELIEF project in order to enhance the workflow of our prototype.

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