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Verb Classes and Alternations in Bangla, German, English, and Korean

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Abstract

In this report, we investigate the relationship between the semantic and syntactic properties of verbs. Our work is based on the English Verb Classes and Alternations of (Levin, 1993). We explore how these classes are manifested in other languages, in particular, in Bangla, German, and Korean. Our report includes a survey and classification of several hundred verbs from these languages into the cross-linguistic equivalents of Levin's classes. We also explore ways in which our findings may be used to enhance WordNet in two ways: making the English syntactic information of WordNet more fine-grained, and making WordNet multilingual.

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Contents

Introduction

Doug Jones

The main question we consider in this volume is the extent to which the semantics of verbs determines their syntactic properties. We will refer to the thesis that the properly formulated semantic structure of the verb determines the syntactic form of the sentence as the projection principle, following Marantz 1984 in his discussion of Chomsky 1981 and other work in linguistics to derive syntactic form from verb semantics.

We make a number of cross-linguistic comparisons in which we investigate the syntactic behavior of verbs in German, Bangla, and Korean which correspond to the English semantic classes of Levin's *English Verb Classes and Alternations.* The reason that we pay special attention to cross-linguistic work is very simple: if the meaning of a verb in one language is the same as its counterpart in another language, we expect its syntactic properties to be the same. We found that sometimes this is the case, and sometimes it is not. We do not feel, however, that we have negated the projection principle. We do feel that investigating the correspondences and non-correspondences across languages sheds light on aspects of meaning, syntax, and morphology that otherwise go unnoticed. Remarks about these aspects are to be found in the section on cross-linguistic work in by Khan, Sauerland, and Cho.

Several of the papers address various aspects of grammar and parsing. Parts of these papers are based on computational work that incorporated a database we constructed using the syntactic and semantic verb classes in Levin 1993, *English Verb Classes and Alternations* (hereafter EVCA). Ulicny discusses his parser which he implemented, based on the syntactic and semantic forms found in EVCA, as well as implications of his investigation for the status of the projection principle. Jones and Radhakrishnan discuss why certain modifiers are obligatory in verbs like English *put* – the proposal is that these verbs select transitive prepositions. Sauerland discusses techniques for automatically converting the lexical representations of our EVCA database into lexical entries for Sandiway Fong's principle-based parser Pappi. Kahn also gives a brief overview of Bangla grammar which is intended as a starting point for constructing a principle-based grammar for a parser, in particular, Pappi (Fong (1991)).

The paper by Kohl, *et al.*, is an exploration of the relationship between the semantic classes of EVCA and those in WordNet (Miller (1985)). Kohl discusses her work in enhancing our EVCA database to include WordNet word senses. She discusses the granularity and various other characteristics of the two systems of grouping verbs according to their meaning and syntactic properties. The frames we developed for representing thematic and syntactic information of the verbs are similar in de-sign to those used in the START system developed by Boris Katz and his colleagues at the MIT AI Lab (Katz & Levin (1988)).

The paper by Cho gives a prospectus for enhancing WordNet to accommodate other languages with a special emphasis on those with non-Roman scripts such as Korean.

The purpose of this report is to benchmark our progress toward understanding the basic questions around the projection principle as it applies to our work in natural language processing. The bulk of the work was done during the summer of 1994 at the MIT AI Lab under the sponsorship of Robert C. Berwick. We expect that our work will take a variety of directions in the future. We would like for it to form part of the basis of our continuing work in principle-based parsing and machine translation. We offer this work-in-progress in its rather rough form in the hope that other people may benefit from the effort that our group has put into the project.

An editorial note is in order regarding the format of this report. There are two potential sources of errors, although every effort has been made to avoid them. In order to convert the paper by Khan to LaTeX, I scanned the hardcopy draft of the report from August of 1994. I post-edited the OCR work, and I also preserved Khan's original Bangla script. I also converted the paper by Cho into hlatex format from the MULE encoded files. In a handful of cases, I was unable to convert the source files and I entered the Hangul myself.

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Nearly all of the work on the content of this report was done during the spring and summer of 1994, and I would like to thank Professor Robert C. Berwick for his support of this project during this time. I would also like to thank the people of the MIT Linguistics department for many helpful discussions about it: especially Noam Chomsky, Ken Hale, Morris Halle, Jay Keyser, Alec Marantz, Shigeru Miyagawa, and Wayne O'Neil. I would also like to thank Beth Levin for helpful discussions about theoretical issues relating to this work. I would especially like to thank the other contributing authors of this report for their hard work and dedication.

A significant amount of work has gone into the publication of this report since August of 1994, and I would like to thank the Institute for Advanced Computer Studies at the University of Maryland (UMIACS) for the resources that were available to me for finishing it. Five people deserve special mention for their help at various times over the past few months with their encouragement: Bonnie Dorr and Amy Weinberg at the University of Maryland were very helpful in their comments on the content of the work, as well as their general support of its goals. Federico Girosi of the Center for Biological and Computational Learning was very encouraging at an important point in the process. Boris Katz has been very kind in making time available to review this report. Additionally, I would like to thank Sally Richter of the Publications office of the MIT Artificial Intelligence Laboratory, whose support helped guide this publication to become an official AI Memo.

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Part I
Using WordNet for Linguistics

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Abstract

This chapter shows how to use Wordnet for linguistic research and engineering. We have enhanced Wordnet by linking it to a computerized database we have built from Levin's verb class alternations ("EVCA"), including thousands of example verbs. With this addition along with a simple sentence generation component, EVCA Wordnet can now output what *is not* a possible sentence pattern as well as what *is* a possible sentence pattern, and do so in the context of actual sentences. Second, we show how to use an enhanced Wordnet to probe multilingual verb patterns and exhibit a prototype multilingual Wordnet, with examples drawn from Korean, Japanese, and Bangla.

Introduction: the Wordnet Enterprise

The Wordnet enterprise, as George Miller has so aptly put it (1993) forges "the passage from computing with numbers to computing with words." In this chapter we show how the Wordnet framework can be extended to further the marriage of lexicography—traditional dictionaries— with linguistic science. The reason is simple: as is familiar, while traditional dictionaries often give us very good descriptions *explicit* word knowledge, they quite rightly do not usually provide the *tacit* information that all speakers have in common—because everybody already knows it. In this chapter we focus on just one sort of tacit knowledge: *verb alternations*. For example, even though the verbs *circle* and *revolve* are near synonyms, they cannot occur in the same contexts. Compare (1i) and (1ii) with (1iii) and (1iv) below:

(1) (i) The planet circles around the sun.
(ii) The plan revolves around the sun.
(iii) The planet circles the sun.
(iv) *The planet revolves the sun.

While we shall say a bit about *why* such *alternations* occur, our main concern here will be simply to *add* this information to Wordnet, because people need to know not only what sentence patterns are possible, but also what sentence patterns are impossible. Not only is this valuable in its own right, but it also helps solve another difficulty with traditional dictionaries that Miller (1993) has rightly pointed out:

> But they [people] have persistent problem. When they look up a word, especially a commonly used word, they often find a dozen or more different meanings. What the dictionary does not make clear are the contexts in which each of these different meanings would be understood. So we know what kind of information is required, but we have not yet learned how to provide it to a computer.
> (G. Miller, U.S./Japan Joint Workshop on Electronic Dictionaries and Language Technologies January 23–25, 1993.)

Therefore, we should not only provide the *positive* alternation patterns, we should also supply them in a form that people can easily understand, and this implies a system that can *generate* simple example sentences for possible and impossible contexts. This is precisely what we have done for verbs. The next publicly released version of Wordnet, 1.6 will most likely include this alternation information for over 2600 verbs (3034 word senses) along with our simple generation component to make these alternations accessible.

Of course, our aim goes beyond simple engineering functionality enhancements. By computerizing the Levin information, previously available only in a written text, we can use it for linguistic exploration of alternations in English and other languages. In particular, the fourth section of this chapter shows how one can use Wordnet to explore differences between natural languages such as Korean and Bangla.

Linguistic Verb Enhancements to Wordnet

We first turn to the basic verb enhancement to Wordnet developed by K. Kohl; what follows is excerpted from her technical report on her research (1995). The enhancement involved two steps:

1. Annotate the 2600 verbs of Part One of B. Levin's *English Verb Classes and Alternations* (EVCA) with WordNet word senses;
2. Develop resources for generating sample sentences for verbs in WordNet. In particular, Kohl's system generates 10153 example sentences. A modified version of WordNet reads these, where the verbs of EVCA have been folded into our modified WordNet.

Project Overview

Our basic goal was to add the information of the 226 sentence patterns of the 2600 verbs in Beth Levin's *English Verb Classes and Alternations* (EVCA) to WordNet, both to improve the sample sentences of verbs in WordNet and to boost the number of sentence patterns. Many of Levin's verbs and alternation patterns in Part I of EVCA were used to build a generation system in Prolog for these real example sentences, and these were added to Wordnet. In addition to demonstrating how to use linguistic knowledge to fine-tuning Wordnet coverage, we were able to add a "negative example" component, as shown below.

To summarize our procedure, we generated sample sentences for all of the verbs in Part One of EVCA. EVCA itself gives only one sentence per verb class, so significant effort was required to produce natural sentences for each verb. The Prolog notation for an EVCA verb class is displayed just below (this notation is for a slightly older version of Wordnet).

```
evca_dataset(2,
   [coil-3, revolve-2, rotate-1, spin-1, turn-2,
   twirl-1, twist-5, whirl-1,wind-3],

   [pattern(7:ii,'Motion Around an Axis',
     [
      eg(12:a,s,1,
         'Janet broke the cup.',
         [np,v,np]),
      eg(12:b,s,1,
         'The cup broke.',
         [v,np])]),
    pattern(105:ii,'Verbs of Motion Around an Axis',
     [
      eg(106:a,s,1,
        'The spaceship revolves around the earth.',
        [v,np,[p(around,1),np]]),
      eg(106:b,s,0,
        'The spaceship revolves the earth.',
        [v,np,[p(around_0,1),np]])])]).
```

If we had taken the noun phrases from Levin's example sentences and substituted these noun phrases blindly for any verb in the same class, we would not have come up with natural sentences. For instance, consider Levin's alternation type (12), the Causative/Inchoative Alternation, shown below.

(2) (i) Janet broke the cup.
(ii) The cup broke.

The verbs *bend, crease, crinkle, crumple, fold, rumple*, and *wrinkle* also follow the same Causative/ Inchoative Alternation. However, blind substitution would have found Janet folding the cup, even though this is not a possible action or a natural sentence.

