Primary and secondary meaning facets of polysemous nouns and their formalization

Long Chen  Laura Kallmeyer  Rainer Osswald
Heinrich Heine University Düsseldorf

1 Introduction

Inherently polysemous nouns, or dot-type nouns, have different meaning facets which can be targeted at the same time. There has been plenty of research on the types of meaning facets and their semantic relationships. However, the internal semantic structures of the polysemous nouns and how they license copredication remain unclear. For example, Pustejovsky (1995) and Asher (2011) modelled the meaning facets of complex type nouns as equal facets; Chen, Kallmeyer & Osswald (2022) assumed that all the facets are on the same level and related to each other by attributes in the frames of the nouns; Babonnaud, Kallmeyer & Osswald (2016) suggested that one of the facets stands for the noun and the other facet is its attribute; Ortega-Andrés & Vicente (2019) and Murphy (2021) used “activation package” or “coherence” to indicate the close semantic relationship between facets that can copredicate, but not in a formalized way and without distinguishing primary and secondary facets.

In this paper we argue based on data from English and Mandarin Chinese that polysemous nouns have primary facets and secondary facets. Primary facets are more prominent and stable in the noun’s meaning, which is to say, they are usually available even when they are not predicted. In contrast, secondary facets might be unavailable if they are not targeted. The theory is based on the observation of the possibility of copredication. We examine three common dot-types nouns, discuss their primary and secondary facets, and sketch the formalization of the dot-type nouns with primary and secondary facets in frame semantics.

2 Primary facets and secondary facets

The *event*, *info(mation)* and *obj(ect)* facets are common in dot-type nouns in English and Chinese. This paper investigates *event•food*, *obj•info* and *event•info* dot-types regarding the respective patterns of primary and secondary facets.

**Event•Food** The nouns for meals in English and Chinese, such as *lunch, buffet, 晚餐 ‘dinner’, 大餐 ‘feast’,* have both event facets and object facets. In the copredication pattern V + Mod + N, it is possible that the Mod(modifier) targets the object facet and the V(verb) targets the event facet as in (1a)\(^1\), but the other direction of copredication as in (1b) is unavailable.

(1) a. On Saturday night, the INTA had organized a delicious dinner in the CityNorth Hotel.
   b. *take away the lively dinner

The asymmetry also exists in coercion. Usually, in Chinese the classifier 顿 (dùn)\(^2\) is used for events and 份 (fèn) is used for objects. However, as in (2)\(^3\), sometimes 顿 (dùn) can also be

---

\(^1\)The English examples in this paper are from English Web 2020 corpus on SketchEngine
\(^2\)It will be glossed as CL_e. Similarly classifiers for objects will be glossed as CL_o.
\(^3\)The Chinese examples in this paper are all from CCL corpus (corpus of the Center for Chinese Linguistics of PKU).
used for food nouns like 饺子 ‘dumpling’ but 份 (fèn) can never be used for event nouns like 晚宴 ‘banquet’. This also indicates that in the context with the event and the food, usually the event is more prominent.

(2)  a. 一 餃子/晚宴
tone CL_e dumpling/banquet
a meal of dumpling/a banquet  
b. 一 份 饺子/* 晚宴
one CL_o dumpling/*banquet
a portion of dumpling/*banquet

Object • Info Different from event • food, the two facets in object • info are usually equal and both are primary facets, because the copredication of V + Mod + N is always available. (3) and (4) are the copredication examples of the English noun book and the Chinese noun 书 ‘book’.

(3)  a. Others may regard reading thick books as a dull way to learn.
   b. Individuals cannot carry their religious books like the Bible with them.

(4)  a. 我读了一本很厚的书
1SG read ASP one CL_o very thick ModM book
I read a very thick book
b. 翻开那些难懂的书
open those difficult ModM book
open those difficult books

Event • Info Speech is a typical event • info noun in English. In (5), only (5c) is a possible copredication, so both facets are not very prominent.

