Lexical Inheritance in Upper-Level Ontologies *

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Abstract. Most of lexical bases and computational ontologies are organized by means of a lexical inheritance system based upon the IS-A taxonomic relation. This relation is conceived of as an ontological channel allowing the transfer of lexical information to a great extent. We will assume, however, that inheritance can be related, not only to the IS-A relation, but also to other sorts of ontological relations, such as the CONSTITUTED-BY meronymic relationship. The main aim of this paper will be to characterize the informational skeleton of upper-level lexical ontologies by taking into account meronymic inferences, that is, inferences allowing any whole to inherit information from its parts. Finally, we will describe how this sort of meronymic inheritance can be used to analyse and model metonymic interpretations of polysemous nouns.

1 Introduction

Lexical knowledge bases, also called computational thesauri or ontologies, are not symply ordinary repositories of definitions about static words. Such bases are built as dynamic objects integrating, in addition to the list of conceptual types, a set of structuring devices, such as, for example, *inheritance*. The main motivation for inheritance lies in the interest of the economy principle whereby information is stated in the most efficient manner [14]. Monotonic, nonmonotonic, simple or multiple inheritence systems are based in most cases on the taxonomic IS-A relation, i.e, the *is a hyponym of* link. This relation is used to build up a type hierarchy in such a way that information is transferred from the generic parent-type to the more specific daughter-type, that is, the daughter-type inherits information from the parent-type. Lately, the simple and monotonic versions of inherintace systems have been modified and refined in order to deal with controversial phenomena such as exceptions and polysemy. Whereas the nonmonotonic property has been used to treat exceptions and non prototypicality, multiple inheritance seems to be more appropiate to account for polymorphic and polysemic lexical items.

Most of work on lexical inheritance solely makes use of the taxonomic IS-A relation. This relation is defined as the channel that allows lexical information

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to be transferred. Yet, the main goal of this paper will be to describe how information can be transferred through type hierarchies by means of other kinds of ontological relations. We will analyse, more specifically, inheritance devices based upon the meronymic relation: CONSTITUTED-BY (or the *has a part* link). In other words, we will characterize type hierarchies by taking into account the inferential mechanism allowing any *whole* to inherit some information from its *parts*. Moreover, we will show that this kind of inheritance should enable us to model metonymic interpretation of polysemous nouns in a suitable way.

This paper will begin with an intuitive introduction to some cases of transfer of meaning in metonymic interpretations, in particular, these cases being asociated with a very large notion of *part-whole* relationship. Then, we will describe a type hierarchy partly organized according to the general principles of meronymic inheritance. Finally, we will use this kind of inheritance to try to model sense shifting of polysemous nouns in metonymic contexts.

2 Polysemy and Sense Shifting

Many works on lexical semantics focus their analysis on selectional restrictions and constraints on linguistic composition. In particular, such works analyse how the sematic type of nouns come into conflict with the selectional restrictions of verbs or adjectives in linguistic composition. This situation arises when the type expected by the relational expression is not compatible with the argument's type. For example, in "listen to the piano", the verb "listen" requires an argument of the type *sound*, whereas "piano" denotes a *spatio-material* entity. Likewise, in "drink the bottle", the verb "drink" expects an argument of the type *liquid*, while "bottle" rather denotes an entity perceived as a *spatio-material* container. Type conflict (i.e., violation of selectional restrictions) is a widespread linguistic phenomenon. It seems to be present in very common expressions such as, for example, "tie up your shoes", "the bank announced that...", "John is parked in...", "put the poem on the table", "I can't read this sheet of paper", etc.

