VALENCE ALTERNATIONS IN GERMAN: AN LMT ANALYSIS

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ABSTRACT: This paper proposes an LMT analysis for valence alternations in German of the form NP_k V NP_i [P NP_j] $\rightarrow$ NP_k V NP_j [P NP_i], where the indices denote referential identity. These alternations involve direct internal arguments (i.e., objects) and indirect prepositional complements, and characterize among others the behaviour of verbal predicates which participate in the so-called Locative Alternation phenomena in German.

1 Introduction

This paper focuses on valence alternations in German of the following general form:[1]

(1) NP_k V NP_i [P NP_j] $\rightarrow$ NP_k V NP_j [P NP_i]

These alternations involve direct internal arguments (i.e., objects) and indirect prepositional complements.

Such alternation patterns in German characterize among others the behaviour of verbal predicates which participate in the so-called Locative Alternation phenomena[2] (see Dowty (1991), Rappaport and Levin (1988), Levin and Rappaport Hovav (1991) on similar constructions in English).

The rest of the paper is structured as follows. In the next section (Section (2)) we will give a thorough overview of the behaviour of the relevant classes of verbs in German: the so-called *contact* predicates, the *removal* predicates, and the *impingement* predicates. In Section (3) we will present briefly previous analyses of valence alternations. Finally, in the last section (Section (4)) we are presenting the analysis of valence alternations in German that we are proposing here.

2 Locative Alternation in German: Overview

2.1 Contact Predicates in German

(2) Peter   goß   die Blumen   mit Wasser.
     Peter.N poured the flowers.A with water

     "Peter watered the flowers".

(3) Peter   goß   Wasser auf   die Blumen.
     Peter.N pour.PAST.3S water.A onto the flowers

     "Peter poured water onto the flowers".

(4) Peter   füllte den Tank   (mit Wasser).
     Peter.N filled the tank.A (with water)

     "Peter filled the tank (with water)".

(5) Peter   füllte   Wasser in   den Tank.
     Peter.N fill.PAST.3S water.A into the tank

     "Peter filled the tank with water".

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[1]The indices in (1) denote referential identity.

[2]As well as in the Dative Shift phenomena, which we do not examine here.

(2)-(5) are examples of German contact predicates which participate in the so-called locative alternation phenomena. Alternations in German with the locative verbs *füllen* (fill) and *gießen* (pour) are of the general form $\text{NP}_k \text{ V NP}_i \text{ [P NP}_j\text{]}$ $\rightarrow \text{NP}_k \text{ V NP}_j \text{ [P NP}_i\text{]}$, where the indices denote referential identity. The main features of such verbs in German is that they are morphologically identical and that they involve two arguments: one denoting a *location* and one denoting the *locatum* (*die Blumen* (flowers)/*den Tank* (tank) and *Wasser* (water), respectively, in (2)-(5) above).

2.2 Removal Predicates in German

The *removal* predicates in German also take *locatum* and *location* arguments and they are distinguished in the following groups:

1. Predicates (like *leeren/entleeren* (empty)) which imply a change of state of the *location* argument when it is realized as the direct object of the verb:

   (6) Peter   leerte   den Tank.
   Peter.N emptied the tank.A
   "Peter emptied the tank".

   (7) Peter leerte   das Wasser aus   dem Tank.
   Peter emptied the water.A from the   tank
   "Peter emptied the water from the tank".

2. Predicates which denote a contact with the *location*, as well as a change of location. These predicates may also specify the manner or the instrument related to the action of moving (*wischen* (wipe)). *wischen* does not admit a *von*-PP (of/from-PP) complement when its *location* argument is realized as the direct object (example (8)). In this case *wischen* does *not* entail the existence of a *locatum* argument. For instance, the act of wiping a board does not necessarily result in wiping something off it.

   (8) *Peter   wischte die Tafel   von   Kreide.
   Peter.N wiped   the board.A from chalk
   "*Peter wiped the board of chalk".

   (9) Peter   wischte die Tafel.
   Peter.N wiped   the board.A
   "Peter wiped the board".

(10) Peter   wischte die Kreide von der Tafel.
Peter.N wiped   the chalk.A from the board
"Peter wiped the chalk from the board".