English Verb Classes and Alternations

Part I of Levin's EVCA explores both the syntax and semantics of more than three thousand verbs. These verbs are classified according to similar meaning and similar behavior in sentence alternation patterns. Levin suggests that a verb's behavior in sentence alternations depends on its meaning. In EVCA, Levin gives real example sentences with each verb class to demonstrate the alternation. In the first half of EVCA, we boiled down Levin's 2600 verbs to 226 sentence patterns; a single sentence pattern may be grammatical for one class of verbs and ungrammatical for another. For instance, section 1.1.2.1 of EVCA associates verb class (7) with the alternation (12), while section 1.4.1 gives the same verb class (105) with the alternation (106).

(3) (i) (7) Roll Verbs: bounce, drift, drop, float, glide, move, roll, slide, swing including Motion Around an Axis: coil, revolve, rotate, spin, turn, twirl, twist, whirl, wind

(ii) Janet broke the cup.

(iii) The cup broke.

(iv) (105) *ROLL VERBS: bounce, drift, drop, float, glide, move, roll, slide swing including MOTION AROUND AN AXIS: coil, revolve, rotate, spin, turn, twirl, twist, whirl, wind

(v) (106) The spaceship revolves around the earth.

(vi) *The spaceship revolves the earth.
(on the interpretation "The spaceship circles the earth.")

Why Enhance WordNet?

WordNet distinguishes the different senses of words and produces synonyms and sample sentence frames each sense. However, WordNet was not designed to recognize the syntactic patterns that come from the semantic meaning of the verbs. On the other hand, wordnet does include at least one generic sentence frame for each sense. These frames distinguish verb features by showing the sentence patterns that the verbs may take. These sample sentences indicate specific verbal features, such as argument structure, prepositional phrases and adjuncts, sentential complements, and noun phrase animacy. The sentence frames are limited to the following simple format[1], like the following:

(4) Somebody ----s something PP.
Something is ----ing PP.
Somebody ----s something to somebody.
Somebody ----s somebody.

Enhancing WordNet with EVCA Syntactic Classes

To fold in the EVCA syntactic classes, we followed this procedure: First, we generated one sentence per word sense per alternation pattern. Then we parsed by hand these example sentences for each of Levin's verb classes. Third, each verb was assigned the corresponding WordNet sense number; see Appendix B for examples of EVCA datasets, or verb classes, containing the verbs with sense numbers, the example sentences, and the parses of the example sentences. Fourth, all of the verbs and the noun phrases in their alternations were studied to learn what properties were necessary for each noun phrase in the sentences for a particular verb. Using these properties, specific nouns were created, and these nouns comprised a "toy world" from which the sentences were generated. Consider again the verb *rotate*. Not all things can rotate. For something to rotate, it must be solid and axial. Thus the property list for the direct object of *rotate* is *[thing,solid,axial]*, and one

[1]See Appendix A for a complete listing of the thirty-four sentence frames.

instance of a solid, axial thing is a top. These example sentences and property lists would be very useful for learning the language. Comparing the verbs that appear in WordNet with those that appear in EVCA, it is clear that WordNet is very fine-grained for some verbs, but other semantic classes are missing. For example, the relatively morphologically productive *de-* and *un-* prefixed verbs such as *declaw* and *unzip* are largely missing from WordNet, as discussed later.

We next review this procedure step-by-step.

Parsing Verb Class Alternations: from Sentences to Schemas

As mentioned, after generating example sentences for each EVCA/Wordnet class, we hand parsed them, replacing the lexical items of the sentence with annotated parts of speech labels.[2] These parses, or **schema**, include such elements as noun phrases, verbs, prepositions, pronouns, and adverbs. Parses were revised also to give specific prepositions for each alternation in a class of verbs. Sometimes, however, not all verbs would fit using the same preposition. In these cases, each verb class, or dataset, was split into smaller classes that could all take the same preposition. In the end we were left with 250 verb classes.

To collapse these verb alternation classes, we looked first at Noun Phrase arguments. Following common practice, we assumed that each noun phrase has a *thematic role* for example, agent, theme, figure, ground, and others. In the original parses, we gave each noun phrase its explicit thematic role. To derive thematic role patterns from other more basic principles, or *schema*, we next look more closely at these thematically-marked parsed sentences.

In deriving the thematic role schemas, we considered the agent, or subject, to be any noun phrase to the left of the verb and the theme, or object, to be any noun phrase not in a prepositional phrase to the right of the verb. Currently noun phrases may act as the subject of the verb phrase, the object of the verb phrase, or the object of a preposition.[3]

Movement of Noun Phrases to Subject Position

In addition, we encoded *unaccusativity* in the schema. Why is this necessary? If there is no subject of the verb phrase, then the object moves to the subject position in the reading of the sentence, as in *The glass broke*. We also encoded the other thematic roles using prepositions, both overt and covert. If there is a prepositional phrase and the preposition is overt, then the same rule of the direct object moving to the subject position applies here also. The movement of noun phrases to the subject position when there exist in the sentence prepositional phrases with hidden prepositions will be seen later. We restate this procedurally below:

(5) a. If there is a subject of the verb phrase, it becomes the subject of the sentence.

b. If there is no subject of the verb phrase and there is no hidden preposition (except around), then the object of the verb phrase becomes the subject of the sentence.

c. Otherwise, the object of a hidden preposition becomes the subject of the sentence.

The example directly below, Levin's example (12) of the unaccusativity hypothesis in section 1.1.2.1 of EVCA, displays a sentence with no hidden prepositions but with this sort of argument structure.[4]

(6)

SENTENCE	ARGUMENT STRUCTURE Matrix
a. Janet broke the cup.	vp(v, np, np)
b. The cup broke.	vp(v, e, np)

Prepositions Yield Thematic Roles

Most of the alternations in EVCA hinge on the placement of prepositions and their objects. For most prepositions, alternations imply binary relationships between noun phrases, such as figure and ground or material and artifact. These relationships can be counted and numbered, so a preposition is given a reading number telling what kind of noun phrase its object should be. Since there are a limited number of prepositions and a small number of readings for each preposition, the preposition is a good location for information to be stored about noun phrases and relationships. We encoded nine readings of one preposition and only one of another, but these readings are now easily understandable. This information encoding also reduced the number of schema elements. In the example below, the preposition *to* in sentence the (a) sentence indicates that its object will be the indirect object of that sentence. In sentence (b), the indirect object has moved to the position before the direct object and has lost the preposition *to*.

(7) (i) Bill sold a car to Tom.

(ii) Bill sold Tom a car.

It seems that in sentence (b) that the *to* is still understood. We could say that this *to* is a **hidden preposition**. Recall that an alternation with noun phrases other than agent, object, bodyparts, animals, and cognates depended only on prepositions and their objects. Using the idea of hidden prepositions, *all* noun phrases could now be placed in prepositional phrases—some with overt prepositions like *to*, and the remainder with hidden prepositions. Each hidden preposition could be denoted by _0 appended to the end of it in Prolog notation. These

[2] D. Jones did the initial hand parse, and we modified the parses as the project progressed to suit our needs, for example, to fit the X-bar schema discussed below.

[3] We are considering adding the subject of a preposition to avoid the question of obligatory adjunction of prepositional phrases.

[4] In this representation of argument structure, **vp** means verb phrase, and an **e** denotes an empty element. Our current representation of (2.a.) is `[np,v,np]`, which is parsed as `vp(v,np,np)`, from which we get its thematic assignment. The vp subject becomes then sentence agent, and the vp object becomes the sentence theme. The verb phrase subject in `vp(v,np,np)` is the first np, and the verb phrase object is the second np.

prepositions, like overt prepositions, can then have reading numbers indicating the kinds of noun phrases they can appear with:

(8) (i) Jack sprayed paint on the wall
[np,v,np(figure),[p(on),np(ground)]]
[np,v,[p(with_0,4),np],[p(on,5),np]]
(ii) Jack sprayed the wall with paint.
[np,v,np(ground),[p(with),np(figure)]]
[np,v,[p(on_0,1),np],[p(with,7),np]]

When there is a hidden preposition in a sentence with no subject, the rule for movement to the subject position usually means moving the object of the hidden preposition, not the direct object. The one instance found in this study in which the direct object moves rather than the object of the hidden preposition is the case of a hidden preposition *around*. For the other prepositions studied, *with*, *to*, *in*, *for*, *from*, *into*, and *of*, it does not matter whether a direct object exists, since the object of the hidden preposition always moves.

For example, thematic roles in such a case can be derived as follows:

(9) (i) Mary rotates the top.
(ii) The top rotates.
(iii) The top rotates around its axis.
(iv) * The top rotates its axis.
(v) I cut the bread with this knife.
(vi) This knife cut the bread.
(vii) This knife doesn't cut.

Toyworld: A Model World for Sentence Generation

In several cases, a single specific noun phrase could be used throughout all the alternations to replace all or most instances of a certain kind of noun phrase in the schema. For example, almost all verbs could take a human subject, *Mary*. The subjects for the others that could not take a human were given separately. Some verbs can take a kind of subject other than a human subject. WordNet gives two separate sample sentences for these verbs, using somebody and something. In adding real sentences to WordNet, only one sentence per schema per sense was created, so only the human subject was chosen if it made sense. See Figure 4 in Appendix C for an example.

In order to come up with the rest of the good noun phrases for the sentences, it was necessary to find which properties a noun phrase needed to make sense in a sentence with a particular verb—the traditional notion of selectional restrictions, but now grounded on the EVCA alternations. To implement this, we associate with a verb certain properties for each noun phrase in its alternation. These property lists include such general descriptions as thing, animal, person, solid, liquid, and abstract, as well as some more specific qualities like *texture:springy*, *shape:axial*, *feathered*, and *physical_property:flammable*. Sometimes a specific noun would be included if the verb restricted nouns for one noun phrase to one of a very few choices. In the cases of noun phrases other than subjects also, many verbs can take either a human or an inanimate noun. WordNet gives these, too, as *somebody* and *something*. Since only one sentence was given from EVCA, the more appropriate noun was chosen, and it would be given that property list. See Figure 5 in Appendix C for an example.

In most cases, verbs grouped themselves together by requiring, at least most of the time, the same kind of noun for a particular noun phrase. For example, very many verbs demand solid direct objects in most ways that they are used. For example, sense 2 of *move* takes a solid object, as do *drop*, *hit*, *put*, and *shellac*. *Move* is a fairly general verb that can be done to a solid object. So we say that *drop*, *hit*, *put*, *shellac*, and many others inherit the property list of the verb *move*. We use this idea of linking through inheritances to propagate the property solid through all the verbs that need a direct object that is solid. These verbs that inherit the property lists of another verb are obviously not all synonyms. We simply used this technique of inheritances to show that they share the relevant properties of the noun phrase. In cases where there are noun phrases that pair themselves together almost all of the time, such as figure and ground or material and artifact, we represented the inheritances slightly differently. Sometimes two verbs could take the same sort of ground, but not the same type of figure. We decided that a verb inherits from another verb if and only if it inherits the properties of both noun phrases.