In order to explain the conflict of semantic types in composition, some researchers assume that neither the verb nor the adjective undergoes sense shifting, whereas the noun does [7, 15, 6]. From this perspective, the noun "bottle" possesses a polysemic potential allowing it to be perceived either as a solid container or as a liquid substance, according to the selectional restrictions imposed by the verb. Nevertheless, in other lexical works, type shifting is mainly related to verbs (or adjectives). Verbs change their types with the aim of joining the types imposed by their nominal arguments [10, 11, 13]. Thus, it is the verb "drink", and not its argument, that possesses the polysemic potential allowing it to combine either with a liquid substance ("drink wine") or with a solid and spatio-material object ("drink the bottle").

We will examine type conflict from a case apparently not being considered as conflicting: the combination of "touch" with "bottle" ("touch the bottle"). Let's suppose that "bottle" is a count noun denoting an entity of the type *spatio-material*, i.e., a material object having both a specific shape and particular dimensions in the space[1]. So, in order to build the interpretation of "touch the bottle", the verb "touch" should be defined as a function selecting count nouns of the type *spatio-material*. Yet, such a selectional restriction does not seem to be appropriate when the direct object of "touch" is filled by uncountable nouns as "butter" or "sand", referring to pieces of matter having unspecified shape and indeterminated dimensions in the space: "touch the sand". Such a situation must be perceived as a particular case of conflicting type. In fact, the noun selected by "touch" can be either:

– a count noun typed as a spatio-material entity
– a uncountable noun typed as a unbounded matter

As had been said in the previous paragraph, we have to choose between two alternating descriptions:

1. On the one hand, we could describe "touch" as a polysemic verb likely to be filled either by unbounded matter or by bounded spatio-material objects. In this way, the verb "touch" could be associated with, at least, two semantic types: both the *touch1* type, which would select unbounded pieces of matter and the *touch2* type, which would select bounded spatio-material entities, i.e., physical objects with specific shape and dimensions.
2. On the other hand, we could make polysemic, not the verb "touch", but its nominal argument: the noun "bottle". From this viewpoint, "bottle" would denote both bounded spatio-material containers (*bottle1* type) in by default cases, and the material constituent of which the container is made (*bottle2* type) when the noun is coerced by the verb's conditions. For example, if "touch" is defined as a function only selecting unbounded matter, then the noun "bottle" should undergo a type shifting from the spatio-material type (*bottle1*) to the material one (*bottle2*). In such a case, "touch" coerces the noun "bottle" to mean *bottle2*.

3 Metonymy and Interpretation of Complex Expressions

Kleiber [8, 9] rejects both solutions because they would require the multiplication of the types associated with either the verbal entries (*touch1*, *touch2*, ...) or the nominal ones (*bottle1*, *bottle2*,...). Such a multiplication would imply a great difficulty to fix and stabilize the denotation of nouns and verbs. Indeed, Kleiber does not resort to type shifting when a particular type conflict arises in linguistic composition. According to him, it is a particular internal constituent of the entity denoted by the noun that becomes salient and representative with regard to the whole entity, under specific conditions. So, both verbs and nouns actually keep their by default types. He calls *integrated metonymy* the principle asserting that certain parts become salient with regard to the whole, under specific conditions. Let's take again the previous example: "touch the bottle".

[1] Such a definition comes partly from the characterization of physical objects by [1]. Yet, I do not take into account the temporal facet of such a definition

Under the conditions concerning the action of touching, the material facet of the bottle becomes the salient part of the entire bottle, and, as such, it may characterize the overall whole. In other words, the material part of the bottle represents and characterizes the complex spatio-material configuration under the conditions imposed by "touch".

Considering "touch the bottle" as a metonymic expression is in accordance with the fact that metonymic interpretations are no longer special cases, but rather standard and usual ones. Indeed, the interpretation of complex expressions often involves a metonymic inferencial device operating on the noun meaning. From this viewpoint, non metonymic interpretations represent the limit case. Therefore, we assume that a complex expression combining a noun with a relational expression (verb, adjective, etc.) will be commonly interpreted by means of a nominal metonymy. Metonymic inferences are, then, located in the centre of the interpretation process building the meaning of complex expressions.

