Comparison-based modification in derivational morphology: diminutives, augmentatives and stereotype negation

Abstract Although the intuitive effects of modification in derivation are clear, the semantic details are certainly not. In the present study, I seek to explicitly model the way morphological processes can access the inner structure of a base lexeme and bring about changes in its properties. I lay out the characteristics of comparison-based modification and offer evidence from evaluative morphology that challenges the idea that modification can be modeled as the addition of a component of meaning to the base lexeme. I motivate an analysis under which evaluative morphology is relational in nature. That is, evaluative morphology expresses a relation between the derived lexeme and a standard of comparison, with respect to a pertinent scale. Finally, I enquire into whether there are morphological processes other than evaluation that exhibit comparison-based modification.

1 Introduction

Derivational processes are usually classified into class-changing and class-maintaining. Class-changing derivation is one of the best-studied areas in word formation and attempts to formalize its lexical semantic properties are ubiquitous (see for example the seminal work of Lieber 2004). Despite differences in assumptions and mechanisms (e.g. co-indexation, reference shifting), a common denominator in the various lexical-semantic analyses of class-changing derivation is that the morphological process brings about a change of reference. For example, in verb-to-noun derivation, the morphological process may target an argument of the base verb, which in turn becomes the new referent of the derived lexeme. This accounts for the agentive reading of *employer* in *-er* suffixation and the patient reading of *employee* in *-ee* suffixation; *-er* targets the agent argument, and *-ee* selects the patient argument of the verb *employ*.

Rather less attention has been paid to the lexical-semantic treatment of morphological processes that do not shift the reference of a lexeme, but rather operate

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on the base lexeme and manipulate its inner structure. For example, processes that bring about a modification of the base lexeme. Evaluative morphology figures as a prime example of how morphological processes can access the inner structure of a base lexeme and bring about changes in its properties, as for example in the SIZE (BIG vs SMALL) of a lexeme.

This paper aims to inform the discussion on the way modification works at the interface between morphology and lexical semantics. To this end, I invoke a constraint-based architecture under which

> "A grammar is best stated as a set of constraints on possible linguistic objects. As in all formal theories of grammar, utterances and other linguistic objects are modelled by mathematical structures. What sets apart constraint-based theories is the use of a description logic (or set of such description logics) whose model theory makes explicit under what conditions a grammatical constraint is satisfied by a model." (Bonami & Crysmann 2016: 609)

In particular, I follow a frame-based approach[1] (Petersen 2007; Kallmeyer & Osswald 2013; Löbner 2014) and motivate a treatment of evaluative morphology in terms of lexical rules using the formalism of attribute-value matrices.

Some pertinent questions I will address are the following:

- *Can modification be considered as the addition of a semantic component to the base lexeme?*
- *What would be the nature of this semantic component? Is it a semantic primitive?*
- *By which mechanism is this component added to the base?*
- *How can we account for polysemy?*
- *How could comparison-based modification account for evaluative morphology?*
- *Are there morphological processes other than evaluation that exhibit comparison-based modification?*

By answering these questions, the present study aims to also fill a gap with respect to the study of modification in morphology and other fields. As I will show,

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[1] Frames have been used by several scholars to model linguistic phenomena (for an overview see Lehrer & Kittay 1992). Frames, for example, figure in works on Lexical Functional Grammar (Bresnan 2001) and Head-Driven Phrase Structure Grammar (Pollard & Sag 1994). More recently, Sag (2012) uses a version of Frame Semantics and Minimal Recursion Semantics (Copestake et al. 2005). Fillmore's frames (Fillmore 1982) are used in the FrameNet project (Fillmore & Baker 2010). For an overview of the main similarities and differences between frame-based approaches, the interested reader is referred to Osswald & Van Valin (2014). For evidence for frames in human language see Löbner (2014).

the semantics of comparison-based morphology should not be treated in isolation from advancements in the study of the semantics of scales in other fields (Kennedy 2007; Barner & Snedeker 2008; Bale 2011; Tessler et al. 2017).

The rest of the paper is structured as follows: Section 2 presents the way the semantics of evaluative morphology has been treated in previous literature and introduces the notion of standard of comparison. Section 3 gives a brief overview of the way a frame-based approach can be used to capture the semantics of word formation. In Section 4, I offer an analysis of the semantics of evaluative morphology and in Section 5, I tackle the issue of polysemy. Section 6 offers evidence from stereotype negation which corroborates the idea that comparison-based modification should be studied in its own right. Section 7 concludes the paper.

2   Size, primitives, and modification

Following the seminal work of Scalise (1984: 132-133) on evaluative affixes, a number of approaches on the formal and pragmatic aspects of evaluation have been developed (for a recent handbook on evaluative morphology see Grandi & Körtvélyessy 2015a).

With respect to the formal aspect of evaluative morphology, scholars raise issues that pertain to the status of evaluative morphology, its place within morphology and its formal properties (Scalise 1984; Stump 1993; Beard 1995; Štekauer 2015; Grandi 2015).

Studies on the pragmatic and semantic aspect of evaluative morphology are primarily concerned with its descriptive and qualitative functions. Studies on morphopragmatics (Dressler & Merlini-Barbaresi 1994; Schneider 2003; Merlini-Barbaresi 2015) have contributed to our understanding of functions of evaluative morphology that emerge in discourse, as for example, "tenderness", "irony", "euphemism", "modesty", "anger", "pleasure", "request", "pleading", "contempt", and "sarcasm". Studies on semantics have analyzed evaluative morphology in terms of semantic primitives (Wierzbicka 1996; Lieber 2007), as a radial category (Jurafsky 1996), and from a cognitive perspective (Prieto 2005; 2015).

Although evaluation has been the focus of much literature, a satisfactory formal modeling of its semantics, and thus, modification in word formation, is still a desideratum. The intuitive effects of evaluative morphology might be clear, but the semantic details are certainly not.

In this section I present the way evaluative morphology has been treated in previous literature and introduce the notion of standard of comparison. I focus on two aspects. First, the central role of the category of size in evaluation. Second, the way modification works in evaluative morphology.

2.1 The central role of size

As argued for by Prieto (2015: 22), the meaning of evaluative affixes "is grounded in the fundamental bodily function of perception, and visual perception of size, particularly". Thus, the starting point for the meaning of evaluatives is the category of size (Jurafsky 1996; Prieto 2005; 2015). This means that the qualitative function of evaluative affixes (i.e. the expression of subjective feelings and opinions) is secondary, in that it derives from the descriptive one (i.e. the descriptive characteristics of an item) via figurative extensions such as metaphor (Wierzbicka 1984; Jurafsky 1996; Prieto 2005; 2015).