What is the shape of our lexical inheritance system? We call the general verb a *parent*. A verb that inherits its properties from another verb we call a *child*. There are always many more children than parents. The object of the verb phrase was the most common of all the noun phrases that were given property lists. In our baseline case, there were 142 parents and 2103 children, giving a ratio of more than 14 children to one parent; the distribution is relatively flat. For an instrument noun phrase, there were twelve parents and 112 children.

The property lists ranged from very general, e.g. *thing*, to very specific, e.g. *egg*. Other noun phrases had few total properties among all the property lists. Some of these surely overlap among different noun phrases. The instances of real nouns with these properties are also divided by the types of noun phrases. One improvement would be to keep the division by noun phrase type in the assignment of property lists to noun phrases of verbs but to remove the division in the real instances of noun phrases, since there is plenty of overlapping in the property lists among these types of noun phrases. Some property lists include properties such as *shape:round*, *texture:flexible*, or *texture:springy*. These give a feature that the noun phrase depends on and then what kind of quality that feature must have. In the direct objects, there are five different features and 38 qualities among these five features that the feature may have.

These property lists were built solely by intuition. In many cases, we may be able to derive the properties from the verb. As an example, the property list of the direct object of *bounce* is [em thing,solid,texture:springy]. But *springy* means simply that this object can bounce,or is bounceable. We are considering creating an operator that would derive this property from the verb. More specifically, *able(X)*, where X is the verb would create the property *X+able*. So *able(bounce)* would produce *bounce+able*, which could replace *texture:springy*.

Sometimes a verb can take only a very limited kind of direct object or other noun phrase. For example, *hatch* usually refers to a bird coming out of its egg. "To hatch a plan" would be a figurative use. Here we are considering defining a meta-operator, *refer(X)*, that would give this specific noun, egg, as the usual direct object of *hatch*. So *refer(hatch)* would give *egg* as the direct object.

We have encoded all of the lexical features into the noun phrases in their property lists so far. There is some other information that cannot be encoded in the noun phrases. We are considering adding this information into other parts of the sentence. For example, *drop* means "to go straight down" in simple terms. This means that the path of an object dropping has to be straight: compare "The pine cone dropped past the tree branch" vs. "The pine cone dropped around the tree." This remains a direction for future research.

The Sentence Generator

K. Kohl wrote the program to generate the sentences in Prolog. Using this program it is possible to create 4 levels of sentence description for WordNet to read. The simplest gives solely the generated sentence. Another produces the thematic roles of many noun phrases. The third gives the sentence, the thematic roles, and the property lists of many noun phrases, while the fourth gives the sentence, the thematic roles, and the property lists, as well as a few of the spray/load paraphrases discussed below. On a Sparc 10, it takes about 8 minutes to create a Prolog file of these sentences with the thematic roles and property lists and then about 15 minutes to read this file into Prolog and create three other files for EVCA WordNet to read. See examples of EVCA WordNet sessions in Appendix C.

Enhancing EVCA with WordNet Wordsenses

A Survey of the Word Senses in WordNet and EVCA

An important addition to EVCA WordNet was word sense differentiation. WordNet gives one or more word sense numbers per verb, where the number of word senses is the number of different meanings of the verb. This was an important enhancement since quite a few EVCA verbs appeared in more than one class, or dataset. Often the appearance of a verb in more than one class meant that there were different senses. Now there should be no confusion as to the meaning or the alternation.

Determining verb word sense was not performed mechanically, but it is nonetheless simple: one looks at the alternation, the WordNet synonyms and sample sentences, and the other verbs in that verb class, or dataset. A verb with a WordNet word sense was converted to that verb with a hyphen and the sense number after it—for instance, sense 2 of *bake* would become *bake-2*.

WordNet version 1.5 contains 14253 verbs, corresponding to 25558 word senses; so the ratio of senses to verbs is 1.79. In EVCA, there are 2600 verbs with 3034 senses, therefore a ratio of 1.17. One hundred fifty-six of these verb senses are not in Wordnet, as *bail* in "bailing water out of a boat."

We used Levin's analysis in the following way. Levin's verb class alternation study concludes that a verb sense is derived from another sense because of these alternations. In the example below, Levin's example (12) of section 1.1.2.1, the two usages of *break* are considered the same word sense. See also Figure 6 in Appendix C. The second is derived from the first by the unaccusative hypothesis, described earlier.

(10) (i) Janet broke the cup. [np,v,np]
     (ii) The cup broke. [v,np]

In WordNet, however, these two versions of *broke* are considered to have different word senses. As a rule, in annotating the verbs with sense numbers, the causative, if it existed in WordNet, was chosen to be the correct sense. If the EVCA example sentences of the alternations had been split between the two senses in WordNet, then the alternation would not have been clear. It was important to keep these alternations together. In this project we are trying to understand the relationships among the senses of verbs. If all these word senses had also been counted, then the percent coverage of WordNet would have increased noticeably. Also, the gap between EVCA ratio of 1.17 of senses to verbs and the WordNet ratio of 1.79 senses to verbs would have narrowed.

Sometimes more than one word sense of a verb fits the alternation. Instead of adding all the possible senses that could fit into the alternation, only the most familiar or most general of the senses was chosen for the correct number for now. These other possible senses have similar or figurative meanings. See Figure 7 in Appendix C for an example, which is taken from Wordnet version 1.3. In this example of the verb *burn*, it is obvious that more senses than sense 2 could fit the alternation of example (11). Of course sense 3 is derived from sense 2, as is sense 6 from sense 5 and sense 9 from sense 8. Example sentences created for EVCA WordNet in sense 2 are below. Example sentences of this alternation could also be made from sense numbers 4, 5, 7, 8, and 10, as in the example below.

(11) burn: (11) [np,v,np] ; [v,np]
 2. a. Mary burns the leaves.
    b. The leaves burn.
 4. a. Mary is burning the witch.
    b. The witch is burning.
 5. a. The pepper is burning my eye.
    b. My eye is burning.
 7. a. Mary is burning the building.
    b. The building is burning.
 8. a. Mary is burning the log.
    b. The log is burning.
 10. a. The acid is burning my skin.
    b. My skin is burning.

Other Suggestions for EVCA WordNet

If more verbs were to be added to EVCA WordNet in an existing verb class, it would be necessary to determine what properties were necessary for any of the noun phrases. If another verb with the same properties for the same noun phrase already existed, then the new verb would have to be added as a child of the other verb. If no verb with the same property list for the same noun phrase existed, then it would be necessary to find an good noun phrase having this property list.

In generating these sentences, only a *+s*, *+ed*, *+en*, or *+ing* were added to indicate tense. We are considering writing a morphological analyzer to change these endings to the correct verb form. This analyzer would be added on after these sentences were generated. For example, *give+ed* would change to *gave*.

Acknowledgements

This research was greatly aided by the "EVCA summer working group" consisting of the authors. Anand Radhakrishnan, and Brian Ulicny. All residual errors are ours. This research is supported by NSF grant 9217041-ASC and ARPA under the HPCC program, as well as by a generous grant from the NEC Corporation.

1 WordNet Verb Frames

```
1  Something ----s
2  Somebody ----s
3  It is ----ing
4  Something is ----ing PP
5  Something ----s something Adjective/Noun
6  Something ----s Adjective/Noun
7  Somebody ----s Adjective
8  Somebody ----s something
9  Somebody ----s somebody
10 Something ----s somebody
11 Something ----s something
12 Something ----s to somebody
13 Somebody ----s on something
14 Somebody ----s somebody something
15 Somebody ----s something to somebody
16 Somebody ----s something from somebody
17 Somebody ----s somebody with something
18 Somebody ----s somebody of something
19 Somebody ----s something on somebody
20 Somebody ----s somebody PP
21 Somebody ----s something PP
22 Somebody ----s PP
23 Somebody's (body part) ----s
24 Somebody ----s somebody to INFINITIVE
25 Somebody ----s somebody INFINITIVE
26 Somebody ----s that CLAUSE
27 Somebody ----s to somebody
28 Somebody ----s to INFINITIVE
29 Somebody ----s whether INFINITIVE
30 Somebody ----s somebody into V-ing something
31 Somebody ----s something with something
32 Somebody ----s INFINITIVE
33 Somebody ----s VERB-ing
34 It ----s that CLAUSE
```

2 EVCA Verb Classes (Datasets) in Prolog

In the Prolog representation below, 12:a and 12:b refer to examples (12.a.) and (12.b.) in EVCA. The letter *s* means sentence, and the ones or zeroes mean that this pattern is grammatical or ungrammatical for this particular verb class. The example sentences are given with their parses just below.

```
evca_dataset(2,
   [coil-3, revolve-2, rotate-1, spin-1, turn-2,
   twirl-1, twist-5, whirl-1,wind-3],

   [pattern(7:ii,'Motion Around an Axis',
     [
      eg(12:a,s,1,
         'Janet broke the cup.',
         [np,v,np]),
      eg(12:b,s,1,
         'The cup broke.',
         [v,np])]),
    pattern(105:ii,'Verbs of Motion Around an Axis',
     [
      eg(106:a,s,1,
        'The spaceship revolves around the earth.',
        [v,np,[p(around,1),np]]),
      eg(106:b,s,0,
        'The spaceship revolves the earth.',
        [v,np,[p(around_0,1),np]])])]).

evca_dataset(101,
   [brush-3, cram-1, crowd-1, cultivate-2, dab-1,
   daub-1, drape-2, drizzle-2, dust-1, hang-4,
   heap-1, inject-6, jam-3, load-2, mound, pack-4,
   pile-2, plant-3, plaster-3, pump-2, rub-3,
   scatter-3, seed, settle-3, sew-2, shower-2,
   slather, smear-3, smudge-1, sow, spatter-3,
   splash-1, splatter-1, spray-1, spread-3,
   sprinkle-2, spritz, squirt-1, stack-2, stick-1,
   stock-1, strew-1, string-7, stuff-1, swab-2,
   wrap-1],

   [pattern(124,'Spray/Load Verbs',
    [
     eg(125:a,s,1,
        'Jack sprayed paint on the wall.',
        [np,v,[p(with_0,4),np],[p(on,5),np]]),
     eg(125:b,s,1,
        'Jack sprayed the wall with paint.',
        [np,v,[p(on_0,1),np],[p(with,7),np]])])]).


evca_dataset(126,
   [alter-4, change-4, convert-3,
   metamorphose-1, transform-1, transmute-1,
   turn-10],

   [pattern(156,'Turn Verbs',
      [
       eg(157:a,s,0,
          'He turned from a prince.',
          [v,np,[p(from,6),np]]),
       eg(157:b,s,1,
          'He turned into a frog.',
          [v,np,[p(into,2),np]])]),
    pattern(158,'Turn Verbs',
      [
       eg(159:a,s,1,
          'The witch turned him into a frog.',
          [np,v,np,[p(into,2),np]]),
       eg(159:b,s,1,
          'The witch turned him from a prince
           into a frog.',
          [np,v,np,[p(from,6),np],[p(into,2),np]])]),
    pattern(150:b,'Turn Verbs',
      [
       eg(151:a,s,1,
          'I kneaded the dough into a loaf.',
          [np,v,np,[p(into,2),np]]),
       eg(151:b,s,0,
          'I kneaded a loaf from the dough.',
          [np,v,[p(into_0,2),np],[p(from,1),np]]),
       eg(152:a,s,1,
          'The witch turned him into a frog.',
          [np,v,np,[p(into,2),np]]),
       eg(152:b,s,0,
          'The witch turned him from a prince.',
          [np,v,np,[p(from,6),np]])])]).
```