Let's take the expression "small bottle". The selectional restrictions of the dimensional adjective "small" should require spatial or temporal entities that have bounded shape and dimensions, regardless of their material facet. Indeed, "small" can combine with inmaterial objects: "small hole", "small line",... Under the conditions relating to dimensionality, it is, then, the *spatial* facet of the bottle that represents and characterizes the overall *spatio-material* configuration. According to the principle of integrated metonymy, the restrictions imposed by a dimensional adjective such as "small" require the noun "bottle" to have direct access to the type *space*, which is one part integrating the *spatio-material* complex type.

Furthermore, one can easly find also limit conditions imposing a *spatio-material* configuration. For example, in the the expression "put the bottle in...", the movement verb "put" selects a *spatio-material* noun. Indeed, according to Naive Physics' assumptions [1], it is necessary to presuppose both a piece of matter and a set of spatial locations in order to conceptualize physical movement and shift location. Consequently, under the conditions required by movement, its the overall *spatio-material* configuration that characterizes and represents the whole bottle. It is the limit case: the whole represents the whole.

Integrated metonymy is, then, the principle that let a nominal expression be compatible with selectional restrictions in linguistic composition. We will use such a principle to constrain and control the lexical inheritance based upon the *part-whole* meronymic relation.

4 Two Sorts of Lexical Inheritance

Conceptual information is mainly structured as type hierarchies in lexical knowledge bases, ontologies, and computational thesauri. From an abstract viewpoint, a type hierarchy can be defined as an algebra $< T, \subseteq >$, where T represents the set of types, and $\subseteq$ a partial ordered, reflexive, antisymetric, and transitive relation. Intituitively, this relation means either "contains more information than" or "is more specific than" [3, 2]. It is by means of such a relation that the inheritance device enables information to be transferred through the type hierarchy[2]. For example, given that:

$$bottle, matter, spatio - material \in T$$

it is possible to characterize the following "is more specific than" relationships linking *bottle* to both its hyperonym *spatio-material* and its meronym *matter*:

$$bottle \subseteq spatio - material$$
$$bottle \subseteq matter$$

In other words, the type *bottle*, which contains more information than both its hyperonym *spatio-material* (= physical object) and its meronymic component *matter*, inherits information from these two types. Intuitively, the relation $\subseteq$ subsumes, at least, both the taxonomic IS-A and the meronymic CONSTITUTED-BY relationships. The hierarchy $< T, \subseteq >$ can be specified by two operations: the conjunction or integration operation, noted $\cap$, and the disjunction or union operation, noted $\cup$. These operations allow types to be combined in order to build up more complex and abstract types. For example, the type spatio-material can be conceived of as a complex type from two viewpoints:

- On the one hand, it can be built up by integrating (i.e., by the conjunction of) its meronymic components: $spatio - material = matter \cap space$
- On the other hand, it can be the result of extracting the shared information from specific hyponyms such as *bottle, pencil, table*, etc: $spatio - material = bottle \cup pencil \cup table \cup \ldots$

These examples show that conjunction operations seem to be used only when types are linked by meronymic relations, whereas the construction of types by disjunction seems to characterize only taxonomic structures.

We call "meronymy" any hierarchy organised by means of both the meronymic relation, and the conjunction operation[3]. A meronymy is the triple:

$$< T, \subseteq_{mer}, \cap >$$

where $\subseteq_{mer}$ is the meronymic CONSTITUTED-BY relation. In a similar way, we call "taxonomy" any type hierarchy organised by means of both the taxonimic relation and the disjunction operation. A taxonomy is the triple:

$$< T, \subseteq_{tax}, \cup >$$

[2] In this paper, we will not deal with the way in which information is represented. Further analyses about modes of representation such as feature structures, interpretation postulates, or conceptual graphs are beyond the scope of this paper.