3. *säubern* (trim) is different than *wischen* (wipe), though, in the sense that "trimming an object" necessarily means "trimming something off this object":

(11) Peter   säuberte den Busch von trockenen Ästen.
Peter.N trimmed the bush.A of   dry   branches
"Peter trimmed the bush of dry branches".

2.3   Impingement Predicates in German

A typical impingement verb in German is *schlagen* (hit). According to Dowty (Dowty 1991), the verb *hit* (in English) does not imply any change of state for any of its arguments which may surface syntactically as direct object. The same semantic entailments also hold for the German verb *schlagen*. *schlagen* is an assymetric predicate in that when the *location* argument is realized as the direct object of the predicate the *locatum* argument is optional, but when the *locatum* argument is realized as the direct object all arguments are obligatory.

(12) Peter   schlägt den Gong   (mit dem Klöppel).
Peter.N hits   the gong.A (with the   clapper)
"Peter hits the gong with the clapper".

(13) Peter   schlägt den Klöppel   gegen den Gong.
Peter.N hits   the clapper.A against the gong
"Peter hits the clapper against the gong".

(14) *Peter   schlägt den Klöppel.
Peter.N hit.3S   the clapper.A
"*Peter hits the clapper".

For verbs in the *schlagen* (hit) subclass of German, the *mit* (with) alternant (example (12)) entails that one of the arguments (i.e., the *locatum*) is understood as the instrument ("means") which is used by the actor in order to perform the action denoted by the verb. The "*gegen*" (against) alternant (see example (13)), on the other hand, entails that the *locatum* undergoes directed motion.

3 Previous Analyses of Locative Alternations

3.1 Rappaport and Levin (1988) and Pinker (1989)

Valence alternations like the ones we have presented in Section (2) have always posed an interesting theoretical challenge.

As Rappaport and Levin (1988) have shown, the locative alternation variants in English differ in entailments: the *with* variant has an entailment the locative alternant lacks (see examples (15) and (16), respectively).

(15) The farmer loaded the wagon with hay. (*with*-variant)
$\Rightarrow$ The hay was loaded on the wagon.
$\Rightarrow$ The wagon was loaded with hay.

(16) The farmer loaded hay on the wagon. (locative variant)
$\Rightarrow$ The hay was loaded on the wagon.
$\not\Rightarrow$ The wagon was loaded with hay.

Based on this, Rappaport and Levin (1988), as well as Pinker (1989), assume that the two alternants of the English locative verbs *load* and *spray* have different semantic contents and propose that the alternation is about alternate choices of object (see examples (17) and (18)).

(17) Peter sprayed the statue with paint. (*with*-variant)
ACT-ON (PETER, STATUE, BY (CAUSE (PETER, GO (PAINT, TO (STATUE)))))

(18) Peter sprayed the paint onto the statue. (locative variant)
CAUSE (PETER, GO (PAINT, TO (STATUE)))

One of the problems, though, among others, with such analyses of valence alternations is that there is no independent semantic motivation for the new metalanguage predicate/keyword BY (see (17) below).

3.2 Jackendoff (1990)

Jackendoff (1990) finds neither of the above mentioned accounts totally convincing. That is, he does not find convincing that Rappaport and Levin (1988), as well as Pinker (1989), connect completiveness with the fact that the *wagon* (see example (15) above) is Patient when it is in object position, which means that in order to be "affected" it must end up fully loaded.

According to Jackendoff (1990), the association of Patient with direct object is not invariable, since (19) below, for instance, is not too bad.

(19) ? What Bill did to the truck was load books on it.

According to Jackendoff, (19) is not necessarily completive. Hence, the connection of affectedness to completiveness cannot be sustained, either.

Moreover, according to his analysis, the object of *with* in the completive form displays the determiner constraints characteristic of a Theme being located in a distributive location:

(20) Peter loaded books/some books/the books onto the wagon.

(21) Peter loaded the wagon with books.

(22) Peter loaded the wagon with ?*some books.

(23) Peter loaded the wagon with the books.