3 Sample WordNet Computer Sessions

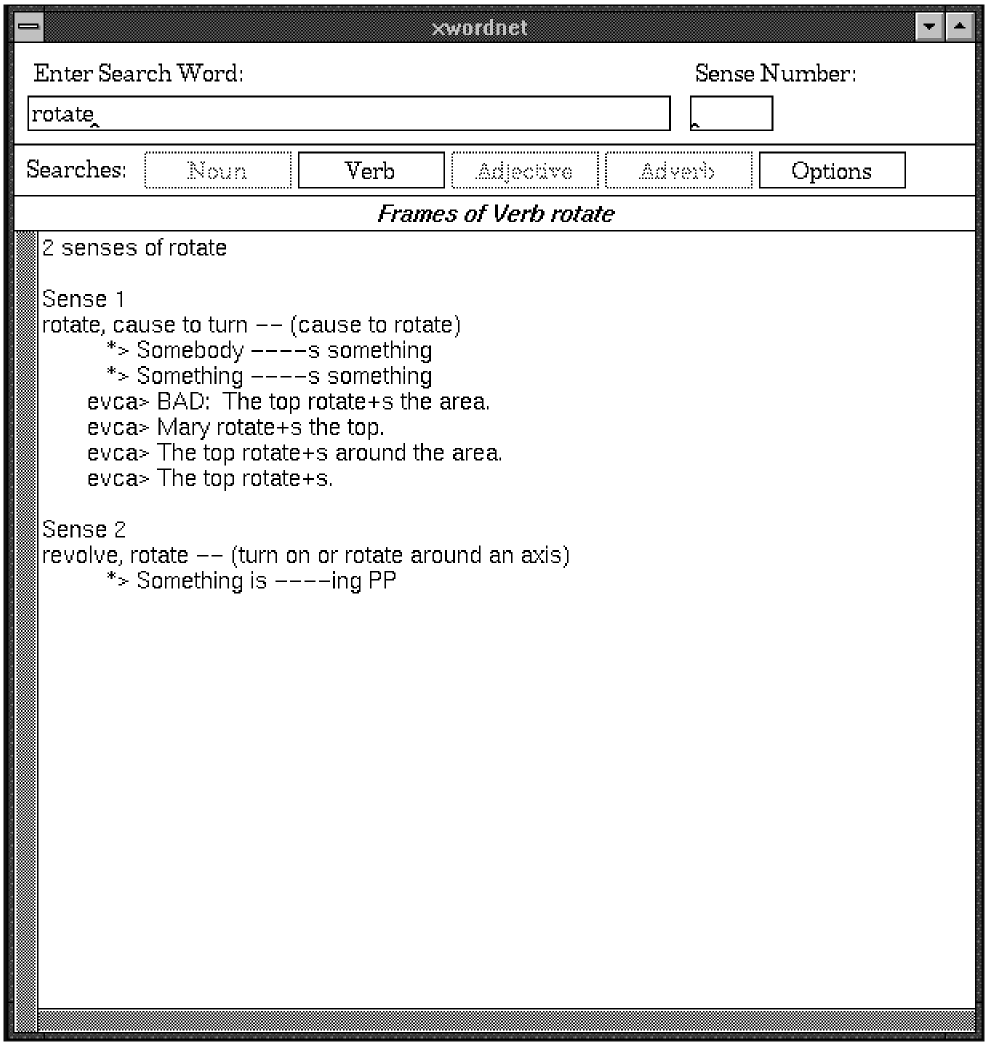


Figure 1: This is a sample session of EVCA WordNet. The generated EVCA sample sentences are marked by *evca¿*. The bad example is important because verbs like *circle* allows this pattern.

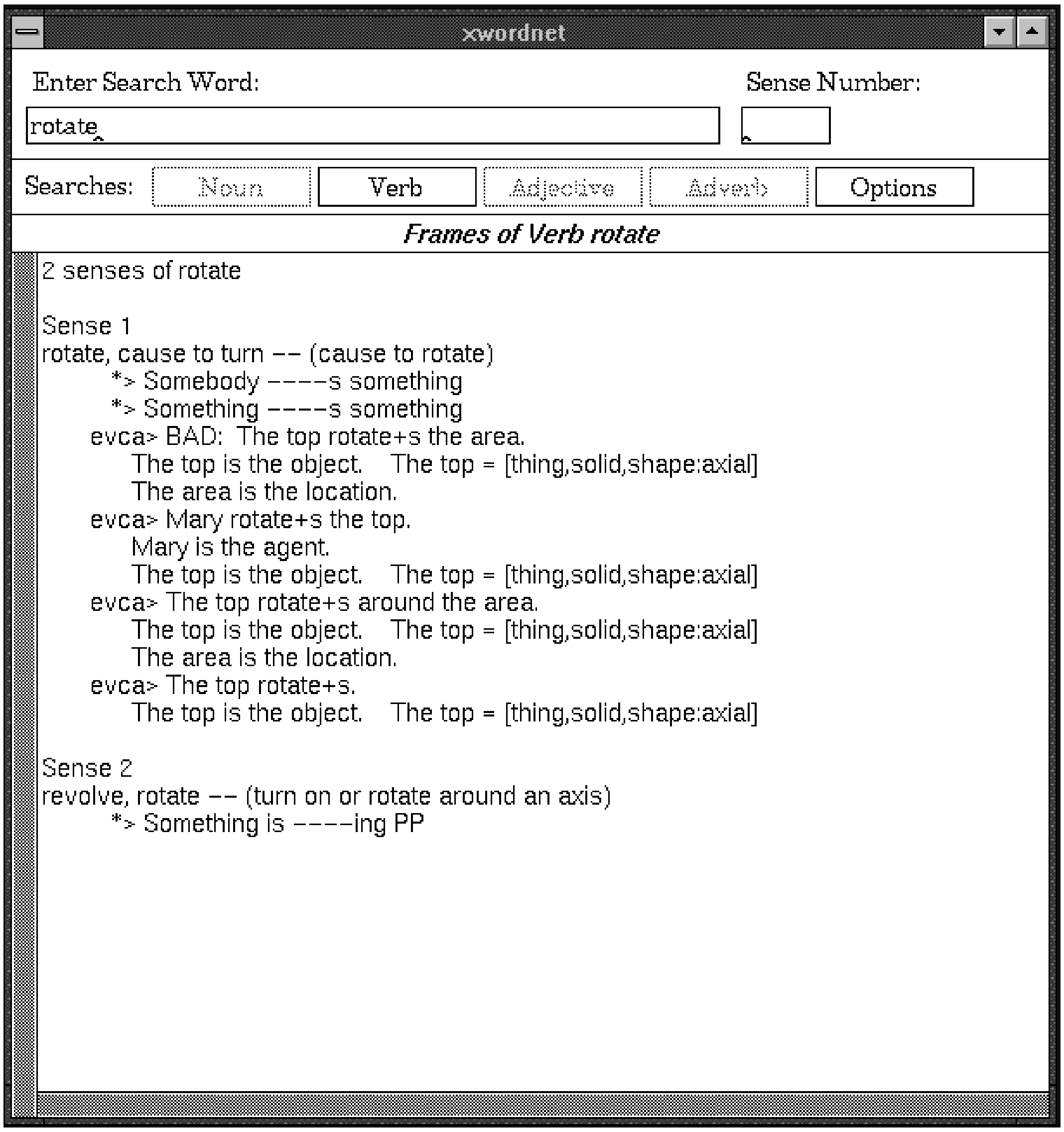


Figure 2: This session of EVCA WordNet gives the new sample sentences, marked by *evca¿*, the thematic roles of the noun phrases, and, in addition, the property lists for many nouns.