[3] Our definition of meronymy is more specific than the general definition of mereology by [18] and [17]. According to these logicians, a mereology is an ontology structured by a partial ordered relation which subsumes, among others, the IS-A and the CONSTITUTED-BY relations. So, mereologies subsume taxonomies and meronymies.

where $\subseteq_{tax}$ is the IS-A relation. General speaking, we call "ontology" any type hierarchy gathering together both meronymic and taxonomic structures.

The lexical knowledge bases are mainly built and organised on the basis of taxonomic hierarchies. In this sort of bases, the informational inheritance device solely depends on the IS-A relationship, while the CONSTITUTED-BY relationship plays a secondary ontological role. In this paper, we assume, however, that the meronymic relationship must be conceived of as an integral part of the organising skeleton of knowledge bases and upper-level ontologies. More specifically, our main concern is centred on the way that meronymic hierarchies and their inheritance potential are related to the metonymic principle described in the previous section.

According to Borgo and Guarino (see [1]), the internal structure of spatio-material configurations (i.e., of physical objects) can be represented as a meronymic hierarchy. The lowest level of this hierarchy is the type representing complex spatio-material configurations, noted *phy* (see Figure 1).

On the other hand, the organisation of types such as *bottle, pencil, table*, etc., with regard to *phy*, can be built up as a taxonomy. Here, the top level is the phy type.

Figure 1 can be described as follows:

- From the taxonomic viewpoint, *phy* is the disjunction of the elaborate types such as *bottle*, *pencil*, *table* ...: $phy = bottle \cup pencil \cup table \cup \ldots$ That is to say, *phy* represents the type containing the information shared by all the particular physical objects. In Figure 1, vertical thin lines illustrate taxonomic relationships.
- From a meronymic viewpoint, *phy* is a spatio-material entity, i.e., an integrating type that is built up by the conjunction of both the *space* type and the *matter* type: $phy = espace \cap matter$. Thick arrows illustrate meronymic relationships.
- From a meronymic viewpoint, *space* is the integrating type resulting of the conjunction of a bounded *shape* and specific dimensions, noted *dim*: $space = shape \cap dim$.
- From a meronymic viewpoint, *matter* is the integrating type resulting of the conjunction of properties such as, for example, colour (= *col*), texture (= *tx*), etc.: $matter = col \cap tx \cap \ldots$

The level of elaboration concerning the internal components of physical objects depends on the particular applications, designs and descriptive goals of the ontology. If the ontology would be used to represent physical information about a particular expert domain, we should take into account a more fine-grained elaboration of the phy components. As far as the particular goal of this paper is concerned, we assume that the meronymic information about *phy* in Figure 1 is described, at present, at the suitable level of elaboration.

Figure 1 represents a type hierarchy whose inheritance device depends not only on the taxonomic relation but also on the meronymic one. Indeed, the *bottle* type inherits information not only from the upper level types in the taxonomy - for example, from its hyperonym *phy* -, but also from the upper level types

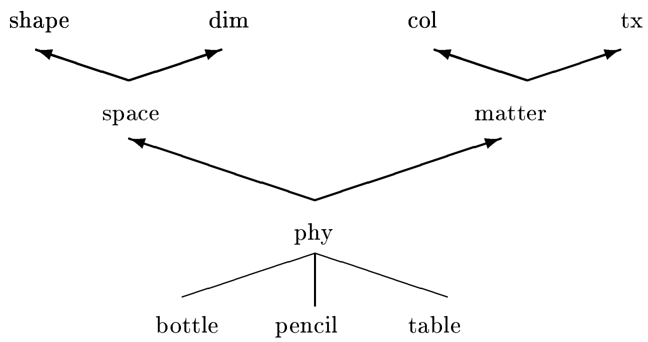

Fig. 1. Ontology organized on the basis of the *phy* type (physical object)

in the meronymy, i.e., from its constituents *matter, space, dim, colour*, ... Let's note that the upper-level of this hierarchy is a meronymic ontology with multiple inheritance, whereas the botton-level represents a taxonomy with simple inheritance. Polysemic and metonymic senses of nouns would be then modeled by the multiple inheritance that organises the meronymic upper-level. It is at this level that we can conceive noun types as polymorphic entities.