This, according to Jackendoff, suggests that the proper account of the completive reading is that it involves a distributive location: the books completely occupy the relevant space in the interior of the wagon. Thus, *load* in this frame denotes: "cause to come to be in$_d$", exactly like, for instance, *fill* (or the German verb *füllen* in example (4) in Section (2.1) above).

This leads to the following entry for *load* in the NP-*with*-NP frame that Jackendoff (1990) proposes.

(24)
$$
\begin{bmatrix}
\text{LOAD} \\
\text{V} \\
\quad \text{NP}_j \\
\Big[\text{CAUSE} \left([\ ]_i, \Big[\text{INCH} \Big[\text{BE} \left([\ ], \underset{I}{[} \text{N}_d/\text{ON}_d\, [\ ]_j] \right) \Big] \Big] \right) \Big]
\end{bmatrix}
$$
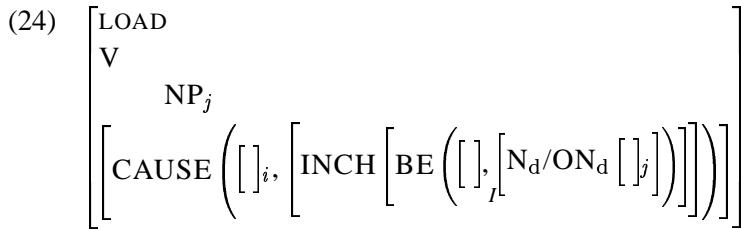
In the entry in (24), the Theme is not coindexed to the syntax, and the reference object is coindexed to the direct object. As a result, the *with*-phrase in (15), for instance, is interpreted as a Theme, whose grammatical function is that of an adjunct. Hence, the hay ends up in the wagon (cf., also Rappaport and Levin (1988)).

As far as the relation between the *with* variant and the *locative* alternant is concerned, according to Jackendoff (1990), there are two conceptual structure differences between them. First is the distributive-nondistributive difference in many of the verbs (though not in *spray*, for example). The second is that in the *locative* alternant, these verbs appear to be verbs of motion rather than inchoatives, since they occur with a wide variety of Path prepositions: the use of the Path prepositions *into* and *onto* are, according to Jackendoff (1990), strong evidence that the verb in question is a GO-verb rather than an INCH BE-verb.

The relation between the *with* alternant and the *locative* variant, then, does not appear in Jackendoff's (1990) analysis to be a simple case of multiple frames.

Rather, Jackendoff (1990) proposes that some relation of elaboration is called for, along the lines of Rappaport and Levin (1988), who suggest that the *locative* alternant represents the core reading and the *with* variant is its elaboration. That is, *Peter loaded the wagon with hay* in such an account is roughly "Peter filled the wagon with hay by loading hay onto the wagon". Another possibility would be to start with *load the wagon* as core, and consider the *locative* alternant as an elaboration of this core. On this model, *Peter loaded hay onto the wagon* is roughly "Peter put hay onto the wagon in order to load the wagon with hay". Alternatively, Jackendoff (! earNPjackendoff:90) suggests to follow Pinker (1989), who proposes that locative alternation verbs may vary in which member of the alternation is the conceptual core.

3.3 Markantonatou and Sadler (1996)

Markantonatou and Sadler (1996) use underspecified verb entries in order to provide an (HPSG) analysis for verb alternations in English which affect specifically the choice of direct and indirect internal arguments.

Unlike Rappaport and Levin (1988), Pinker (1989) and Jackendoff (1990), in their analysis no lexical rules are implicated in relating the two different semantics they assume for the English locative verbs, which correspond to different syntactic argument structures. Instead, for their analysis they rely on the application of the rules of their linking component, the simultaneous satisfaction of different constraints and on type inference.

As an example of how their analysis works, let us take a closer look at their proposal for the English verb *load*, which, as the German verbs *gießen* and *füllen* in examples (2)-(5) in Section (2.1) above, has two alternative forms, each with an optional oblique which is existentially quantified when not syntactically realized:

(25)   John loaded the hay on the wagon.

(26)   John loaded the wagon on the hay.