The link between size and other notions such as endearment is shown in the studies of Jurafsky (1996) and Prieto (2005) that build on the model of radial categories of Lakoff (1987). Under these approaches, there is a core primitive from which other senses emerge. Consider Figure 1:
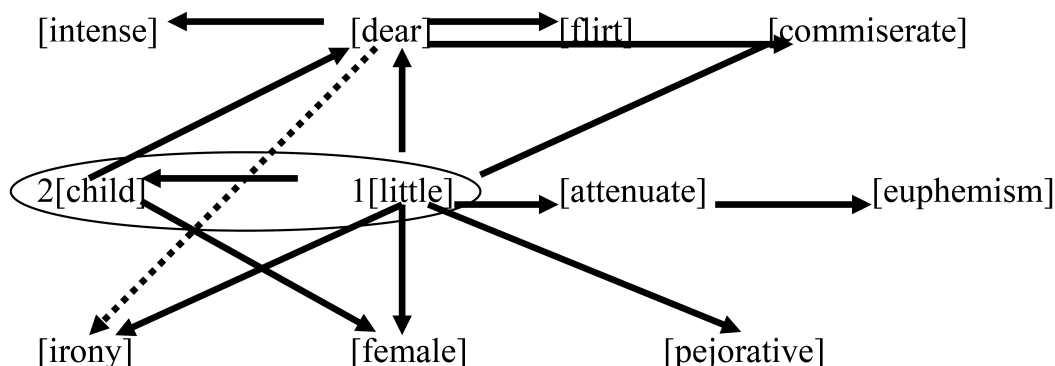
Figure 1: Radial models of diminutives (Prieto 2005: 86).

As shown in Figure 1, the polysemy of evaluative affixes can be considered as structured polysemy, in that there is a core from which other senses emerge. The core in Prieto's analysis of diminutives is "littleness". We will return to the issue of polysemy in Section 5.

In addition to polysemy, any treatment of the interface between morphology and lexical semantics needs to account for the way the semantics of the base and the semantics of the affix interact. That is, the way the affix modifies the base. Below I present the traditional view with respect to the semantics of evaluative morphology.

The traditional view, which I will call the "additive" view, is nicely captured in the following excerpt from Schneider (2013): "the suffix does not change the word class of the base, nor does it crucially change the meaning of the base. The meaning of the base is merely modified by adding the semantic component SMALL" (Schneider 2013: 138). As is clear from this passage, under the traditional approach, the

contribution of the affix is characterized as the addition of a component to the base. A formalization of this view can be sketched as in (1).

(1)   x + affix[SEM: SMALL] → x[SEM: SMALL] (where x is the morph. base)

In (1), there is a morphological base, e.g. *bomb*, we add to it a suffix, e.g. *-let*, which comes with the semantic specification SMALL, and we get a derived lexeme with the meaning 'small x', e.g. *bomblet*: 'a small bomb'. Thus, under the additive view, we have modification by addition of a component. This component is SMALL in the case of diminution and BIG in augmentation.

Although the approach sketched in (1) seems to be intuitively on the right track, it leaves much to be desired on a lexical-semantic level. In fact, although the intuitive effects of evaluative morphology are clear, the semantic details are certainly not. The traditional approach has three shortcomings:
- the ontological status of this assumed component (e.g. SMALL) is not clear,
- the mechanism by which it is added to the base has not been spelled out in any detail in the relevant literature, and
- the semantics of evaluation is more complex than the additive view suggests.

Let us begin with the examination of the ontological status of the assumed components (e.g. SMALL, BIG). Wierzbicka (1989; 1996) proposes to capture the distinction between the descriptive function and the qualitative function of evaluation in terms of the semantic primitives SMALL, BIG, GOOD, and BAD. The primitives SMALL and BIG, which Wierzbicka (1996: 36) calls "descriptors", relate to the evaluation of the physical properties of an item. The primitives GOOD and BAD, which Wierzbicka (1996: 36) labels "evaluators", relate to the expression of subjective feelings such as endearment, appraisal, contempt, and attenuation.

Lieber (2004; 2007; 2016a) also proposes an approach that is based on semantic features that are primitives of meaning. The feature that is relevant to evaluative morphology is the feature [scalar] that reads as

(2)   [+/–Scalar]: This feature signals the relevance of a range of values to a conceptual category. With respect to [–dynamic] SITUATIONS it signals the relevance of gradability. Those SITUATIONS for which a scale is conceptually possible will have the feature [+scalar]. Those SITUATIONS for which a scale is impossible will be [–scalar]. With respect to SUBSTANCES/THINGS/ESSENCES [scalar] will signal the relevance of size or evaluation. This will be the feature which characterizes augmentative/diminutive morphology in those languages which display such morphology. (Lieber 2016a: 39)

The analyses of Wierzbicka (1996) and Lieber (2007) highlight two important aspects of evaluative morphology. Lieber's analysis focuses on the importance of

scalarity in evaluative morphology and Wierzbicka's analysis highlights the importance of the category of size. Both proposals, however, have some shortcomings which relate to the ontological status of the assumed meaning components, and the mechanism by which they are added to the base.

A well-known problem with Wierzbicka's analysis relates to antonymy and the use of primitives such as SMALL and BIG. It is certainly not the purpose of the present paper to provide an overall theory of semantic features, but it is worth mentioning that the option to use semantic primitives such as SMALL/BIG is problematic from a semantic perspective. The basic characteristic of a semantic primitive is that it is not further analyzable. This means that we cannot decompose SMALL and BIG into smaller pieces of semantic information. But if SMALL and BIG cannot be further decomposed, it is unclear how one would establish a relation of antonymy between the two (Löbner 2013: 244).

Although Lieber is right to highlight the role of scalarity in evaluative morphology, it is not clear how the feature [scalar] could be used in order to derive the correct semantics of evaluative formations. It should be mentioned that an analysis which is based on positive and negative values (e.g. [-scalar] and [+scalar]) is rejected by Wierzbicka (1996: 108-109).

Let us now turn to the second shortcoming of the traditional approach. To date, there is a gap in the relevant literature on the mechanism by which a component of meaning is added to the base. A treatment of this issue is offered in a series of publications within the realms of Rochelle Lieber's Lexical Semantic Framework (see for example Lieber 2004; 2007; 2010; 2015; 2016b). This framework applies a decompositional approach to meaning and makes use of a repository of universal semantic features (i.e. semantic primitives) to which every particular language has access. As we saw above, the feature that accounts for evaluative morphology is [scalar]. Although Lieber offers a detailed formal treatment of affixational processes involving affixes such as *-er*, *-ee*, and *non-*, she does not elaborate upon evaluative morphology in any detail.

Finally, a description of the semantics of evaluative morphology is more complex than what the approach in (2) suggests. Consider the following from Grandi & Körtvélyessy (2015b: 13):

> "[...] a linguistic construction can be defined as evaluative if it has the function of assigning a value which is different from that of the standard or default (within the semantic scale to which it pertains) to a concept: this value usually coincides with a shift towards the negative or positive end of the scale and is assigned without resorting to any parameters of reference which are external to the concept itself. [...] For example, the Italian sentence *questa é una casetta*

‘this is a small house (lit. house-DIM)’ means that the house in question is small with respect to the standard size of Italian houses.” (Grandi & Körtvélyessy 2015b: 13)

This passage introduces some crucial characteristics of evaluative morphology that any semantic account must take into consideration. First, evaluation assigns a value that is different from the default within a pertinent scale. Second, the assignment of this value is not based on parameters of reference which are external to the concept itself (on this also see among others Jurafsky 1996; Körtvélyessy 2015; Štekauer 2015).

2.2 Evaluation is relational and not additive

Based on the foregoing discussion I propose that the analysis of the semantics of evaluative morphology should not be treated in isolation from advancements in the study of the semantics of scales in other fields (Cresswell 1977; Klein 1980; Kennedy 2007; Barner & Snedeker 2008; Bale 2011; Tessler et al. 2017).