Meronymic inheritance will enable us to make the integrated metonymy principle defined in the previous section operational. This principle asserts that a part or a partial aspect of an entity can characterize and represent the whole entity under specific conditions. Let's take again the expression "touch the bottle".

As has been shown, the selection conditions of the verb "touch" require its direct object to be a material entity, that is, an entity of the type *matter*. In our ontology, the type *bottle* meets such conditions because it inherits meronymically material information from its constituent *matter*, through its hyperonym *phy*:

$$bottle \subseteq_{tax} phy \subseteq_{mer} matter$$

This hereditary channel allows us to account for the imperceptible sense shift which the noun "bottle" undergoes in the context of the expression "touch the bottle". The shift in question is not an entire denotational transformation where the noun "bottle" would change the criteria of identity. It is not a referential change from a spatio-material and dimensional object into a material entity without specific dimensions nor shape. Intuitively, such a denotational transformation does not take place. The referential entity denoted by "bottle" keeps its criteria of identity: it is still identified as a physical object ($bottle \subseteq_{tax} phy$). Yet, such an object is perceived from one of its internal facets, the material constituent, under the conditions imposed by "touch".

Likewise, the adjective "small" requires the modified noun to be a dimensional and shaped space, i.e., an entity of type *space*. In our ontology, the type *bottle* fills such conditions because it can inherit spatial properties from its constituent *space*, through its hyperonym *phy*:

$$bottle \subseteq_{tax} phy \subseteq_{mer} space$$

Resorting to meronymic inheritace allows us to stabilize the reference of "bottle". In this way, it is not necessary to operate a denotational transformation constraining physical objects (i.e., spatio-material configurations) to change into entities identified as spatial locations (holes, circles, ...), lacking their material component. The type *bottle* IS_NOT_A *space*; it rather denotes a spatio-material object which can be perceived from its spatial facet under specific conditions.

5 Types and Functional Information

Each nominal type is directely related to a set of functional types. Functional types represent the event roles likely to be filled by the nominal type, i.e., they represent the thematic roles to which the nominal type can be assigned. For example, the spatio-material configuration *phy* gives direct access to functional roles such as *being moved, being used in a certain way, being created*, etc. When more elaborate information specifies the funcional roles, the ontological type also becomes more specific (see [4, 5]). So, further elaborate descriptions concerning the *being used* functionality could allow us to perceive physical objects as tools or pieces of decorations, etc. Likewise, specific information concerning the *being created* functionality would enable us to perceive physical objects as artefacts or natural objects.

The relationship between a nominal type, noted t, and the set of functionalities F to which it gives access, will be noted as an attribute-value structure:

$$t : F$$

Nominal types are not only associated with the set of characteristic functionalities to which they are directly related. By means of the meronymic relations, types also inherit functional information from their constituent types (see Figure 2). For example, the complex type *phy* inherits functional content from both its material component and its spatial facet. From the former, it inherits event functions, *F2*, such as *being touched, being stained, getting wet, having a specific colour*, etc. From the latter, it inherits functionalities, *F3*, such as *being measured, having a specific length, being drawn, being designed*, etc. Consequently, the type *phy* fills in not only the functional roles contained in the set *F1*, but also the functional roles, *F2* and *F3*, of its meronymic parts: *space* and *matter*.

In our ontology, the meronymic type hierarchy is then conceived of as a sort of a multiple inheritance system.

However, we assume that meronymic inheritance can be regulated by means of a number of constraints. In the following section, we shall analyse a particular case of constraint on meronymic inheritance.