The following is the semantic representation that Markantonatou and Sadler assume for the (active) English verb *load*:

257

(27)

$$
\left[\begin{array}{ll}
\text{REL} & \textit{load} \\[4pt]
\text{ARG1} & \boxed{1}\left[\text{OTHER } \left\{\textit{location}\right\}\right]_{\textit{argtype}} \\[8pt]
\text{ARG2} & \left[\begin{array}{ll}\text{LINK} & \textit{causer\_ntc} \\ \text{OTHER } \{\} \end{array}\right]_{\textit{argtype}} \\[10pt]
\text{ARG3} & \boxed{2}\left[\text{OTHER } \left\{\textit{locatum}\right\}\right]_{\textit{argtype}} \\[10pt]
\text{SEM.CONS.} & \left[\begin{array}{ll}\text{REL} & \bot \\ \text{ARG1} & \boxed{1} \\ \text{ARG2} & \boxed{2} \end{array}\right]_{\textit{contact}}
\end{array}\right]_{\textit{specc}}
$$

They presuppose that

> "...the [English] verb *load* has **only one** argument for which proper-
> ties relevant to linking are expressed. This argument is the argument
> which will eventually surface as the subject. Otherwise, *load* requires
> a location and a locatum argument, but it does not define any entail-
> ments over these arguments which would enforce any particular link-
> ing" (Markantonatou and Sadler (1996, p. 52)).

According to Markantonatou and Sadler, it is this lack of further specifications which permits the location-object locatum-object alternation, and which reflects the fact that the two alternants of the verb *load* in English are somehow symmetric with respect to the optionality of oblique arguments. As far as existential quantifi-cation is concerned, they assume that arguments which appear in the lexical entry of *load* as first level or embedded (second level) semantic arguments are existen-tially quantified.

load, according to them, also has a value specified for the attribute SEM.CONS, which indicates that there is an entailment of contact between the ARG1 and the ARG3 of the predicate *load* (the location and the locatum). Markantonatou and Sadler underline that "the fact that this is the most general type of contact will in turn ensure that the predicate can surface with both *with*-PP and *on, in, etc*-PP".

As far as linking of the arguments of the verb *load* is concerned, Markantonatou and Sadler assume that by means of the semantic representation that they propose in (27) two options are possible: "[Either] ARG2 is linked to subject as it has no other choice, and since it is a top level argument which is not also the argument of an embedded predicate, it must be linked. [Or] ARG1 and ARG3 are not specified for any LINK values and therefore they can each link either to the object of the verb or to the object of a predicate that maps an embedded relation.... [Finally] similar argumentation can be developed if one assumes that instead of linking the

ARGs first, the system links SEM.CONS first" (Markantonatou and Sadler (1996, p. 52-53)).

Finally, the fragment of the hierarchy of *semcons* in Figure (1) below shows how the alternation characterizing the locative verbs like *load* in English is accounted for in the theory proposed by Markantonatou and Sadler, which we have presented briefly above.

$$
\begin{bmatrix}
contact \\
\text{REL} \quad \bot \\
\text{ARG1: argtype} \\
\text{ARG2: argtype}
\end{bmatrix}
$$

$$
\begin{bmatrix}
contact\_with \\
\text{REL: with} \\
\text{ARG1:} \begin{bmatrix} \text{LINK:} \quad \text{incr\_pp} \\ \text{OTHER} \{\text{LOCATION}\} \end{bmatrix} \\
\text{ARG2:} \begin{bmatrix} \text{OTHER:} \{\text{LOCATUM}\} \end{bmatrix}
\end{bmatrix}
\quad
\begin{bmatrix}
contact\_ltn \\
\text{REL: on OR in OR...} \\
\text{ARG1:} \begin{bmatrix} \text{OTHER:} \{\text{LOCATION}\} \end{bmatrix} \\
\text{ARG2:} \begin{bmatrix} \text{LINK:} \quad \text{incr\_pp} \\ \text{OTHER} \{\text{LOCATUM}\} \end{bmatrix}
\end{bmatrix}
$$
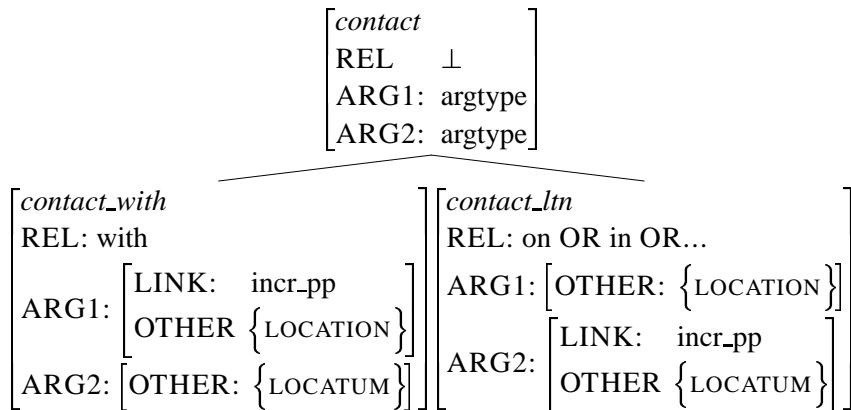
Figure 1: The hierarchy of *semcons* that Markantonatou and Sadler propose for English locative verbs like *load*