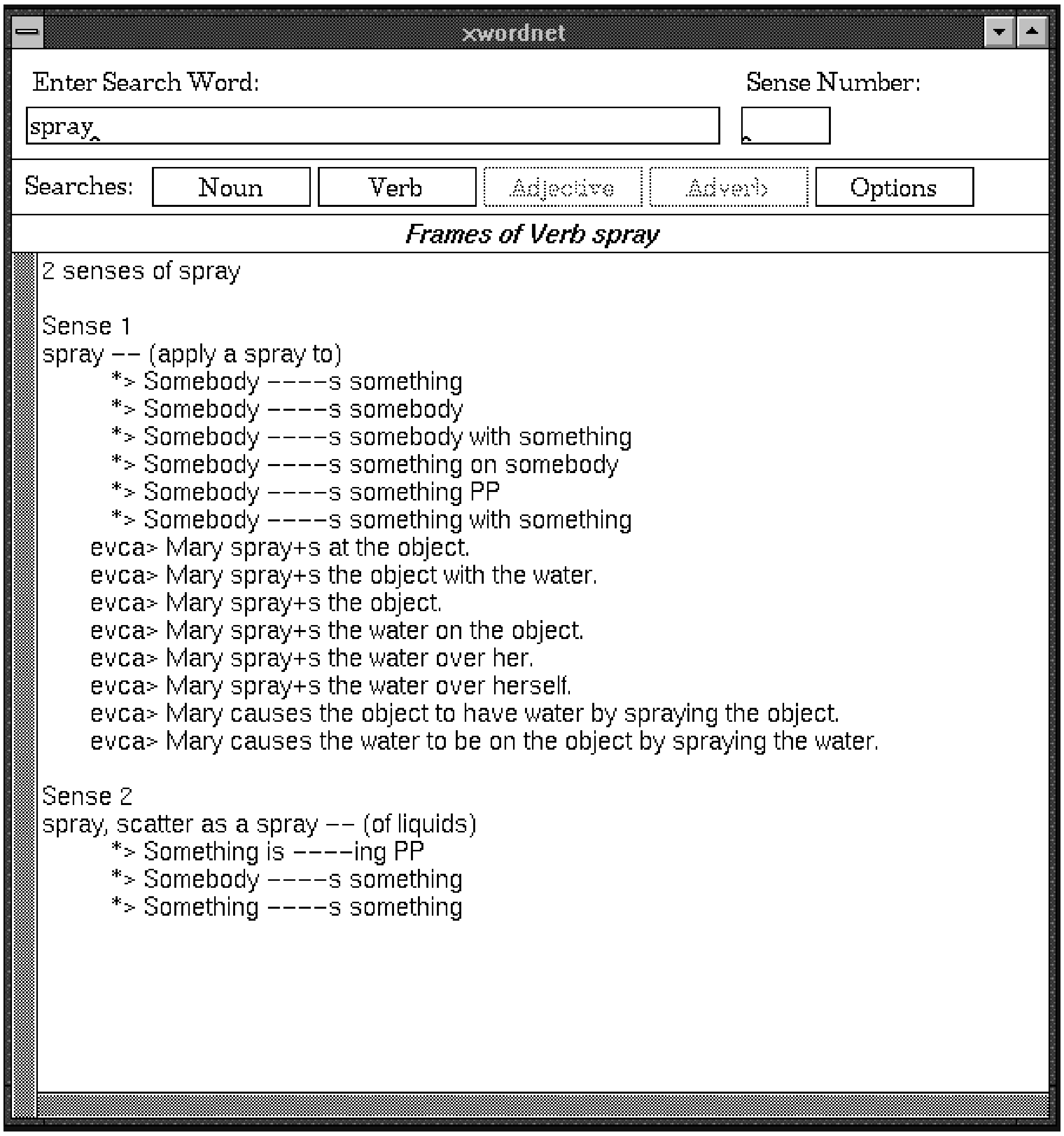


Figure 3: This session of EVCA WordNet gives the EVCA sample sentences for the verb *spray*. EVCA sentences 7 and 8 are paraphrases of EVCA sentences 2 and 4.

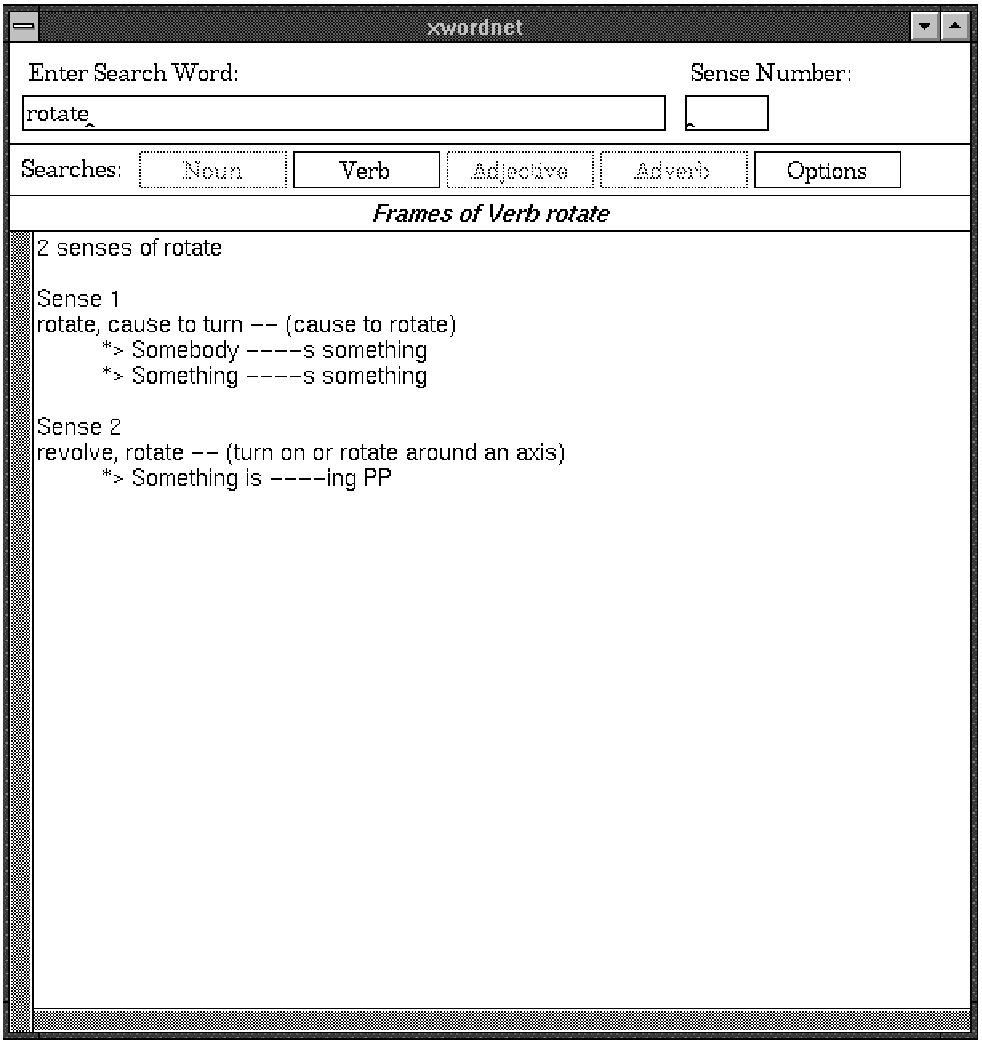


Figure 4: This standard session of WordNet version 1.3 shows that some verbs can take more than one kind of subject. As a rule in creating EVCA sample sentences, a human subject was chosen if it made sense.

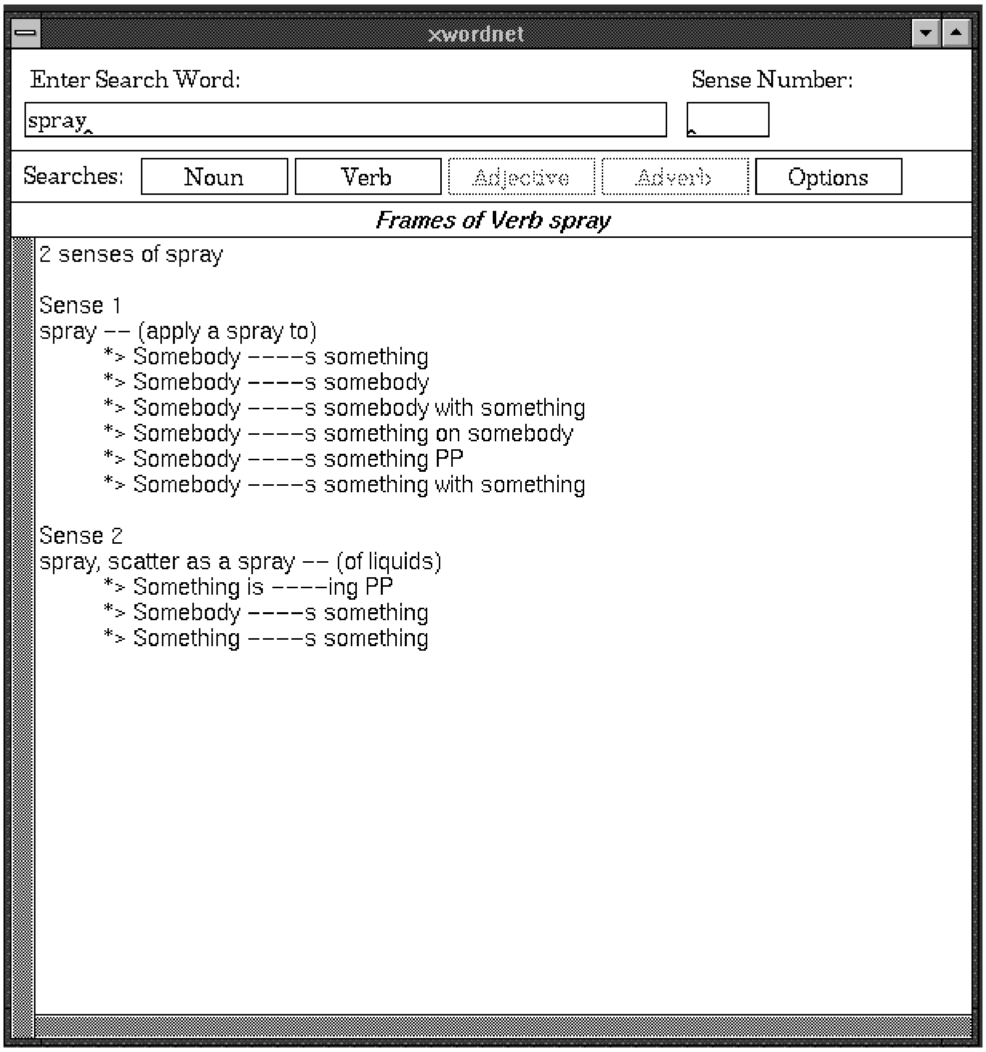


Figure 5: This standard session of WordNet version 1.3 shows that some verbs can take more than one kind of object or other noun phrase. In creating sample sentences for EVCA WordNet, only the most appropriate noun phrase was chosen.