(5)  a. *recite the crowded speech
   b. *conduct the detailed speech
   c. The captain could read English, but barely understood oral speech.

However, in Chinese, not all event • info nouns have both secondary facets. There are two nouns for speech in Chinese, namely 讲话 (jiǎnghuà) and 演讲 (yǎnjiǎng). The former is usually used for speeches given in more serious situations or by important people, while the latter is a more general word for “speech”. Both nouns have the event facet and the info facet, but they behave differently in copredication. Table 1 shows the facets of both nouns after modification. The event facet of 演讲 (yǎnjiǎng) is always preserved, but when 讲话 (jiǎnghuà) is modified by 两千字 ‘2000 characters’, the phrase only has the info facet. Therefore, in 讲话 (jiǎnghuà), both facets are secondary facets, whereas in 演讲 (yǎnjiǎng), the event facet is the primary facet.

<table>
<thead>
<tr>
<th></th>
<th>targeted facet</th>
<th>讲话 ‘speech’</th>
<th>演讲 ‘speech’</th>
</tr>
</thead>
<tbody>
<tr>
<td>两千字 ‘2000 characters’</td>
<td>info</td>
<td>info</td>
<td>both</td>
</tr>
<tr>
<td>两个小时 ‘2 hours’</td>
<td>event</td>
<td>event</td>
<td>event</td>
</tr>
<tr>
<td>详细 ‘detailed’</td>
<td>info</td>
<td>both</td>
<td>both</td>
</tr>
<tr>
<td>盛大 ‘grand’</td>
<td>event</td>
<td>event</td>
<td>event</td>
</tr>
<tr>
<td>沉闷 ‘dull’</td>
<td>event</td>
<td>event</td>
<td>event</td>
</tr>
</tbody>
</table>

The reason why 演讲 (yǎnjiǎng) has a primary facet while 讲话 (jiǎnghuà) has not is probably related to the Chinese lexical system. The info and event facets of 讲话 (jiǎnghuà) can also be referred to as 讲话稿 ‘speech draft’ and 讲话会 ‘speech meeting’. Neither is a frequent word. On the contrary, although the info facet and the event facet of 演讲 (yǎnjiǎng)
can also be referred to as ‘speech draft’ and ‘speech meeting’, ‘speech draft’ is much more commonly-used when the info facet is targeted, while ‘speech meeting’ is not frequently used.

Table 1 also displays the difference between the two modifiers, 两千字 (2000 characters) and 详细 (detailed). The former picks the info facet of 讲话 (speech) and the latter keeps both facets. We can thus categorize modifiers into facet-keeping and facet-dropping with regard to whether or not non-targeted secondary facets are kept. This property of adjectival modifiers is related to the closeness between the meanings of the modifier and the noun. For example, arguments of the events, possessors and nominal modifiers are usually facet-keeping. Adjectives that describe the non-inherent properties of a noun are usually facet-dropping.

3 The formal modelling of the polysemous nouns and modifiers

The formalization follows the modelling in Chen, Kallmeyer & Osswald (2022) with some modifications in the elementary trees of the polysemous nouns, and is based on Kallmeyer & Osswald (2013), with the syntactic part replaced by Tree Wrapping Grammars (TWG)(Kallmeyer, Osswald & Van Valin 2013), which is developed from Role and Reference Grammar (RRG; Van Valin 2005). We propose two options to model the difference between the primary and secondary facet and their composition with modifiers. One focuses on syntax and uses the edge feature in TWG, and the other focuses on semantics and uses default logic in frames.

Using edge features for primary and secondary facets  Kallmeyer & Osswald (2017) introduced edge features as a means to model adjunction constraints for sister adjunction concerning obligatory adjunction and linear order of trees adjoining to the same node. One can think of edge features as left and right features of the lower node of an edge that constrain adjunction options on the respective sides. In the final derived tree, the left feature structure of a node unifies with the right feature structure of the next sister to the left or, if this does not exist, with the left feature structure of the mother of the node. The same holds for the right edge features respectively. We will use this to model (co)predication constraints for dot-objects.