3.4 Locative Alternations in the traditional Lexical Mapping Theory

In the Lexical Mapping Theory (LMT) literature the (English) locative alternations are not extensively discussed. In an effort to account for such alternations in LMT, adapting the thematic role analysis which Ackerman (1992) has proposed for locative inversion in Hungarian to the locative alternation data at hand is a natural step to take and gives results along the lines described in (28) and (29).

(28)   The farmer loaded the wagon with hay. (*with*-variant)
         load<   agent   theme(locatum)   location >
                     -o   ??   ??
                   SUBJ   OBL$_{with/theme}$ OBJ

(29)   The farmer loaded the hay on the wagon. (locative alternant)
         load<   agent   theme(locatum)   location >
                     -o   -r   -o
                   SUBJ   OBJ   OBL$_{on/goal}$

As shown in (28) and (29), though, such a thematic role analysis is indeed problematic because the attempt to account for two diffent linkings to the respective grammatical functions from the same array of thematic roles clearly fails.

A way out in this case might have been to assign randomly a [+r] intrinsic classification feature to one of the non-agent roles in the a(rgument)-structure in (28) above. This would have led, for instance, to an output like the following:

(30)   The farmer loaded the wagon with hay. (*with*-variant)
   load< agent theme(locatum) location >
       -o   +r   -r
      SUBJ OBL$_{with/theme}$ OBJ

(31)   The farmer loaded the hay on the wagon. (locative alternant)
   load< agent theme(locatum) location >
       -o   -r   -o
      SUBJ OBJ   OBL$_{on/goal}$

This "solution", though, does not really solve the problem, since the assumption that the theme of the *with*-variant in (30) above should be assigned the intrinsic classification feature [+r] is a stipulation.

4   The Analysis

4.1   Motivation and Basic Assumptions

The analysis we propose here addresses the problematic points that a traditional LMT account does not seem able to avoid. Specifically, the analysis we propose in the following aims at overcoming the difficulties that classical LMT analyses of valence alternations are inevitably confronted with, given that the assignment of grammatical functions in traditional LMT is based on a uniform hierarchy of thematic roles in the argument structure. Moreover, it also aims at showing that the implicational differences of the locative alternation variants are to be derived from alternative realizations, and not from alternative lexical meanings.

Thus, the following two points are crucial for the analysis we propose:

1. we rely on Rappaport and Levin's (1988) conclusion that the locative alternation variants differ in entailments, as well as on the fact that this difference in entailments is found across all locative alternation verbs in English, as well as German that we are interested in here. This is a fact which according to Rappaport and Levin (1988) suggests that the entailments in the case of locative alternation verbs are associated with the variants and not the verbs or the

different arguments these verbs support, as is for instance the case with the dative alternation in English.

2. we follow Baker (1997), Maling (2001), and Levin and Rappaport Hovav (2001) who suggest that with locative alternation verbs either the location or locatum argument shows "object" properties depending on which is object (see examples (32) and (33) which are due to Baker (1997) and Williams (1980); their counterparts in German we give in (34) and (35)).