In particular, I will use the notion of standard of comparison which provides a frame of reference for the comparison. Jurafsky (1996) uses a similar notion, namely, that of the prototypical exemplar of a category. In the *casetta* ‘small house’ example from Grandi & Körtvélyessy (2015b: 13) the standard of comparison is other Italian houses. In a similar vein, the standard of comparison in the sentence in (3) is the set of *9-year-old* children.

(3)   John is tall for a 9-year-old.

A major difference between evaluation in morphology and evaluation in syntax is that in morphological formations the standard of comparison is explicit, whereas in syntax it could be left implicit. Consider for example that in (4), the standard of comparison, i.e. the set of all people, is implicit:

(4)   John is tall.

Based on the foregoing discussion, I propose that contrary to the additive view, evaluation is relational and not additive in nature. The semantics of evaluative morphology involves a comparison between the derived lexeme and a standard of comparison, with respect to a pertinent scale. In evaluative morphology, the standard of comparison is the base lexeme. It is this relational nature of evaluative morphology that I tackle and model in the present study. Despite the complex state of affairs exhibited by evaluative formations, I will show that the semantics of evaluative morphology can be accounted for in a straightforward manner in terms of a

constraint-based model with the use of frames. Given that evaluation relates to the value of an expression with respect to (as for example) size, a model that has attributes and values in its core architecture can inform the discussion on the semantic details of evaluation.

3   Frames

In what follows, I give a brief overview of the way frames are used as formats for describing concepts, with an emphasis on word formation.

Frames are recursive attribute-value structures that provide information about referents. They can be represented as either attribute-value matrices, as also used, for example, in Head-driven Phrase Structure Grammar (HPSG, Pollard & Sag 1994), or as directed graphs. In the latter formalization a frame is "a directed, connected graph with nodes labeled by types and arcs labeled by attributes" (Petersen & Osswald 2014: 248). Attributes are always functional, in that there cannot be two arcs labeled with the same attribute going out from one node. The central node is the reference node[2] and is marked by a double border; rectangular borders are used for arguments. Consider for example the partial frame of the concept >ball<[3] as a directed graph and as an attribute-value matrix:

$$
\begin{bmatrix} ball \\ \text{SHAPE} \quad round \end{bmatrix}
$$

Figure 2: Partial frame for >ball< as a directed graph and as an attribute-value matrix.

Figure 2 informs us that the SHAPE of >ball< is *round*. The double border marks the central node that refers to the extension of the concept. It should be mentioned that all frames which I will present in the paper will be partial and will include

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[2] The reference node stands for the referential argument. In the case of nouns, for example, it stands for the so-called "R" argument that suggests 'referential' and is involved in referential uses of NPs (Williams 1981; Wunderlich 2012).

[3] Concepts will be included in brackets > <.

information that is uncontroversial. That is, it is taken for granted that >ball< has at least one characteristic, that is its SHAPE. In this paper, I will model only those attributes that are necessary for the discussion. *ball* in Figure 2, for example, as a physical object has many more attributes (e.g. COLOR) which I do not model in the partial frame.
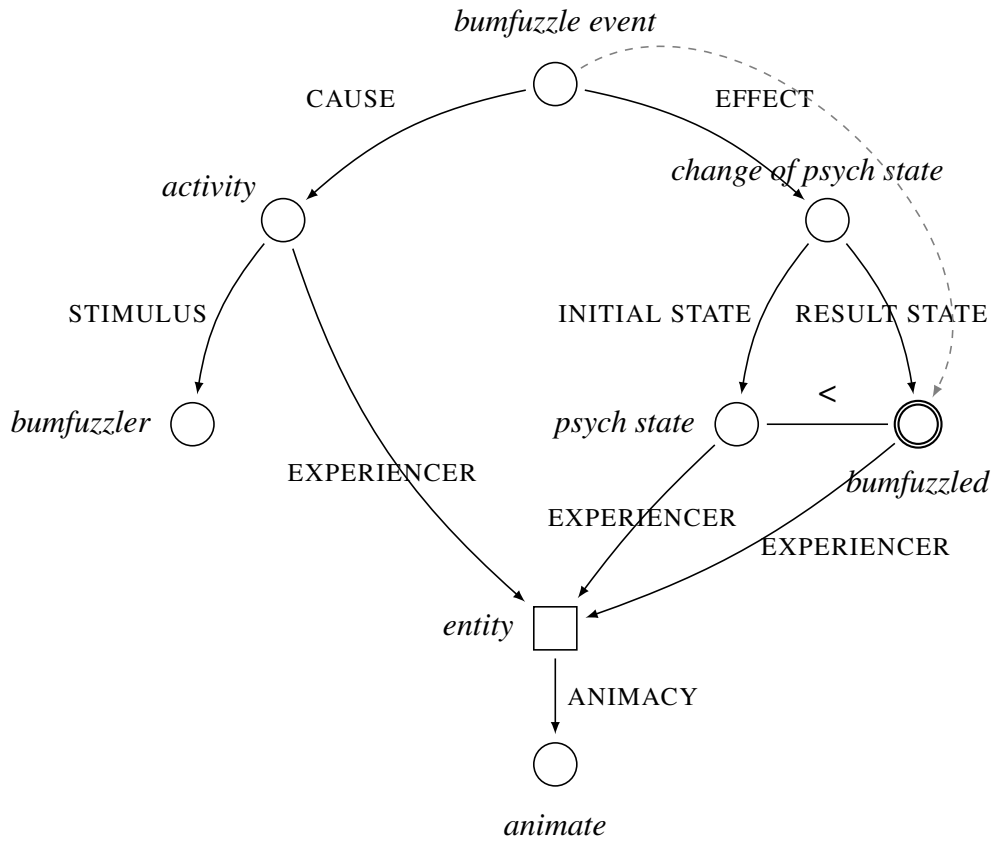
3.1 Word formation and frames

In frame-based approaches, word formation is generally treated in terms of referential shifts (see for example Löbner (2013) and Schulzek (2014) on *-er* and possessive compounds in German, and Kawaletz & Plag (2015) and Plag et al. (2018) on English *-ment* nominalizations). The derived *walker* serves as an illustrative example (from Löbner 2013: 312).
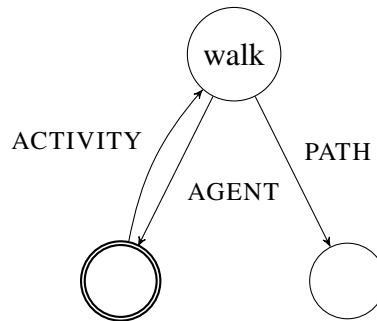
Figure 3: Frame for >walker<.

The concept >walk< has at least two attributes, namely AGENT and PATH as for example in *We walked to the station*. Thus, >walker< is formed by shifting the reference to the value of the attribute AGENT of >walk<. Observe that in accordance with bidirectional functionality, there is an attribute ACTIVITY that links the new referent back to the original referent node; a >walker< is engaged in a walking activity.

Kawaletz & Plag (2015) analyze *-ment* nominalizations in a similar manner. Consider, for example, the frame for the derived *bumfuzzlement* in Figure 4 (from Kawaletz & Plag 2015: 312).

bumfuzzle event

CAUSE   EFFECT

activity

change of psych state

STIMULUS   INITIAL STATE   RESULT STATE

bumfuzzler

<   *psych state*

bumfuzzled

EXPERIENCER

EXPERIENCER

EXPERIENCER

entity

ANIMACY

animate

Figure 4: Partial frame for the nominalization *bumfuzzlement* in a RESULT STATE reading.