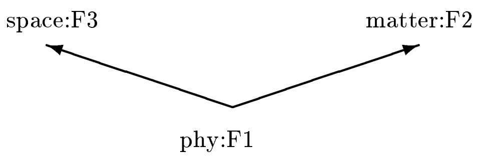

Fig. 2. Meronymic inheritance of functional properties related to physical objects

6 Constraints on Meronymic Inheritance

The conjunction operation allows types to be integrated at various levels of complexity. Such an operation builds complex types by blending their constituents at different levels of organization. At the higher levels, complex types represent polymorph objects such as:

- the type obtained by integrating a physical support with a symbolic content, for instance, the type denoted by "poem": "take the poem", "interesting poem",
- the type obtained by integrating a container or receptacle with the substance it contains, for instance, the type denoted by "wine": "take the wine", "excellent wine",
- the type obtained by integrating a human organization with the product it produces, for instance, the type denoted by "newspaper": "newspaper on strike", "read the newspaper".

In order to account for the type associated with "poem", we can build a complex type, noted *phy_symb*, which is the result of combining a physical object with a symbolic content: $phy\_symb = phy \cap symb$. In a similar way, the type of "wine" could be a complex type, noted *phy_mat*, obtained by combining a spatio-material container with the liquid material it contains: $phy\_mat = phy \cap matter$. Unlike Pustejovsky, we do not separate complex or "dotted types" ([15, 16] from no complex or simple types. In our meronymic hierarchy, *pencil* and *newspaper* are both complex types, even if the former has less levels of meronymic complexity than the latter. The integrating operation enables us to build up types at various levels of meronymic complexity:

- *matter*, by integrating its internal properties: *coul, tx*, ...,
- *phy*, by merging its spatial and material constituents,
- *phy_symb*, by merging its physical and symbolic facets.

Nevertheless, the parts of the more complex types do not always have the same degree of prominence and representativeness with regard to the whole [12]. We argue that meronymic inheritance must be modified and adjusted to a certain extent by taking into account the prominence degree of parts. More specifically, the less salient parts constrain the meronymic inheritance device in such a way that they do not transfer to the complex type all the information which they contain. This constraint can be stated as follows: *A complex type inherits from its less salient parts only the information that can be pertinent to the other parts under specific conditions.*

Let's us analyse the heterogenous use of the polysemous noun "poem" in a number of linguistic contexts:

(1)
a. "read the poem"
b. "write the poem"

(2)
a. "??touch the poem"
b. "??blue poem"
c. "??rectangular poem"

(3)
a. "take the poem"
b. "put the poem on ..."
c. "burn the poem"

We assume that the lexical item "poem" can denote a complex configuration, the *phy_symb* type, constituted by a symbolic content impressed on a physical holder. Physico-symbolic entities are directly related to functionalities such as *being read* and *being written*, which require symbolic objects holding on physical containers [15]. That is to say, the potential complements of "read" and "write" - e.g., "poem", "book", etc. - are perceived under such conditions as polymorphic entities requiring physico-symbolic conditions to be conceptualized (see (1a-b) above).

However, the internal constituents of the polymorphic entity denoted by "poem" are not accessible in the same way. Unlike "book", "poem" does not give access to all the internal aspects of its physical facet. As far as the lexical item "poem" is concerned, the physical facet of the *phy_symb* complex type appears to be less salient than the symbolic one. This construal asymetry constrains the meronymic inheritance device in such a way that there is some information directly associated with the physical part that cannot be inherited by the complex type *phy_symb*. The non inherited information concerns the physical functionalities that do not modify any property of the symbolic facet. In other words, the noun "poem" cut off the access to the functionalities that do not change the state of the other constituent: the symbolic content. Among these functionalities, we can enumerate: *being touched, getting wet, having a specific colour, having particular dimensions, having a specific shape*, etc. Indeed, it is not possible to conceive the noun "poem" as a complement of expressions requiring this kind of spatio-material conditions. That is why (2a-c) are pragmatically ill-formed expressions.