(32) the loading of hay onto wagons / the loading of wagons with hay (nominalization)

(33) John loaded the hay onto the wagon green. / John loaded the wagon full with hay. (secondary predication; from Williams (1980))

(34) das Laden von Heu auf den Wagen / das Beladen des Wagens mit Heu

(35) Peter lud den Wagen mit Heu voll.

(36) das Gießen der Blumen mit Wasser / das Gießen vom Wasser auf die Blumen

(37) das Füllen des Tanks mit Wasser / das Füllen vom Wasser in den Tank

4.2 Locative Alternation in German: the Analysis in LMT

Thus, the LMT analysis we propose below for locative alternations in German adopts the above mentioned two points. Moreover, for the analysis we are presenting below we follow Zaenen (1993).

In brief, Zaenen (1993) addresses the general dissatisfaction with the use of thematic roles, and instead, she incorporates Dowty's (1991) theory of proto-roles into her analysis of Dutch unaccusatives, dispensing with thematic role hierarchies. The association of the LMT intrinsic classification features with the verbal head's participants is guided in Zaenen's theory by the following principles (see Zaenen (1993, pp. 150,152)):

1. if a participant has more agent properties than patient properties, it is marked -o;

2. if a participant has more patient properties than agent properties, it is marked -r;

3. assumption: if a participant has an equal number of properties, it is marked -r;

4. stipulation: if a participant has neither agent nor patient properties, it is marked -o;

5. typological principle: in languages in which SUBJ (and OBJ?) is encoded through case-marking and agreement (and not via word order) lexically case marked participants are always +r.

And the association of the LMT intrinsic classification features with the LFG grammatical functions is guided in Zaenen's theory by the following principles (see Zaenen (1993, p. 151)):

1. order the participants according to their intrinsic markings as follows: -o < -r < +o < +r

2. order the GRs (grammatical functions) as follows: SUBJ < OBJ < OBJ$_\theta$ (< OBL)

3. starting from the left, associate the leftmost participant with the leftmost GR it is compatible with.

Consequently, our proposal for both variants of the German locative verb *gießen* (see also Section (2.1), examples (2) and (3)), for instance, does not rely on thematic roles.

(38) Peter goß Wasser auf die Blumen. (locative alternant)
gießen< agent patient(locatum) nonpatient(location) >
-o ($\hat{\theta}$-arg) -r -o
SUBJ OBJ OBL$_{(auf)}$

(39) Peter goß die Blumen mit Wasser. (*mit* (with)-variant)
gießen< agent patient(location) nonpatient(locatum=means) >
-o ($\hat{\theta}$-arg) -r -o
SUBJ OBJ OBL$_{(mit)}$

Instead, conventional labels in the spirit of Zaenen (1993), such as *agent*, *patient* and *nonpatient*, are used in order to indicate that the verb supports three arguments, each of which is associated with some general lexico-semantic entailments: an agent ("external"/ "semantically-and-syntactically-most-prominent" argument (a $\hat{\theta}$ [-o] argument in LMT terms)), and two other arguments, one with patient entailments (*patient*), and one with neither patient nor secondary-patient entailments (*nonpatient*).

Consequently, *nonpatient* is correctly predicted in both cases to bear the intrinsic classification feature [-o], which maps it to the grammatical function OBL in the case of both variants of the German locative verb *gießen*. *patient*, on the other hand, which can be related either to the argument of the verb which denotes the locatum (see (38)) or to the argument of the verb which denotes the location (see (39)), since both may bear "object" properties, when they are not instantiated as indirect prepositional complements, as we have seen above, is intrinsically classified as [-r]. This classification maps it to the grammatical function OBJ in the case of both variants of the German locative verb *gießen*. This treatment is in accordance with the proposal of Baker (1997), Maling (2001), and Levin and Rappaport Hovav (2001) for this argument of locative alternat! ion verbs which we presented above briefly.