In their analysis, the verb *bumfuzzle* is a complex event of psychological causation and consists of two sub-events: a CAUSE and an EFFECT. The CAUSE is an activity and the EFFECT is a change of psych state with an INITIAL STATE and a RESULT STATE. Thus, the RESULT STATE reading of *bumfuzzlement* is understood as a shift from the original referential node, i.e. *bumfuzzle event*, to the node *bumfuzzled*, which specifies the arc of RESULT STATE.

4   A constraint-based account of evaluation

In the previous section I presented cases in which the reference is shifted to an argument of the base. For example, we saw that the concept >walker< is formed by shifting the reference from the original referential node, WALK, to the value of

the attribute AGENT of >walk<. Evaluative morphology, however, serves a rather different function. Crucially, evaluation assigns a value that is different from the default within a pertinent scale.

The issue now arises how best to capture and model this function of evaluative morphology. In order to tackle this issue we have to be specific with respect to two aspects. The first aspect is the general format of concepts one assumes. I assume that the format of feature structures, on which frames are based, offer a straightforward modeling of the pertinent scale and the value the concept has for that scale. In a frame, the pertinent scale (e.g. size) is considered a functional attribute (i.e. SIZE) which assigns a particular value to the referent of the frame.

The second aspect is the mechanism by which one accounts for the properties of evaluative morphology. On this matter, there is a major gap in the relevant literature. I propose to capture evaluation in terms of a lexical rule that models the interaction of the semantics of the process of evaluation and the semantics of the base. Lexical rules have a long tradition in constraint-based models and have been used as a mechanism to reduce redundancy and to capture generalizations in the lexicon (see among others, Bresnan 1982; Pollard & Sag 1994; Briscoe & Copestake 1999; Sag 2012; Bonami & Crysmann 2016).

Lexical rules will be given in the form of attribute-value matrices and not in the form of graphs. Attribute-value matrices (contrary to graphs) make explicit reference to phonological and categorial features, and allow us to to express scope. Attribute-value matrices have been used in HPSG (Pollard & Sag 1994; Riehemann 1998; Koenig 1999) and other constraint-based models (see Bonami & Crysmann 2016 and literature therein) to capture morphological phenomena. In frame-based approaches, attribute-value matrices have also been used for syntactic and computational purposes (see for instance Kallmeyer & Osswald 2013; Osswald & Van Valin 2014).

In what follows, I exemplify how the system I described above can account for the semantics of evaluative formations. I use the core category of SIZE as a starting point.

The lexical rule in (5) derives lexemes with a diminutive meaning via suffixation as for example in the German *Tisch-lein* 'table-DIM', the Spanish *puebl-ito* 'village-DIM', the Italian *finestr-ella* 'window-DIM', or the English *bomb-let* 'bomb-DIM'.

(5)

$$
\begin{bmatrix}
lexeme \\
\text{PHON } /\boxed{1}\text{-suffix}/ \\
\text{CAT N} \\
\text{SEM } \left[\text{S-FRAME } \boxed{2} \, ! \, \begin{bmatrix} \text{SIZE} & \beta \\ ... & \end{bmatrix} \right] \\
\text{M-BASE } \begin{bmatrix} lexeme \\ \text{PHON } \boxed{1} \\ \text{CAT N} \\ \text{SEM } \left[\text{S-FRAME} \boxed{2} \begin{bmatrix} \text{SIZE} & \alpha \\ ... & \end{bmatrix} \right] \end{bmatrix} \\
\beta < \alpha
\end{bmatrix}
$$

The rule in (5) gives a parallel representation of phonological information (PHON), morphosyntactic information (in particular, category, CAT), and semantic information (SEM) of both the derived lexeme and the morphological base (M-BASE). The M-BASE feature accounts for the internal structure of morphologicaly complex words and is equivalent to the morphological daughters notation (M-DTRS) used in Bonami & Crysmann (2016).

An important part of attribute-value matrices is structure sharing. Structure sharing is used to indicate that information in feature structures is identical. This is expressed by boxed numerals which are called *tags*, as for example $\boxed{1}$.

Let us first elaborate upon the information with respect to the M-BASE. In (5), the M-BASE has the phonology $\boxed{1}$, its category is N(oun), and its semantic information is given in the form of a semantic frame (S-FRAME). The S-FRAME includes functional attributes that assign values to the referent of the frame, in this case the referent of the M-BASE. In (5), the M-BASE has a SIZE attribute with a value which we label α. This is the default value that is culturally or socially associated with the referent of the frame. The three dots in the S-FRAME indicate that there might be other attributes as well.

We now turn our attention to the derived lexeme that is phonologically realized as $/\boxed{1}$-suffix$/$, where $\boxed{1}$ is the phonology of the base lexeme.[4] This means that the derived lexeme and the base lexeme share the phonological value $\boxed{1}$. The value of

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[4] I use suffixation as an example since this is the most widely used morphological strategy in evaluation (Štekauer 2015). Similar to suffixation, the phonological part of evaluation via prefixation would be /prefix-$\boxed{1}$/.

CAT is the same for both the derived and the base lexeme. That is, both are specified as N(ouns).

The "S-FRAME $\boxed{2}$![SIZE β]" notation needs to be addressed in more detail. First, the boxed numeral $\boxed{2}$ shows that the value of the S-FRAME of the derived lexeme must be identical to the S-FRAME part of the M-BASE. Second, the "!" notation, which is borrowed from Sag (2012: 119), informs us that the values of the S-FRAME for the derived and base lexemes are identical except for what follows "!". That is, the value of SIZE which we label β. In particular, the value of SIZE is β for the derived lexeme and α for the base lexeme.

Observe that the lexical rule in (5) captures a non-trivial characteristic of evaluative morphology which is very hard to formalize in lexical semantics. In particular, the value assigned by evaluation "is assigned without resorting to any parameters of reference which are external to the concept itself" (Grandi & Körtvélyessy 2015b: 13). The lexical rule in (5) combined with an important part of feature structures, i.e. structure sharing, allows one to account for this fact in a straightforward manner.

Let us now turn to the way we can derive the function of diminution in (5). The different values with respect to the attribute SIZE in (5) show that the derived lexeme and the base lexeme differ with respect to their position on the scale of SIZE. The value α is the default value for the base and β is the new value that is assigned via evaluation. This state of affairs alone, however, cannot derive any evaluative reading. Thus, the last part of the rule in (5) comes with a constraint that regulates the relation between the values for SIZE. In particular, (5) comes with a constraint on the relation between α and β, i.e. "$\beta < \alpha$" ("β is smaller than α"). This constraint fixes the relation between the derived lexeme and the base lexeme as one of diminution and derives the desired semantics, in that the derived lexeme is smaller on the scale of SIZE than the base lexeme.

The semantics of augmentation can be modeled in a similar vein. I propose to model augmentation in terms of a lexical rule that comes with the constraint "$\beta > \alpha$" ("β is larger than α") as in (6).