In constrast to the non inherited physical functionalities, there are other kinds of spatio-material conditions that could bring about various changes in the symbolic facet. For example, when the physical holder is moving, we can infer a change location of the symbolic content as well. Likewise, when the physical holder is burnt, we have no more access to the symbolic content. That is, the physical functionalities such as *being moved, being located, being burnt*, which modify some properties of the symbolic facet, are inherited by the polymorphic *phy_symb* entity denoted by "poem". So, the noun "poem" can be taken as a complement of expressions requiring this kind of spatio-material conditions (see (3a-c) above).

Figure 3 represents the type hierarchy allowing *poem* (i.e., the entity denoted by "poem") to inherit specific pieces of functional information. At the taxonomic level, the type *poem* is directly related to its hyperonym *phy_symb* type, that is, at this ontological level, the type *poem* is identified as physico-symbolic entity. It inherits from *phy_symb* the set of physico-symbolic functionalities *F1* (e.g., *being written, being read*, ...).

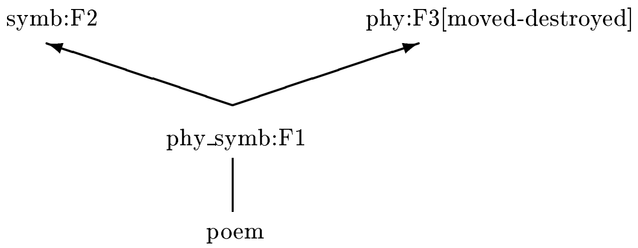

Fig. 3. Information inherited by *poem* through its type hierarchy

At the meronymic level, the type *poem* also inherits information from the internal constituents of *phy_symb*: both the symbolic content *symb* and the spatio-material holder *phy*. It inherits from *symb* the symbolic functionalities *F2*, such as *treating of, being assessed* or *having a specific content*. Thanks to this inheritance, the noun "poem" can be a complement of expressions requiring that kind of symbolic conditions: "polictical poem", "assess/criticize the poem", "naive poem", etc. There is no constraint on the kind of information inherited from the symbolic facet. A poem is perceived as a symbolic entity under all the conditions referring to the symbolic functionalities. Nevertheless, the type *poem* does not inherit all the functionalities related to the spatio-material facet. In fact, it only inherits from *phy* the set of functions *F3* which also modify some aspects of the symbolic facet (e.g., the functions that cause the symbolic content to be moved, or to be located somewhere or to be destroyed). Consequentely, the noun "poem" can be used in expressions that require this kind of spatio-material conditions: see 3a-c above. Yet, the functionalities related to spatio-material conditions that do not involve any change on the symbolic facet (e.g., *being touched, having a specific colour*, etc.) are not part of the functional set *F3* inherited by *poem*. The oddity of the expressions (2a-c) shows that the noun "poem" cannot give access to this kind of information. From this viewpoint, the noun "poem" seems to be a lexical filter constraining the inheritance of spatio-material functionalities.

According to the integrated metonymy principle, the denotation of "poem" IS-A physico-symbolic entity, which can be perceived both as a symbolic entity under the role conditions *F2* and as a spatio-material object under the role conditions *F3*. Unlike Pustejovsky, we needn't assume a shift type operation ("coercion type") which would change the by default type of "poem", *symb*, into a coerced type, *phy*, when the linguistic context requires specific spatio-material conditions. The shift type hypothesis cannot explain how the noun "poem" can refer to the same entity in expressions requiring two different types:

(4) "put the political poem on the table"