The same analysis holds for both variants of the German locative verb *füllen* (see also Section (2.1), examples (4) and (5)):

(40) Peter füllte Wasser in den Tank. (locative alternant)
      füllen<   agent   patient(locatum)   nonpatient(location) >
                  -o ($\hat{\theta}$-arg)   -r   -o
                  SUBJ   OBJ   OBL$_{(in)}$

(41) Peter füllte den Tank (mit Wasser). (*mit* (with)-variant)
      füllen<   agent   patient(location)   (nonpatient(locatum=means)) >
                  -o ($\hat{\theta}$-arg)   -r   (-o)
                  SUBJ   OBJ   (OBL$_{(mit)}$)

For the *mit* (with) alternant of the verb *füllen* (example (41)), where the indirect internal argument (the PP *mit Wasser*) appears to be optional, we assume that semantically the *change-of-location* entailment associated with it carries existential import, even when the PP is not syntactically overt.

4.3   German Removal and Impingement Predicates in LMT

Extending the LMT analysis for the German *contact* predicates we have presented in Section (4.2) above to the *removal* predicates of the same language (see also the examples in Section (2.2) above), we get the following:

(42) Peter leerte das Wasser aus dem Tank.
      leeren<   agent   patient(locatum)   nonpatient(location) >
                  -o ($\hat{\theta}$-arg)   -r   -o
                  SUBJ   OBJ   OBL$_{(aus)}$

263

(43) Peter wischte die Kreide von der Tafel.

wischen<	agent	patient(locatum)	nonpatient(location) >
	-o ($\hat{\theta}$-arg)	-r	-o
	SUBJ	OBJ	OBL$_{(von)}$

(44) Peter säuberte den Busch von trockenen Ästen.

säubern<	agent	patient(location)	nonpatient(locatum) >
	-o ($\hat{\theta}$-arg)	-r	-o
	SUBJ	OBJ	OBL$_{(von)}$

Finally, applying the LMT analysis for the German *contact* predicates we have presented in Section (4.2) above to the *impingement* predicates of the same language (see also the examples in Sections (2.3) above), we get the following:

(45) Peter schlägt den Klöppel gegen den Gong. (locative alternant)

schlagen<	agent	patient(locatum)	nonpatient(location) >
	-o ($\hat{\theta}$-arg)	-r	-o
	SUBJ	OBJ	OBL$_{(gegen)}$

(46) Peter schlägt den Gong (mit dem Klöppel). (*mit* (with)-variant)

schlagen<	agent	patient(location)	(nonpatient(locatum=means)) >
	-o ($\hat{\theta}$-arg)	-r	(-o)
	SUBJ	OBJ	(OBL$_{(mit)}$)

For the *mit* (with) variant of the verb *schlagen* (example (46)), where the indirect argument (the PP *mit dem Klöppel*) appears to be optional, we assume, like in the case of the verb *füllen*, that semantically the *change-of-location* entailment associated with it carries existential import, even when the PP is not syntactically overt.

5   Conclusion and Outlook

In conclusion, the analysis we have proposed in Section (4) overcomes the problems that traditional LMT accounts have encountered with locative alternation verbs cross-linguistically (see, for instance, examples (28) and (29) in Section (3.4) above). It addresses the problem of grammatical function assignment for locative alternations of the *load/spray* type in a version of LMT that allows for a more fine-grained and more flexible intrinsic classification of arguments than the traditional model that builds on atomic thematic roles in a fixed hierarchy.

Specifically, in the analysis we have presented in Section (4) above

1. the implicational differences of the locative alternations in German are derived from alternative realizations, not from alternative lexical meanings;

2. both the location and the locatum arguments of the German locative alternating predicates are shown to bear "object" properties depending on which is object. This verifies that the insights of Rappaport and Levin (1988), Baker (1997), Maling (2001), and Levin and Rappaport Hovav (2001) are correct.

Moreover, the LMT analysis of locative alternations in German that we have presented in Section (4) above provides an excellent constrained treatment of grammatical constructions in LFG.

Finally, the analysis we have presented in Section (4) can extend easily cross-linguistically in order to cover locative alternating verbs in other languages, such as Modern Greek:

- Modern Greek *contact* verbs

    (47) O   georgos fortose   to ahiro sto   karo.
         the farmer.N load.PAST.3S the hay.A onto-the wagon
         "The farmer loaded the hay on the wagon".

    (48) O   georgos fortose   to karo   me ahiro.
         the farmer.N load.PAST.3S the wagon.A with hay
         "The farmer loaded the wagon with hay".