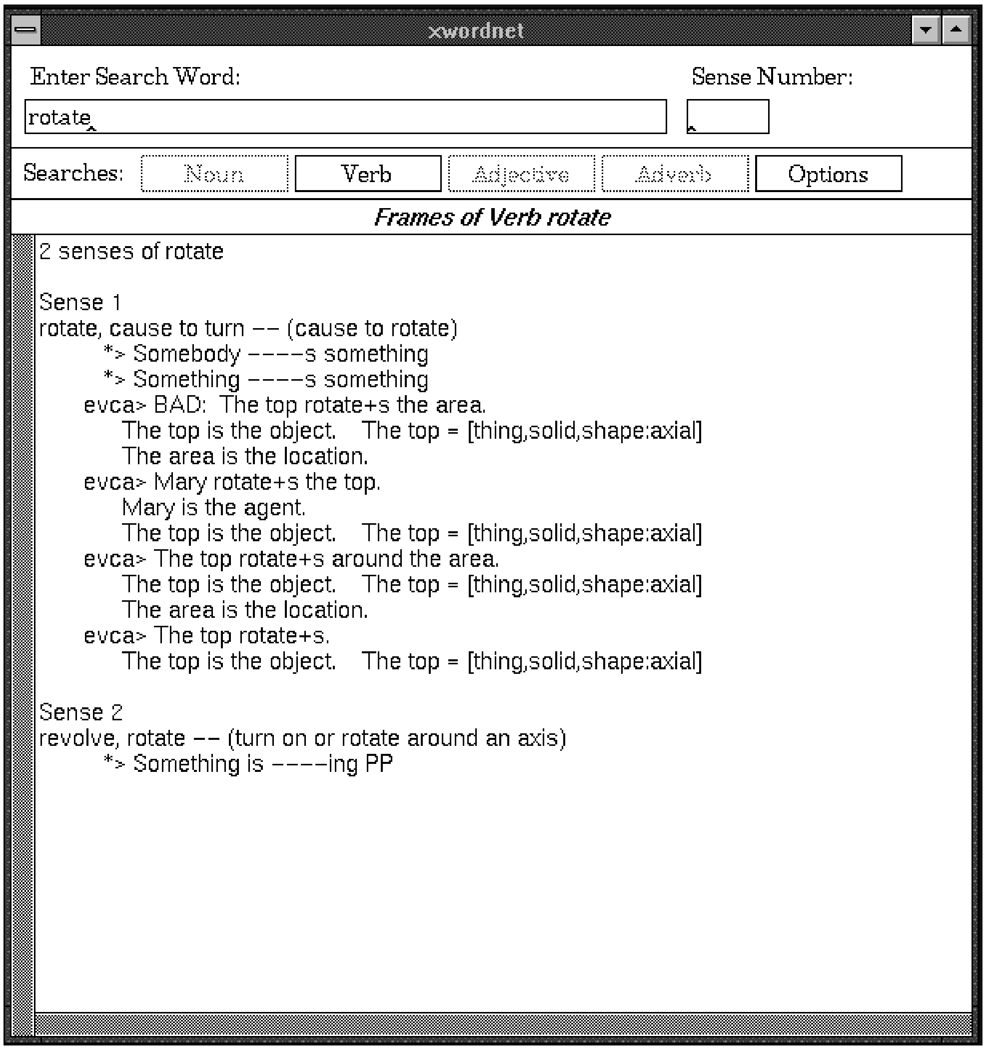


Figure 6: EVCA sentences 1, 3, and 4 actually belong with sense 2. If these had been separated from sentences 2, the alternation would not have been clear.

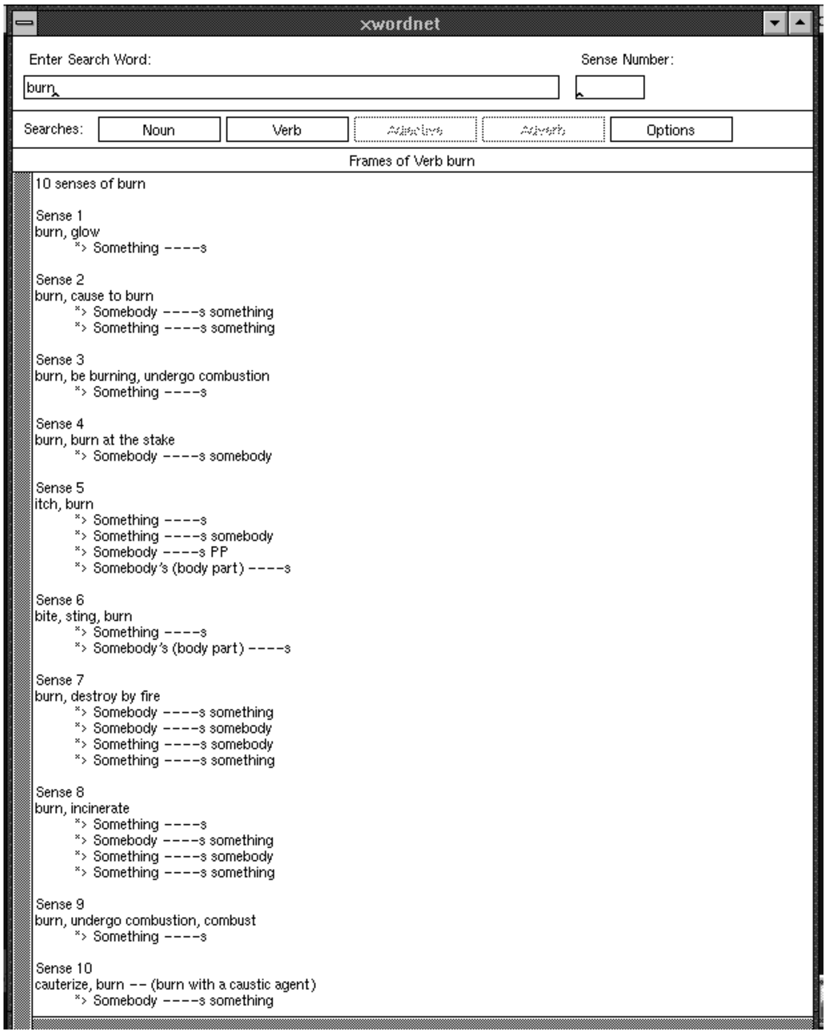


Figure 7: For EVCA WordNet, sense 2 was chosen since it was the most general. However, senses 4, 5, 7, 8, and 10 could also fit the same alternation.

4 A Survey of the Word Senses in WordNet and EVCA

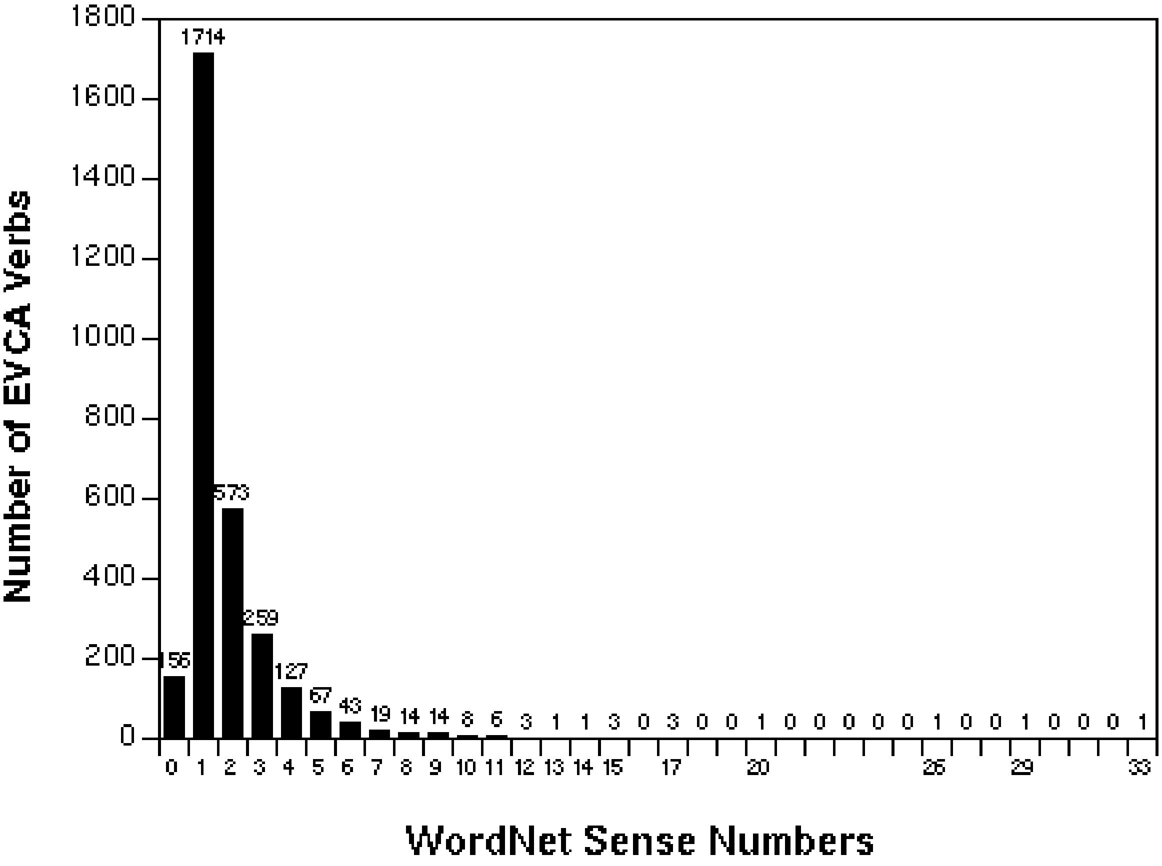


Figure 8: This graph gives the frequency of WordNet sense numbers (0-24) in EVCA. Sense zero means that this verb did not appear in WordNet or that the correct sense did not appear in WordNet.

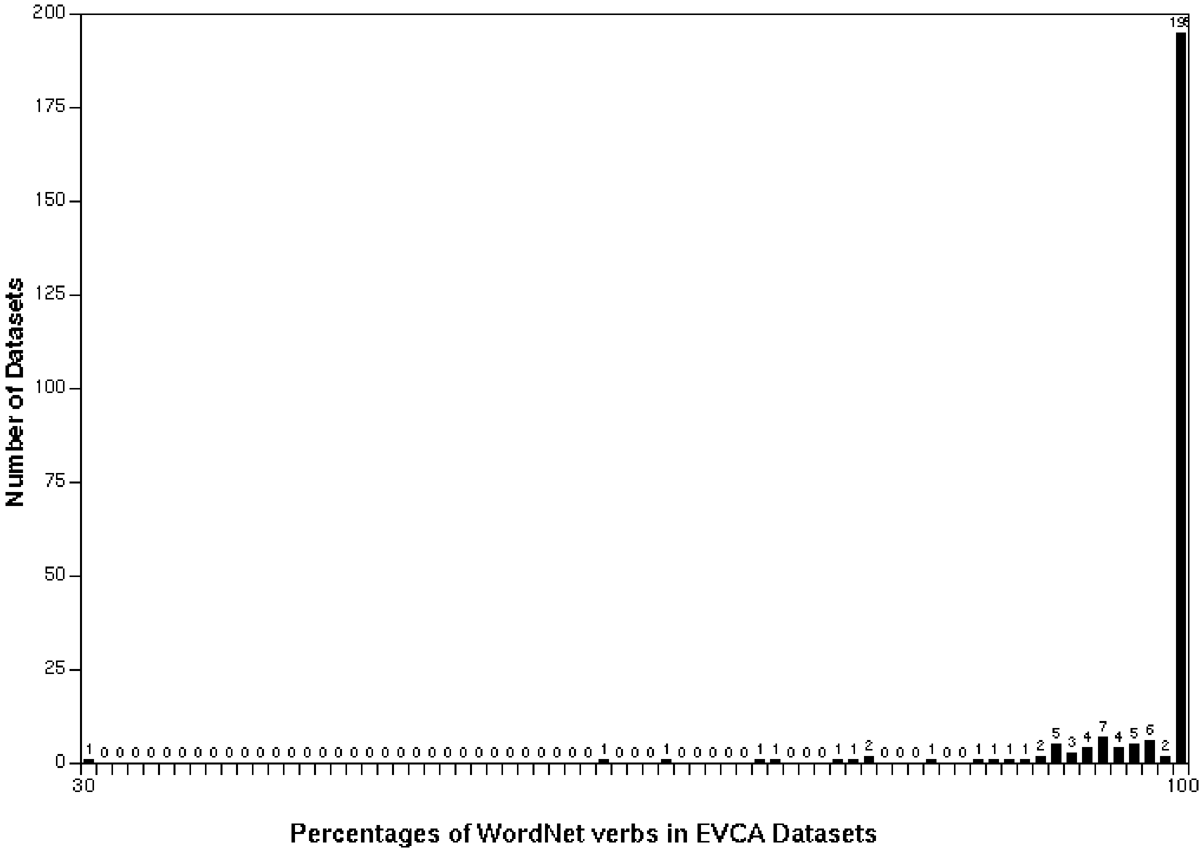


Figure 9: This graph shows the percent of WordNet verbs in EVCA classes on the x-axis. The number of datasets with this percent is given on the y-axis. Several classes disappeared or greatly decreased in number.