Using edge features, the phrase “lively dinner” is modelled as shown in Fig. 1 (edge features are displayed in gray boxes to the left/right of the nodes). The top-left corner of the figure is the elementary tree and frame of “lively”, the top-right corner is the elementary tree and frame of “dinner”. In the bottom part of the figure the frame of ”lively dinner” is in the middle, and on the right of it is the same frame in the form of graphs.

The I feature on the left of the MP (= modifier phrase) node of “lively” has the value $z$, which is the frame that represents the meaning of the modifier, while the value on the right takes care of composition: It unifies with what comes to the right and thereby indicates that the adjunction adds an EVENT-FACET which is the one contributed by “lively” (boxed variable $\Box$). When adjoining to dinner, the final edge feature unification unifies $\Box$ with $u$, which adds the desired facet. However, crucially, $u$ and $z$ do not unify, which means that, even though they have the same event facet, the object facet of the frame $u$ of “dinner” does not become the object facet of $z$, which is, again via final edge feature unification, passed upwards to the left feature of the NUC$_R$ node (unification of $\Box$ and $z$) and thereby passed to the CORE$_R$ node as the node feature I.

On the other hand, if “dinner” is not modified by any modifiers, the value of the I-feature on the CORE node will be $u$, which still contains the obj-facet.

If “dinner” is modified by an object modifier, the tree of “dinner” remains the same, but the edge features on the MP node of the modifier tree are different: Both I features have value
Figure 1: The composition of “lively dinner” using edge features

z, which means that the frames \( z \) and \( u \) unify and the resulting frame, which still contains the OBJ-FACET of “dinner”, is passed as I feature to the CORE\(_{R} \) node.

Similarly, if the dot-type noun has two secondary facets, it will have two elementary trees, where the I features equal to each facet respectively.

In general, in this approach the edge feature of the tree of the modifier decides whether the noun phrase after modification is still polysemous. The problem with this proposal is that in many cases it is not the adjective but the noun that decides the “dotness” of the noun phrase. As is shown in Table (5), if the modifier 蒸汽 ‘2000 characters’ modifies 讲话 (jiāng huà), the noun phrase only has an info-facet, but if it modifies 演讲 (yǎn jiǎng), the noun phrase is still polysemous. In this case there has to be two trees for 蒸汽 ‘2000 characters’, which does not correspond to the fact that it is only a facet-picking modifier.

Using default constraints for secondary facets Our second approach uses default constraints in the frame of the polysemous nouns to distinguish secondary facets from primary facets and enable them to be cancelled during unification. Frame representations of a certain domain are usually subject to a number of (universal) AV constraints that express implicational relations between types and attributes: Types may be (i) subtypes of other types, (ii) certain types may imply the presence of certain attributes (and vice versa), etc. We use the logic from Chen, Kallmeyer & Osswald (2022) to express such constraints. For example, the polysemous noun “book” has the following constraints:

\[
\begin{align*}
\text{a. } & \text{ book } \Rightarrow \text{ phys-obj } \cdot \text{ info} \\
\text{b. } & \text{ phys-obj } \cdot \text{ info } \Rightarrow \text{ OBJ-FACET } : \text{ info-carrier } \land \text{ INFO-FACET } : \text{ info } \land \text{ OBJ-FACET } \cdot \text{ CONT } \equiv \text{ INFO-FACET }
\end{align*}
\]

(6a) indicates that book belongs to the dot-type phys-obj · info. (6b) expresses that anything that is of type phys-obj · info has an OBJ-FACET and an INFO-FACET, and the two facets are related to each other by a CONT attribute, which means the INFO-FACET is the content of the OBJ-FACET.