    (49) I   diadilotes   psekasan   tin mpogia sto
         the demonstrators.N.PL spray.PAST.3PL the paint.A onto-the
         agalma.
         statue
         "The demonstrators sprayed the paint onto the statue".

    (50) I   diadilotes   psekasan   to agalma me mpogia.
         the demonstrators.N.PL spray.PAST.3PL the statue.A with paint
         "The demonstrators sprayed the statue with paint".

- Modern Greek *removal* verbs

    (51) O Petros adiase   tin dexameni (apo to nero).
         the Peter.N empty.PAST.3S the tank.A   (of the water)
         "Peter emptied the tank (of water)".

    (52) O Petros adiase   to nero   apo tin dexameni.
         the Peter.N empty.PAST.3S the water.A from the tank
         "Peter emptied the water from the tank".

(53) O Petros katharise to thamno apo ta xera kladia.
the Peter.N trim.PAST.3S the bush.A of the dry branches

"Peter trimmed the bush of the dry branches".

(54) *O Petros skupise to tigani apo to ladi.
the Peter.N wipe.PAST.3S the pan.A from the oil

"*Peter wiped the pan of the oil".

(55) O Petros skupise to tigani.
the Peter.N wipe.PAST.3S the pan.A

"Peter wiped the pan".

(56) O Petros skupise to ladi apo to tigani.
the Peter.N wipe.PAST.3S the oil.A from the pan

"Peter wiped the oil from the pan".

- Modern Greek *impingement* verbs

(57) O Petros htipise ton frahti.
the Peter.N hit.PAST.3S the fence.A

"Peter hit the fence".

(58) O Petros htipise ton frahti me to xilo.
the Peter.N hit.PAST.3S the fence.A with the stick

"Peter hit the fence with the stick".

(59) O Petros htipise to xilo sto frahti.
the Peter.N hit.PAST.3S the stick.A onto-the fence

"Peter hit the stick against the fence".

(60) *O Petros htipise to xilo.
the Peter.N hit.PAST.3S the stick.A

"*Peter hit the stick".

Applied to Modern Greek, the analysis we have proposed in Section (4) will provide, for instance, the account presented in (61) and (62) below for the Modern Greek *contact* verbs:

(61) O georgos fortose to ahiro sto karo. (locative alternant)
the farmer.N load.PAST.3S the hay.A onto-the wagon

"The farmer loaded the hay on the wagon".

$fortono<$ agent patient(locatum) nonpatient(location) $>$
        -o ($\hat{\theta}$-arg)   -r   -o
        SUBJ   OBJ $OBL_{(sto=Path-prep)}$

(62) O georgos fortose   to karo   me ahiro. (*me* (with)-variant)
      the farmer.N load.PAST.3S the wagon.A with hay

      "The farmer loaded the wagon with hay".
      fortono<   agent   patient(location)   nonpatient(locatum=means) >
                   -o ($\hat{\theta}$-arg)   -r   -o
                   SUBJ   OBJ   OBL$_{(me)}$

As far as English is concerned, extending the analysis for German we have presented in Section (4) above to English *contact* verbs, for instance, we get the following:

(63) The farmer loaded hay on the wagon. (locative alternant)
      load<   agent   patient(locatum)   nonpatient(location) >
                -o ($\hat{\theta}$-arg)   -r   -o
                SUBJ   OBJ   OBL$_{(on=Path-prep)}$

(64) The farmer loaded the wagon with hay. (*with*-variant)
      load<   agent   patient(location)   nonpatient(locatum=means) >
                -o ($\hat{\theta}$-arg)   -r   -o
                SUBJ   OBJ   OBL$_{(with)}$

The analysis we have presented in this paper for locative alternations in German, as well as Modern Greek and English, needs to be further extended, and also compared with an analysis of Dative Alternation/Dative Shift constructions in the above mentioned languages. This is of utmost interest, since the difference in the entailments associated to the alternants participating in Dative Alternation/Dative Shift is not related to the variants as whole constructions, as is the case with the locative alternations we have presented in this paper, but to the verbal heads of the variants or to the different arguments that these verbal heads support.

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