(6)
$$
\begin{bmatrix}
lexeme \\
\text{PHON } /\text{prefix-}\boxed{1}/ \\
\text{CAT N} \\
\text{SEM } \begin{bmatrix} \text{S-FRAME } \boxed{2}\ !\ \begin{bmatrix} \text{SIZE} & \beta \\ \dots & \end{bmatrix} \end{bmatrix} \\
\text{M-BASE } \begin{bmatrix} lexeme \\ \text{PHON } \boxed{1} \\ \text{CAT N} \\ \text{SEM } \begin{bmatrix} \text{S-FRAME} \boxed{2} \begin{bmatrix} \text{SIZE} & \alpha \\ \dots & \end{bmatrix} \end{bmatrix} \end{bmatrix} \\
\beta > \alpha
\end{bmatrix}
$$

5 Polysemy

Evaluative affixes in the languages of the world can express a range of readings that goes beyond the category of SIZE (e.g. approximation, partitive). The polysemy of evaluation can be captured in two ways. First, as we already saw in Section 2, multiplicity of readings can be accounted for in terms of general semantic mechanisms such as metaphor. The mechanism of metaphor is evident, for example, in the link we observe between evaluation and the female gender. In the case of diminution, this link is based on the opposition female/male (e.g. women are smaller than men). The relation between women and augmentation is based on yet another opposition, namely mother/child (for details and more examples see Jurafsky 1996: 546).

There are senses, however, such as approximation and partitive, which cannot be easily accounted for by general mechanisms such as metaphor. Examples include approximation in the Cantonese diminutive *hong hong* 'reddish' or the Greek *ksinutsikos* 'sourish' (Jurafsky 1996: 549). Such cases are accounted for by a mechanism which Jurafksy calls "lambda-abstraction-specification". This mechanism allows one to derive second-order senses of evaluation with the semantics "smaller than the prototypical exemplar *x* on the scale of *y*". For example, the Cantonese diminutive *hong hong* 'reddish' or the Greek *ksinutsikos* 'sourish' involve a scale of *redness* and *sourness* respectively. Although one could propose that most cases of lambda-abstraction-specification do involve metaphor, as for example a transition from SIZE to AMOUNT in partitive senses, "there is no motivated explanation of why this particular set of metaphors is employed" (Jurafsky 1996: 559).

In the present study, I remain agnostic on whether such cases should be accounted for by metaphor or lambda-abstraction-specification. The present analysis, nonetheless, allows one to account for cases of lambda-abstraction-specification by the same general mechanism of modification I proposed for the scale of SIZE. More specifically, the scale in question (e.g. *amount* in partitive readings) is labeled using an appropriate attribute (i.e. AMOUNT), and the desired semantics follows from different values for the relevant attribute in the base lexeme and the derived lexeme.

Consider for example the partitive reading in the Zulu *amazw-ana* 'words-PART, a few words' (Gibson et al. 2017) and the approximation reading in the Greek *ksin-utsikos* 'sour-APPROX, sourish'.[5]

The rule for the partitive reading is given in (7).

(7)
$$
\begin{bmatrix}
\textit{lexeme} \\
\text{PHON } /\boxed{1}\text{-suffix}/ \\
\text{CAT N} \\
\text{SEM } \begin{bmatrix} \text{S-FRAME } \boxed{2}\ !\ \begin{bmatrix} \text{AMOUNT} & \beta \\ ... & \end{bmatrix} \end{bmatrix} \\
\text{M-BASE } \begin{bmatrix} \textit{lexeme} \\ \text{PHON } \boxed{1} \\ \text{CAT N} \\ \text{SEM } \begin{bmatrix} \text{S-FRAME} \boxed{2} \begin{bmatrix} \text{AMOUNT} & \alpha \\ ... & \end{bmatrix} \end{bmatrix} \end{bmatrix} \\
\beta < \alpha
\end{bmatrix}
$$

In the rule in (7), the derived lexeme (e.g. *amazw-ana* 'words-PART, a few words') has a lower value for the attribute AMOUNT than the morphological base (e.g. *amazwi* 'words'). The relevant partitive reading derives from this relation between the two lexemes.

The rule for approximation via suffixation is given in (8).

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[5] Abbreviations: PART Partitive, APPROX Approximation.

(8)
$$
\begin{bmatrix}
\textit{lexeme} \\
\text{PHON } /\boxed{1}\text{-suffix}/ \\
\text{CAT A} \\
\text{SEM } \begin{bmatrix} \text{S-FRAME } \boxed{2} \; ! \begin{bmatrix} \text{SCALAR PROPERTY} & \beta \\ \dots \end{bmatrix} \end{bmatrix} \\
\text{M-BASE } \begin{bmatrix} \textit{lexeme} \\ \text{PHON } \boxed{1} \\ \text{CAT A} \\ \text{SEM } \begin{bmatrix} \text{S-FRAME} \boxed{2} \begin{bmatrix} \text{SCALAR PROPERTY} & \alpha \\ \dots \end{bmatrix} \end{bmatrix} \end{bmatrix} \\
\beta < \alpha
\end{bmatrix}
$$

In (8), the attribute SCALAR PROPERTY stands for the scalar property the gradable predicate has. In the case of *ksinutsikos* 'sourish' for example in (9), this property is SOURNESS. The value for SOURNESS in the derived lexeme (i.e. *ksinutsikos*) is lower than the value for the same attribute in the base (i.e. *ksinos* 'sour'). This derives the approximation reading.

(9)
$$
\begin{bmatrix}
\textit{lexeme} \\
\text{PHON } /ksinutsikos/ \\
\text{CAT A} \\
\text{SEM } \begin{bmatrix} \text{S-FRAME } \boxed{2} \; ! \begin{bmatrix} \text{SOURNESS} & \beta \\ \dots \end{bmatrix} \end{bmatrix} \\
\text{M-BASE } \begin{bmatrix} \textit{lexeme} \\ \text{PHON } ksinos \\ \text{CAT A} \\ \text{SEM } \begin{bmatrix} \text{S-FRAME} \boxed{2} \begin{bmatrix} \text{SOURNESS} & \alpha \\ \dots \end{bmatrix} \end{bmatrix} \end{bmatrix} \\
\beta < \alpha
\end{bmatrix}
$$

5.1   Inheritance hierarchy

The polysemy of morphological processes can be captured and organized in an inheritance hierarchy. Inheritance hierarchies are a useful tool to capture generalizations and avoid redundancy in the lexicon (Riehemann 1998; Koenig 1999; Desmets & Villoing 2009; Booij 2010; Tribout 2010; Bonami & Crysmann 2016; Plag et al. 2018). In an inheritance hierarchy subtypes inherit any appropriateness conditions supertypes may have.