Part II
Projecting Argument Structure from Lexical Semantic Features

Brian Ulicny

In this paper, I describe and evaluate Beth Levin's recent survey of English verb classes and the alternations in which they participate. I then show how Levin's data might be incorporated into a simple procedure for parsing and generating sentences and assigning them truth-conditions in a first-order language.

Beth Levin's Survey of English Verb Classes

Beth Levin's book *English Verb Classes and Alternations* is an extremely rich source of materials applicable to natural language processing [1]. Levin's survey draws upon the research perspective of the MIT Lexicon Project in the 1980s as well as referencing the work of a large number of researchers in categorizing the syntactic and semantic properties of some 3000 English verbs. The fundamental thesis guiding Levin's categorization is this:

(1) (LEVIN'S THESIS) The argument structure of a verb is determined by its semantic properties. (p. 1)

Here the "argument structure" of a verb consists of the syntactic categories and order of the complements the verb requires for grammaticality. Levin's thesis thus predicts that verbs with common semantic properties will project the same argument structure. Levin's thesis does not hold in the reverse direction. It does not state that verbs that participate in all and only the same argument structures or alternations thereby share the same semantic properties.

It is, thus, the task of the researcher to identify lexical semantic features to distinguish nearly synonymous verbs which do not participate in the same argument structures.

Levin's survey consists of two parts. The first part, *Alternations*, details approximately 80 different diathesis alternations in English and the verbs that participate in them, grouped by their semantic categories. The second part, *Verb Classes*, categorizes the verbs surveyed into 48 major categories, with up to approximately 10 subcategories each and lists the diathesis alternations in which these verbs participate. Thus, the two sections present virtually the same information in two different ways.

Among the semantic classifications Levin makes are "Change of State" (e.g. break), "Manner of Motion" (e.g. roll) or "Amuse-type Psych Verbs" (e.g. gladden), all of which participate in the Causative-Inchoative alternation:

(2) The vase broke. John broke the vase.

(3) The ball rolled. John rolled the ball.

(4) Mary gladdened. John gladdened Mary.

Here the first sentence of each pair above displays the inchoative argument structure of the verb. The second exemplifies the causative diathesis alternation.

The causative diathesis represents a "regular meaning shift" from the use of the verb in the inchoative. That is, the inchoative use reports a change of state in the single argument. In the causative alternation, the transitive construction *x Verb y* is equivalent in meaning to *x made y Verb*. For example, "John broke the vase" is equivalent in meaning to "John made the vase break." Thus, this example from Levin's survey is evidence that knowing which verbs will participate in the causative alternation is predictable from one's knowledge of the meaning of the verb and thus, is not a piece of separate information that must be learned for each verb.

Levin's thesis is an empirical thesis, and Levin's survey reports the results of an impressive but still, as she says, "preliminary" investigation. It is relatively easy to find apparent counterexamples to Levin's thesis, verbs with similar meanings but dissimilar argument structures. For example, to what semantic difference can the syntactic differences between "hunt", "look for" and "seek" be attributed? *Seek* is listed as a synonym of *hunt* in at least this on-line version of Webster's dictionary.

(5) SEEK vb [ME seken, fr. OE se-can; akin to OHG suohhen to seek, L (Xsagireto perceive keenly, Gk he-geisthaito lead 1:to resort to: go to 2a: to go in search of :look for 2b: to try to discover 3:to ask for :REQUEST -s advice 4: to try to acquire or gain : aim at 5:to make an attempt :TRY - used with an infinitive :to make a search or inquiry - seek.ern

(6) HUNT vb [ME hunten, fr. OE huntian, akin to OHG herihunda battle spoi]ls 1a: to pursue for food or in sport (- buffalo) 1b: to manage in the search for game (-s a pack of dogs). 2a: to pursue with intent to capture 2b: to search out :SEEK 3: to drive or chase esp. by harrying 4: to traverse in quest of prey (-s the woods) 1: to take part in a hunt 2: to attempt to find something

Yet, these verbs take different argument structures.

(7) John hunted the woods for game.
*John sought the woods for game.
*John looked the woods for game.

(8) John hunted for game in the woods.
*John sought for game in the woods.
John looked for game in the woods.

[1] University of Chicago Press, 1983

(9) John hunted in the woods for game.
*John sought in the woods for game.
John looked in the woods for game.

(10) John hunted game in the woods.
John sought game in the woods.
*John looked game in the woods.

Contrary to her thesis, Levin does not distinguish these verbs semantically. Levin classifies *hunt*, *look* and *seek* as "Verbs of Searching", (Sect. 35), but the subcategories to which Levin assigns them do not indicate semantic differences. The verb *hunt* is assigned to the subclass *Hunt*. The verb *seek* to the subclass *Ferret*; *look* to the subclass *Rummage*. Here, Levin's subclasses distinguish the differences in syntactic behavior among verbs that mean roughly "to look for", but she does not explain the differences in syntactic behavior in terms of differences in their semantic features.

This does not mean that such explanations are unavailable. Syntactic explanations might be available as well. For example, the verbs in the *Ferret* subclass might be thought to have incorporated[2] the preposition *for* into the lexical head, thus resisting its overt presence. This would not explain the difference in the behavior of the verbs in purely semantic terms, but it would accord with the basic insight of Levin's survey given the following additional assumption.

(11) COVERT ELEMENTS HYPOTHESIS: Some syntactic elements are covert.

With this assumption, Levin's thesis allows may be maintained while allowing that some differences in syntactic behavior are to be explained syntactically, through incorporation or other uses of covert items. Where the appeal to covert syntactic elements is unavailable, differences in syntactic behavior must be explainable in terms of purely semantic differences.

Aside from these cases, there are apparent counterexamples to Levin's thesis in the converse direction as well. That is, there are cases in which Levin groups together verbs semantically which don't project the same argument structure. Thus, in section 8.2, Levin lists verbs "perjure", "conduct", "pride", and "ingratiate" as "Obligatory Reflexive Object Verbs". In that these verbs are grouped together, they are all supposed to behave the same way syntactically. Presumably, they all express reflexive relations, relations that are satisfied only by the ordered pair $< a, a >$. The behavior of these verbs are very different, however.

(12) John perjured himself *well/ *to the jury.

(13) John conducted the orchestra.

(14) John conducted himself *()/ well.

(15) John ingratiated herself/Mary to the boss.

(16) John prided himself *()/ on his appearance.

Levin does claim that the sense of, e.g. *conduct* is different when used with a reflexive argument. On the other hand, if the shift in meaning is predictable, then such verbs should not be included in this category. "Regular meaning shifts" are supposed to be predictable on the basis of the original verb meaning.

Computational Implementations

To the extent that Levin's thesis is true, the amount of information that must be included in the lexicon in order to parse is dramatically reduced. In the worst case, one would have had to list every syntactic frame for every verb.

Such an arrangement would not distinguish semantically unrelated homonyms from mere alternation patterns and regular shifts in meaning. However, if N argument structures are possible for a given verb if it has some semantic feature f, however, then the verb need only be listed once in the lexicon with its semantic features to capture this information. Only rules linking this feature to the argument structure are necessary. Here the size of the lexicon will be greatly reduced, and the polysemy relations among various uses of a verb will be clearly distinguishable from mere homonyms that are not lexically related. It is a straightforward matter to prepare a lexicon making use of Levin's categories. I have prepared a lexicon of some 174 verbs in the form:

(17) `verb(Verb, [VerbFeatures1,..]).`

In this lexicon I have listed each verb (in past tense only) along with semantic categories derived from Levin for the semantic verb features. Thus, *carried* is listed as both a "Verb of Sending and Carrying" (Section 11) subclass "Carry" (11.1); and as a "Measure Verb", subclasses "Cost" (54.2) and "Fit" (54.2).

(18)
```
verb(carried, [send(carry),
measure(cost), measure(fit)]).
```

Levin's categorizations are at most three levels deep; most consist of two levels, the major category and a single subclass.

Such a lexicon can be used to derive and project the various argument structures associated with a verb.

(19) If verb V has semantic feature f, then it may project argument structure S.

For instance, only certain verbs participate in the conative alternation in English. Consider the following example:

(20) John pushed the desk.

(21) John pushed at the desk

(22) John pushed on the desk

(23) *John broke at the vase/on the vase.

Thus, in Prolog, the following DCG (definite clause grammar)[3] statement encodes the rule stating which

[2]See Mark Baker's *Incorporation*, 1985.

[3]The formulae of Prolog are a subset of standard first-order logic, comprising only the Horn clauses, for which an automated proof procedure has been implemented. Most implementations of Prolog allow one to write grammatical rules in Definite Clause Grammar (DCG) form, where this con-

verbs may participate in the conative alternation.

```
vp([np(agent),pp(conative)]) -->
    [V],
    {verb(V,Vfeatures),
    (member(contact-impact(hit),Vfeatures);
    member(contact-impact(swat),Vfeatures);
    member(poke,Vfeatures);
    member(cut(cut),Vfeatures);
    member(put(spray),Vfeatures);
    member(force,Vfeatures);
    member(ingest(eat),Vfeatures);
    member(ingest(chew),Vfeatures);
    comps([pp(conative)]).
```

What this rule states is that VP's selecting an agent NP and a conative PP can expand to a verb V followed by a conative PP if V has at least one of the relevant semantic features: contact-impact(hit), compact-impact(swat), poke, cut(cut), put(spray), force, ingest(eat), or ingest(chew).

Prepositional phrases headed by *at* or *on* are considered conative; "conative" is listed as a feature of these prepositions in the lexicon. Thus, the preposition "at" is listed as having both the features "+location" and "+conative":

```
p(at,[location, conative]).
```

Checking for the correct features of the complements is accomplished by means of standard unification techniques. Using this simple technique, I constructed a parser that correctly handled 325 example sentences used by Levin to illustrate the various alternations, including both positive (grammatical) and negative (ungrammatical) examples.