Similarly, dinner belongs to the dot-type event · food, and usually it has an EVENT-FACET and an OBJ-FACET. However, as discussed above, when modified by an event modifier, the OBJ-FACET is no longer accessible in the frame of the resulting phrase. In other words, OBJ-FACET counts as a defeasible attribute in this case. We can encode this formally by allowing default constraints
(indicated by \( \supseteq_D \)) in our logical system. Given a default constraint \( \alpha \supseteq_D \beta \) and a frame \( F \) that satisfies \( \alpha \), we can assume that \( F \) satisfies also \( \beta \) if \( \beta \) is compatible with the properties of \( F \). The constraints for “dinner” are now given as follows:

\[ \begin{align*}
(7) & \quad \text{a. dinner} \Rightarrow \text{event} \cdot \text{food} \\
& \quad \text{b. event} \cdot \text{food} \Rightarrow \text{EVENT-FACET} : \text{event} \land \text{EVENT-FACET} \cdot \text{THEME} : \text{food} \\
& \quad \text{c. event} \cdot \text{food} \supseteq_D \text{OBJ-FACET} : \text{food} \\
& \quad \text{d. event} \cdot \text{food} \land \text{OBJ-FACET} : \top \Rightarrow \text{EVENT-FACET} \cdot \text{THEME} \equiv \text{OBJ-FACET} \\
& \quad \text{e. ev-mod} \land \text{event} \cdot \text{food} \land \text{OBJ-FACET} : \top \Rightarrow \bot
\end{align*} \]

The OBJ-FACET attribute pointing to the secondary facet is generated by (7c), which is a default constraint. These constraints generate the frame of “dinner”:

\[
\begin{bmatrix}
  \text{dinner} \\
  \text{EVENT-FACET} : x \\
  \text{OBJ-FACET} : y \\
  \text{event} \\
  \text{THEME} : y \\
  \text{TIME} : \text{evening} \\
  \text{food}
\end{bmatrix}
\]

After unifying with the frame of a facet-picking modifier “lively” (frame \( 2 \)), the type of the resulting frame is ev-mod \( \land \) dinner, so according to the constraint (7e), the obj-facet should not exist and therefore the default constraint (7b) cannot apply, which leads to the result frame \( 3 \):

\[
\begin{bmatrix}
  \text{ev-mod} \\
  \text{EVENT-FACET} : x \\
  \text{ATMOSPHERE} : \text{lively} \\
  \text{event} \\
  \text{THEME} : \text{food} \\
  \text{TIME} : \text{evening} \\
  \text{ATMOSPHERE} : \text{lively}
\end{bmatrix}
\]

For nouns that have two secondary facets such as 讲话 (jiǎng huà) ‘speech’, both facets are generated by default constraints, but there is also an additional constraint ensuring that at least one facet will always exist.

## 4 Conclusion

This paper proposes a distinction of primary facets and secondary facets in inherently polysemous nouns. A primary facet is more prominent than a secondary facet in a polysemous noun. Copredication is more likely to happen if the primary facet is targeted after the secondary facet. In event \( \cdot \) food nouns the event facet is the primary facet and the object facet is the secondary facet. In object \( \cdot \) info nouns both facets are primary facets. In some event \( \cdot \) info nouns both facets are secondary facets. When both facets are secondary facets, the availability of \( V + \text{Mod} + N \) co-predication depends on the adjectival modifiers. Copredication can happen only if the modifier is a facet-keeping modifier.

This paper also briefly introduces the formalization of the primary and secondary facets in frame semantics and RRG. Two different approaches are discussed. The first one uses edge features in Tree Wrapping Grammar. The edge features in the tree of the modifier decides whether the frame of the modified phrase has one or two facets. The second one incorporates default logic into the attributive-value logic in frame semantics. The attributes indicating the secondary facets are generated by default constraints, and will be cancelled when the conflicting constraints apply.

\( ^4 \) Cf. Osswald (2005) for a more formal exposition of the underlying default logic and its relation to other approaches in the literature.
References