In evaluative morphology, inheritance hierarchies can apply to two cases. First, polysemous affixes, and second, different affixes which serve the same semantic function. First, consider the diminutive suffix *-ana* in Zulu (adapted from Gibson et al. 2017: 356):
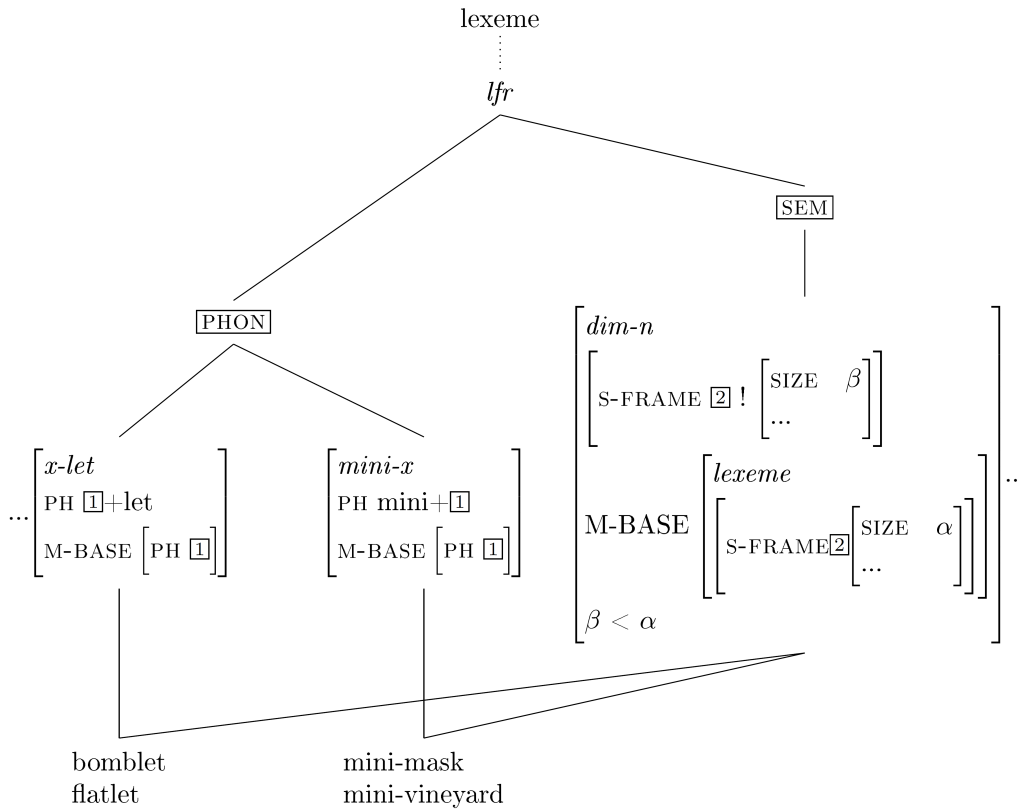
(10)   a.   *idolo* 'knee' *idolw-ana* 'small knee'

b.   *ifu* 'cloud' *if(w)-ana* 'small cloud'

c.   *amazwi* 'words' *amazw-ana* 'a few words'

d.   *izinsuku* 'days' *izinsukw-ana* 'a few days'

Figure 5 gives a partial inheritance hierarchy for the suffix-*ana*. It is a hierarchy of lexeme formation rules (i.e. *lfr*) with two dimensions, namely phonology (i.e. PHON) and semantics (i.e. SEM). The three dots to the left of the hierarchy signify that there are other affixes in the language and the three dots to the right show that there are other semantic nuances in the language as well. The phonological dimension includes the information that *x-ana* words share the phonology $\boxed{1}$+*ana*, where $\boxed{1}$ is the phonology of the morphological base. The semantic dimension includes two attribute-value matrices. One for diminutive nouns (i.e. *dim-n*) and one for partitive nouns (i.e. *part-n*). The morphologically complex lexemes occupy the lower level of the hierarchy and inherit properties from both the phonological dimension and the semantic dimension. With respect to their semantics, the lexemes *idolw-ana* 'small knee' and *if(w)-ana* 'small cloud' are diminutives and as such inherit properties from the *dim-n* part of the semantic dimension. In a similar vein, the partitives *amazw-ana* 'a few words' and *izinsukw-ana* 'a few days' inherit their semantic properties from *part-n*.
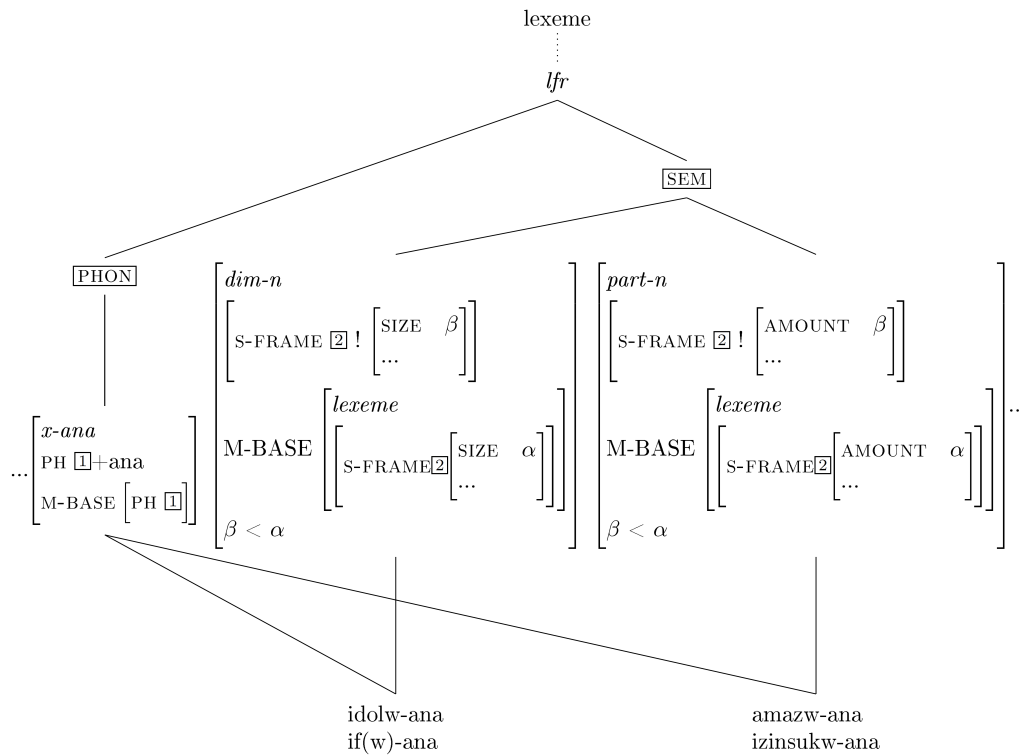
Figure 5: Partial inheritance hierarchy of lexeme formation rules for the affix
-ana.

The hierarchy in Figure 5 models a situation in which a single affix is polysemous. The inheritance hierarchy in Figure 6 accounts for cases in which different affixes serve the same semantic function. For example, both the suffix *-let* and the prefix *mini-* derive diminutives in English.

lexeme

lfr

SEM

PHON

$$\begin{bmatrix} x\text{-}let \\ \text{PH} \;\boxed{1}\text{+let} \\ \text{M-BASE} \begin{bmatrix} \text{PH} \;\boxed{1} \end{bmatrix} \end{bmatrix}$$

$$\begin{bmatrix} mini\text{-}x \\ \text{PH mini+}\boxed{1} \\ \text{M-BASE} \begin{bmatrix} \text{PH} \;\boxed{1} \end{bmatrix} \end{bmatrix}$$

$$\begin{bmatrix} dim\text{-}n \\ \begin{bmatrix} \text{S-FRAME} \;\boxed{2} \;! \begin{bmatrix} \text{SIZE} & \beta \\ ... \end{bmatrix} \end{bmatrix} \\ \text{M-BASE} \begin{bmatrix} lexeme \\ \begin{bmatrix} \text{S-FRAME}\boxed{2}\begin{bmatrix} \text{SIZE} & \alpha \\ ... \end{bmatrix} \end{bmatrix} \end{bmatrix} \\ \beta < \alpha \end{bmatrix} ...$$

bomblet   mini-mask
flatlet   mini-vineyard

Figure 6: Partial inheritance hierarchy of lexeme formation rules for the suffix
-let and the prefix *mini-*.