Whereas the adjective "political" requires "poem" to be a symbolic entity, the verb "put" needs a spatio-material complement. If we assume that "poem" refers to the same entity in these two linguistic contexts, then, could we also assume that such an entity is taken as a symbolic content in one context and as a physical object in the other one? Could we assert that the referred entity *poem* IS-A *symb* and IS-A *phy* at the same time in the expression (4)? It seems to be not possible. Intuitively, the single entity *poem* in the expression (4) has not got two taxonomic types, but only one: the nominal expression denotes only one discourse entity, which can be linked to an anaphoric expression. According to our ontological model, the denotation of "poem" (i.e., the entity *poem*) is identified as a physico-symbolic entity, that is, *poem* is_a *phy_symb*. Such an entity, however, could be perceived from its salient parts: on the one hand, the symbolic facet will be salient under the conditions imposed by "political" and, on the other hand, the spatio-material aspect will be salient under the conditions imposed by "put". As has been shown in Figure 3, the entity denoted by the noun "poem" belongs to one single taxonomic type, *phy_symb*, but it can inherit meronymically from its parts: *symb* and *phy*. In short, the expression 4 gives rise to the following meronymic inheritances:

– Under the conditions imposed by "political", the referred entity *poem* is a physico-symbolic configuration inheriting the functional information from its symbolic facet:

$$poem \subseteq_{tax} phy\_symb \subseteq_{mer} symb : F2$$

– Under the conditions imposed by "put", the referred entity *poem* is also a physico-symbolic configuration, but it inherits in this case the functional information from its spatio-material facet:

$$poem \subseteq_{tax} phy\_symb \subseteq_{mer} phy : F3$$

Like "poem", the denotation of the noun "wine" can be characterized as a complex configuration merging the specific liquid substance with an undertemined spatio-material and solid container. Like the physical holder of the symbolic content, the container of the liquid substance (bottle, carafe, jar, etc.) is only accessible under the spatio-material linguistic conditions likely to modify some properties of the liquid it contains (e.g., (5a-c) below).

(5)
a. “take the wine”
b. “open the wine”
c. “put the wine on the table”

(6)
a. “??scratch the wine”
b. “??green glass wine”
c. “??small wine”

Nevertheless, in some cases, the linguistic spatio-material conditions refering directly on the container do not modify the state of the substance it contains. When it happens, the lexical unit “wine” cut off the metonymic access to the information concerning the container. That is why (6a-c) are pragmatically ill-formed expressions. Consequently, the noun “wine” can be conceived of as a lexical filter constraining the access to the solid container under specific conditions.

7 Conclusion and Future Perspectives

In this paper, we tried to make our contribution to the analysis of inheritance systems and inferencial devices in lexical knowledge bases. Unlike many works in this research domain, our analysis focused, not on the IS-A relation, but on the CONSTITUTED-BY meronymic relation. More precisely, we described how the meronymic parts are able to characterize and represent the overall whole under specific conditions. When a part is conceived of as salient in a particular linguistic context, it transfers its informative content to the whole by means of a meronymic inheritance device based upon the CONSTITUTED-BY link. Moreover, we tried to show that the metonymic inferences (information transferred from parts to wholes) can be adapted in a suitable way to model and deal with lexical polysemy and transfer of meaning.

Finally, we would like to widen the scope of the meronymic inheritance in order to take into account the *participant-event* relation as well. That could allow us to deal with the lexical sense extension called “logical metonymy”, i.e., the operation of substituting an object-type for one of the events-type in which it is a participant. Such a substitution is considered as, not only an ontological shift, but also a logical type coercion: the logic type object ($< e, < e, t >>$) is coerced into the logic type event ($< e, t >$). In our model, the logical metonymy could be conceived of as a mere case of meronymic inheritance: an object can inherit information from an event, when the latter is taken as a salient part of the former. For example, the object-type *car* would inherit meronymically some information from the event-type *running*, under the conditions imposed by some adjectives: “fast car”, “good car”, ... In these particular linguistic contexts, the event of *running* would be taken as a salient part of the vehicule. We think that the analysis of several logical metonymy cases could lead us to characterize in a more suitable way the model of meronymic inheritance we have introduced in this paper. That is being developped in our current work.

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