6   Comparison-based modification

The foregoing discussion suggests that comparison-based modification expresses a relation of comparison between the derived lexeme and a standard of comparison with respect to a set of properties.

In a constraint-based approach we can define comparison-based modification as in (11):

(11)   Comparison-based modification
A relation of comparison between the derived lexeme and a standard of comparison with respect to a set of attributes, in which the value for an attribute in the derived lexeme is different than the value for the same attribute in the standard of comparison.

An open issue is whether there are other morphological phenomena which exhibit this kind of relation. In my opinion, the phenomenon of stereotype negation lends itself readily to a comparison-based analysis. Bauer et al. (2013: 365) introduce this type of negation as follows:

> "In cases of STEREOTYPE NEGATION, a noun is taken to denote a bundle of characteristics or qualities {x, y, z, ...}. When certain affixes are attached, what is negated is not the meaning of the noun as a whole, but a number of its semantic characteristics or qualities. The resulting derivative still generally denotes the same entity or something close to it, but one that is missing several key characteristics. In effect, the noun denotes a non-stereotypical exemplar of its category." (Bauer et al. 2013: 365)

For example, a *nonanswer* and a *nonword* are non-stereotypical exemplars of the category of *answer* and *word* repsectively. A *nonanswer* is "an answer that does not deserve to be called an answer; an inadequate or evasive answer" and a *nonword* is "an unrecorded or hitherto unused word; a word which has (or is regarded as having) no accepted meaning" (Oxford English Dictionary, OED).

A model of comparison-based modification allows one to treat evaluative morphology and stereotype negation on similar grounds. In fact, the two phenomena seem to be pointing to opposite directions with respect to their function. In an atheoretical way, evaluative morphology seems to be "adding" material to the base lexeme, whereas stereotype negation seems to be "deleting" semantic material from the base lexeme and as a result, the derived lexeme is missing several key characteristics of the base lexeme.

The function of stereotype negation in English can be expressed in the rule in (12) (adapted from Andreou 2017: 12).

(12) $\begin{bmatrix} \textit{lexeme} \\ \text{PHON /prefix-}\boxed{1}/ \\ \text{CAT N} \\ \\ \text{SEM} \begin{bmatrix} \text{S-FRAME } \boxed{2} \ ! \begin{bmatrix} \text{ATTRIBUTE}_j & \neg\alpha \\ \ldots & \end{bmatrix} \end{bmatrix} \\ \\ \text{M-BASE} \begin{bmatrix} \textit{lexeme} \\ \text{PHON } \boxed{1} \\ \text{CAT N} \\ \\ \text{SEM} \begin{bmatrix} \text{S-FRAME} \boxed{2} \begin{bmatrix} \text{ATTRIBUTE}_j & \alpha \\ \ldots & \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix}$

This rule is similar to the rule for evaluation and offers a parallel representation of phonological information (PHON), morphosyntactic information (in particular, category, CAT), and semantic information (SEM) of both the derived lexeme and the morphological base (M-BASE). The M-BASE has the phonology $\boxed{1}$, its category is N(oun), and its semantic information is specified by semantic frame (S-FRAME). The M-BASE has an ATTRIBUTE$_j$ with the value α. The three dots in the S-FRAME indicate that there might be other attributes as well.
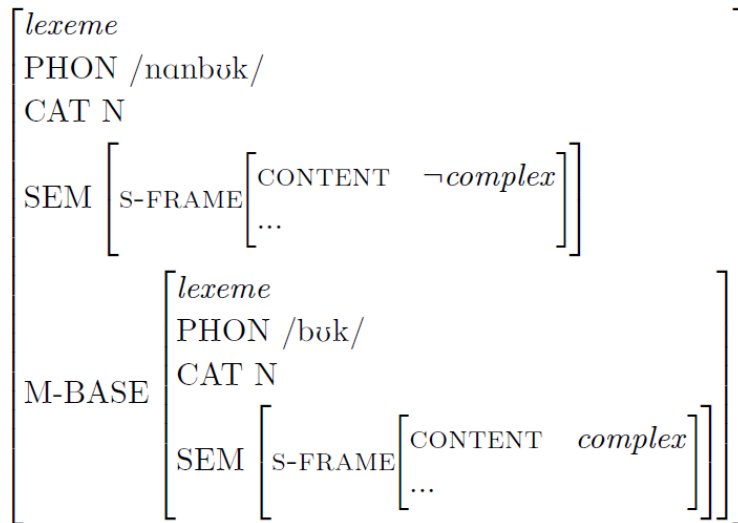
The derived lexeme is phonologically realized as /prefix-$\boxed{1}$/, where $\boxed{1}$ is the phonology of the base lexeme and the value for CAT is the same for both the derived and the base lexeme. The "S-FRAME $\boxed{2}$![ATTRIBUTE$_j$ $\neg\alpha$]" notation captures the fact that the value of S-FRAME of the derived lexeme must be identical to the S-FRAME part of the M-BASE. What is more, the "!" notation, shows that the values of S-FRAME for the derived and base lexemes are identical except for the value of ATTRIBUTE$_j$. In particular, the value of ATTRIBUTE$_j$ is $\neg\alpha$ for the derived lexeme and α for the base lexeme.

Consider for example the derived *nonbook* in (13):

(13)   In my writing workshops I often meet the equivalent writing hobbyists. They are people who are writing what I term "coffee-break books," simpleminded **nonbooks** that they turn out in short order. (COCA ACAD 2010)

Based on the contextual information "writing [...] "coffee-break books," simpleminded nonbooks [...]" we infer that the *nonbook* is a kind of *book* the content of which is not as complex as one would have expected. In fact, it is a "coffee-break" simpleminded book. This is modeled in the attribute-value matrix in (14) (adapted from Andreou 2017: 23).

(14)

$$
\begin{bmatrix}
lexeme \\
\text{PHON} \ /\text{nɑnbʊk}/ \\
\text{CAT N} \\
\text{SEM} \begin{bmatrix} \text{S-FRAME} \begin{bmatrix} \text{CONTENT} & \neg complex \\ \dots \end{bmatrix} \end{bmatrix} \\
\text{M-BASE} \begin{bmatrix} lexeme \\ \text{PHON} \ /\text{bʊk}/ \\ \text{CAT N} \\ \text{SEM} \begin{bmatrix} \text{S-FRAME} \begin{bmatrix} \text{CONTENT} & complex \\ \dots \end{bmatrix} \end{bmatrix} \end{bmatrix}
\end{bmatrix}
$$

It follows from (14) that the derived *nonbook* does not lack the property of content. It simply has a content which is different than the content of a stereotypical *book*. Thus, the rule in (12) allows one to treat the "absence" of stereotypical characteristics not as deletion, but as a change in the value of the relevant attributes. In other words, the "missing" characteristics are still part of the lexical-semantic structure of the derived lexeme.

Like the rule for evaluative morphology, the rule in (12) has all the characteristics of comparison-based modification since it expresses a relation between the derived lexeme and a standard of comparison with respect to a set of attributes. It is nevertheless more general than the rule for evaluation in (5) for reasons to which I turn my attention below.

The first reason relates to the types of attributes evaluative morphology and stereotype negation target. Evaluative morphology has scope over scalar attributes (e.g. SIZE), whereas stereotype negation can target all types of attributes (i.e. part attributes, property attributes, event attributes, and correlate attributes) irrespective of whether they are scalar or not. (15a) gives an example of negating an attribute that is not scalar, and (15b) provides an example of stereotype negation having scope over a scalar attribute.

(15) a. Here comes the **"Un-Car,"** an old, multi-hued Honda pulled dogsled-style by three harnessed adults, two kids and a dog. (COCA MAG 1997)

b. While research continues to create self-driving cars that can drive better than a human, there's also work to figure out the size and appearance of self-driving cars. [...] So what do you think? What will these vehicles of the near-future look like? Like the precious Google car? Golf cart-ish?

> Semi-truck-y? Like a worm? What should we call them? The **un-car**?
> The auto auto?
> (http://www.spokesman.com)

The contextual cue "pulled dogsled-style by three harnessed adults, two kids and a dog" in (15a) guides us to a reading under which the value for the POWER SOURCE of the particular car is not the stereotypical engine but rather a set of entities (for more examples and discussion see Andreou 2017). In one reading of (15b), stereotype negation has scope over the SIZE attribute of the base lexeme.

The second reason relates to the degree to which stereotype negation and evaluative morphology depend on contextual information. The examples in (15) highlight a particular characteristic of stereotype negation. That is, it is largely context dependent. It is the context which determines which attributes negation has scope over and what values these attributes take. In (15b), the size and appearance of the *un-car* are left underspecified. What we can infer from the context is that the *un-car* does not have a stereotypical size or appearance. It could be either smaller or larger than the stereotypical *car*. Evaluative morphology is less depended on context since the function of each evaluative affix is encoded in its core semantics. For example, lexemes derived by *-let* (e.g. *bomblet*) can relate to a smaller size whereas lexemes derived by *mega-* (e.g *megastore*) can relate to a larger size.
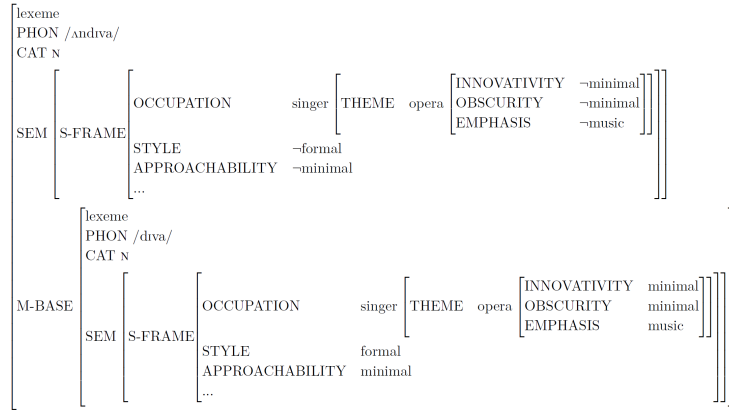
The third reason relates to the scope evaluation and stereotype negation can have. Evaluation targets attributes which directly assign properties to the referent of the frame. For example, the SIZE attribute assigns a value to the noun *bomb* in a direct manner. In addition to targeting attributes which belong to the core frame of a referent, stereotype negation can also have scope over sub-frames that are embedded into the frame for the original referent. An example is given below:

(16)   Dawn Upshaw has been called the **'un-diva'** of the opera world, often preferring to perform innovative, relatively obscure works that emphasize words over music in an informal style, often - imagine this - even chatting with an audience at recitals. (COCA SPOK 1994)

From the immediate context we can infer that stereotype negation has scope over the STYLE of the *un-diva* (i.e. "preferring to perform [...] works in an informal style") and her APPROACHABILITY (i.e. "[...] even chatting with an audience at recitals"). These attributes belong to the core frame of the *un-diva* and assign properties directly to the referent of the frame. The contextual information "innovative, relatively obscure works that emphasize words over music", introduces a number of attributes (i.e. INNOVATIVITY, OBSCURITY, and EMPHASIS) which do not assign properties to the *un-diva*, but rather to the works the *un-diva* prefers to perform. In

other words, these attributes belong to a sub-frame that is embedded into the core
un-diva frame as in (17) (adapted from Andreou 2017: 18).

(17)

$$
\begin{bmatrix}
\text{lexeme} \\
\text{PHON } /\text{\textturnv ndiva}/ \\
\text{CAT } \text{\textsc{n}} \\
\text{SEM} \begin{bmatrix} \text{S-FRAME} \begin{bmatrix} \text{OCCUPATION} & \text{singer} \begin{bmatrix} \text{THEME} & \text{opera} \begin{bmatrix} \text{INNOVATIVITY} & \neg\text{minimal} \\ \text{OBSCURITY} & \neg\text{minimal} \\ \text{EMPHASIS} & \neg\text{music} \end{bmatrix} \end{bmatrix} \\ \text{STYLE} & \neg\text{formal} \\ \text{APPROACHABILITY} & \neg\text{minimal} \\ ... \end{bmatrix} \end{bmatrix} \\
\text{M-BASE} \begin{bmatrix} \text{lexeme} \\ \text{PHON } /\text{diva}/ \\ \text{CAT } \text{\textsc{n}} \\ \text{SEM} \begin{bmatrix} \text{S-FRAME} \begin{bmatrix} \text{OCCUPATION} & \text{singer} \begin{bmatrix} \text{THEME} & \text{opera} \begin{bmatrix} \text{INNOVATIVITY} & \text{minimal} \\ \text{OBSCURITY} & \text{minimal} \\ \text{EMPHASIS} & \text{music} \end{bmatrix} \end{bmatrix} \\ \text{STYLE} & \text{formal} \\ \text{APPROACHABILITY} & \text{minimal} \\ ... \end{bmatrix} \end{bmatrix} \end{bmatrix}
\end{bmatrix}
$$

7 Conclusion

Although considerable research has been devoted to morphological processes that
bring about a change of reference, rather less attention has been paid to the lexical-
semantic treatment of processes that do not shift the reference of a lexeme, but
rather operate on the base lexeme and manipulate its inner structure. For example,
processes that bring about a modification of the base lexeme.

In the present study, I sought to explicitly model the way morphological pro-
cesses can access the inner structure of a base lexeme and bring about changes in its
properties. To this end, I invoked a constraint-based architecture to lay out the char-
acteristics of comparison-based modification. This allows us to, first, identify such
processes and, second, treat them in lexical semantics. I offered evidence that chal-
lenges the view that modification can be modeled in terms of the addition/deletion
of a semantic component to/from the base lexeme and proposed a model that builds
on the idea that the processes of evaluation and stereotype negation are relational
in nature. That is, they involve a relation of comparison between the derived lex-
eme and a standard of comparison with respect to a set of attributes, in which the
value for an attribute in the derived lexeme is different than the value for the same
attribute in the standard of comparison.

The proposed analysis highlights an important tenet of constraint-based frame-
works. That is, semantic information is structured. Information is not a mere list of
features, but comprises a complex network of attributes that assign particular prop-
erties to the referent of the frame. The fine-grained make-up of frames allows one

to delve into the structure of lexemes and model processes that can access the structure of a lexeme, operate on it and alter the value of attributes. This view allows us to reevaluate the way word-formation processes manipulate the base lexeme and offers new perspectives on the modeling of modification in the semantics of word formation.

Competing interests

The author has no competing interests to declare.

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