While it assigned the correct structure to all of the grammatical sentences in the sample, the parser was not overly permissive. It assigned unintended parses to sentences marked ungrammatical in the dataset in only 14 cases. For example, it accepted

(24) Janet broke at the bread.

because it assigned it the same structure as "The dawn broke over the horizon". Obviously, it is not necessary that all such assignments of verbs to semantic categories should result in a fairly unpermissive parser. That is, where a verb falls into more than one semantic class (+A,+B,...), it is possible that by having the feature +A, the parser allows it to accept as grammatical certain sentences that are meant to be excluded for sentences with the feature +B. It is an encouraging sign that this largely failed to happen for the semantic categories that Levin proposes.

(25) Sentences parsed (sample): Brenda agreed with Molly.
Brenda and Molly agreed.
Brenda and Molly bantered.
Brian hit the fence with the stick.
Brian hit the stick against the fence.
*Brian threw the fence with the stick.
Brian threw the stick against the fence.
Celia braided her hair.
*Celia braided.
*Celia brushed herself.
Celia brushed.
Clouds cleared from the sky.
David constructed a house from those new bricks.
David constructed a house out of bricks.
David constructed a house from bricks..
David constructed the bricks into a house.
Don swatted the mosquito with the newspaper.
*Don swatted the newspaper against the mosquito.
Each room sleeps five people.
Ellen and Helen chitchatted.
*Ellen chitchatted Helen.
Fanny pulled the blanket over her.
Fanny pulled the blanket over herself.
Faustina sprayed at the lilies.
Faustina sprayed the lilies.

Run in reverse, the grammar was capable of generating on the order of 5000 different grammatical sentential frames from 174 verbs or approximately 29 different frames per verb. In order to minimize variants due simply to differences in the arguments themselves, generation was based on a preset list of stock NPs, with "Mary" as the default Agent NP, "something" as the default Theme NP, and so on. Preposition selection accounted for the large number of different structures per verb.

(26) Sentences generated (sample): Mary cut something.
Mary cut her way across some place or direction.
Mary cut at something.
Mary cut something from something.
Mary cut something with something.
Mary cut alpha and beta.
Mary cut alpha and beta apart.
Mary cut something on some part of her body.
Mary cut something from something for something.
Mary cut something into something.
Mary cut some part of her body.
Mary cut herself.
Mary cut someone.
Something cut.
Something cut across something.
Something cut easily.
Alpha and beta cut.
Alpha and beta cut apart.
Something of someone's cut someone.

By passing the argument structure grid of the verb phrase up to the highest node of the sentence, the "s" node, it was possible to generate neo-Davidsonian truth-conditions for sentences. Thus, given the sentence

sists of a context-free grammar rule to which additional constraints in the form of Prolog clauses may be added. For details, see F. Pereira and S. Sheiber, *Prolog and Natural Language Processing*, CLSI Lecture Notes Series, U. Chicago Press, 1987.

"Mary baked something" as an argument (in the form of the list `[mary,baked,something]`), the following truth-conditions were returned:

(27)
```
Ee(baked(e) & agent(e,mary) &
theme(e,something))
```

This asserts that the sentence "Mary baked something" is true just in case there was an event that was a baking and Mary was the agent of this event and the theme of this event was something.

The following procedures were used to construct the representations of the sentence's truth-conditions in first-order logic.

```
tc(S,TC) :-
   setof(Lterm,lterm(S,Lterm), Termset),
   concat_atom(Termset," & ", Conj),
   concat_atom(["Ee(", Conj," )"],TC).

lterm(S,Arg) :-
   lfevent(S,Arg); lfarg(S,Arg).

lfevent(S,Event) :-
   s(X,S,[]),
   member(Verb,S),
   verb(Verb,Vf),
   concat_atom([Verb,'(e)'], Event).

lfarg(S,Lterm) :-
   s(ArgList,S,[]),
   member(Argument,ArgList),
   arg(1,Argument,Type),
   subseq(S,Subseq,Comp),
   phrase(Argument,Subseq),
   concat_atom(Subseq," ",SubseqAtom),
   concat_atom([Type,"(e,",SubseqAtom,")"],
         Lterm).
```

Conclusions

It was shown that using simple procedures, one can implement a parser/generator covering a wide range of diathesis alternations while representing only semantic information within the lexical entry of the verbs.

On the other hand, 111 rules relating lexical semantic features to argument structures were necessary. Thus, the parser/generator employed approximately the same number of lexical features available as argument structures. Roughly, there were about 100 of each. Thus, the total amount of information represented was not significantly lowered from what it would have been if one had merely included each syntactic frame within the lexical entry of each verb. In part, that is because the verbs were chosen to be illustrative of diathesis alternations. Thus, each verb has a representative diathesis. If the rest of the verbs in the database were coded into the lexicon, the ratio of verbs to features would become much more favorable.

Obviously, if such a system of parsing is to be an improvement upon one in which the permissible selectional restrictions (as in an *Aspects* style theory) or the permissible thematic grids, as in the *Government-Binding* approach), the number of necessary semantic features must be minimized. It is obvious where some such reductions could be made. For example, there are instances (such as the "Verbs of Searching" mentioned above, in which there were 2^n diathesis alternations and 2^n semantic features or categories by which Levin categorized them. Here, the number of features necessary for the parser could be reduced to n from 2^n.

That is, if there were 4 diathesis alternations into which 4 semantic subclasses participated or failed to participate, one could reduce the number of required semantic features by finding some 2 semantic features +A and +B such that the acceptability of each of four possible diathesis alternations for those verbs was determined by whether the verb had the features (+A,+B), (+A,-B), (-A,+B), or (-A,-B).

Before beginning such a search for the smallest number of semantic features necessary, it would be useful to distinguish between those alternations that could be explained in terms of covert syntactic elements, and those which are not. Where differences in syntactic behavior are due to covert syntactic elements, the attempt to find more basic semantic features distinguishing verbs will, if one could find semantic differences at all, explain differences in syntactic behavior in terms of artificial semantic distinctions. That is, if two verbs are distinguished syntactically in that one takes a *to*-phrase as an argument and the other doesn't, but they seem to be in the same semantic family, then it may be that there is no semantic feature that distinguishes the two verbs. Rather, the explanation for their difference in syntactic behavior might be that the verb that rejects the *to*-phrase argument has a covert to already incorporated into its syntactic representation.[4].

Once one distinguishes diathesis alternations due to covert elements from diathesis alternations based purely on semantic distinctions, it should be possible to find a minimal set of semantic features by means of which one can create a sophisticated grammar while distinguishing verbs and other lexical items only by their semantic features.

[4]See D. Pesetsky, *Zero Syntax: Experiencers and Cascades*, MIT Press, 1995, for a comprehensive discussion of zero morphemes in syntax.

Part III
Transitive Prepositions as Verb Complements

Douglas Jones
and Anand Radhakrishnan*

Abstract

In this paper, we propose that verbs may select transitive prepositional phrases as complements. We present an analysis in which we are able to maintain the Uniformity of Theta Assignment Hypothesis (UTAH) of Baker (1988) for a subclass of the Spray/Load verbs, exemplified by the verb *pile*. We also capture other aspects of the Pile class of Spray/Load verbs, namely, the obligatoriness of the *with* phrase, the failure of the verbs to undergo the adjectival passive, and the failure of the *with* phrase to prepose. This paper grew out of a summer project at the MIT Artificial Intelligence Laboratory on Verb Classes and Alternations. One of the goals of the project was to investigate the English Verb Classes and Alternations found in Levin (1993).

Introduction

Not all of the Spray/Load verbs listed in Levin (1993:2.3.1), have exactly the same behavior. While all the verbs do participate in the locative alternation, a closer inspection reveals that for several of the verbs, the adjunct phrase is obligatory, whereas for the general Spray/Load class, it is always optional. [2]

Consider the standard example of the locative alternation for a Spray/Load verb, shown in (28):

(28) a. Pat loaded the hay onto the wagon.
b. Pat loaded the wagon with hay.

We can omit the prepositional phrases and the sentences remains acceptable.

(29) a. Pat loaded the hay.
b. Pat loaded the wagon.

Other verbs in the Spray/Load category, such as the verb *pile* seem to exhibit the same behavior, as shown in (30)

(30) a. Pat piled the books on the shelf.
b. Pat piled the shelf with books.

However, the sentence is unacceptable if we omit the *with* phrase as in the (b) case:

(31) a. Pat piled the books.
b. *Pat piled the shelf.

The verb *pile* cannot take *shelf* as a direct object. The *with* phrase in (31)b must remain in the sentence for it to be acceptable.

The subset of the Spray/Load verbs that fit into the Pile class are shown in (32).

(32) drizzle, hang, heap, mound, pile, scatter, settle, shower, slather, spread.

There are two important aspects of (31) to explain. One is the obligatoriness of the *with* phrase in (30)b.

But a deeper problem is that the verb appears to violate the UTAH of Baker (1988:46), as stated in (33).

(33) The Uniformity of Theta Assignment Hypothesis (UTAH): Identical thematic relationships between items are represented by identical structural relationships between those items at the level of D-structure.

Reconsider the Spray/Load verb of (30), repeated as (34):

(34) a. Pat piled the books on the shelf.
b. Pat piled the shelf with books.

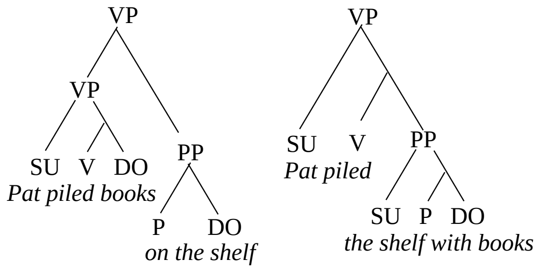
In the (a) case, the direct object is the THEME, and the LOCATION is encoded obliquely in the PP. However, in the (b) case, the direct object is the LOCATION, and the THEME is encoded obliquely. The reason this is a problem for the UTAH is that identical thematic relationships do not appear to be encoded by identical structural relationships at the level of D-structure. If the UTAH were to hold for (34), then the direct objects should both have the same thematic role, contrary to fact.

Our solution to the problem is quite simple: we claim that that *the books* in the (b) case, contrary to appearance, is not really the direct object of the verb. Rather, we claim that it is the subject of a prepositional phrase which is selected as a complement by the verb. On the other hand, *the books*, in the (a) case is a direct object of the verb. We have illustrated the structural difference in (35).

*We would like to thank the other participants of the VCA summer project for their helpful discussion: Franklin Cho, Zeeshan Khan, Karen Kohl, Uli Sauerland, Brian Ulicny, and especially Robert C. Berwick for financial support.

[2] Here is a list of all of the Spray/Load verbs listed for the locative alternation in Levin (1993:2.3.1) *brush, cram, crowd, cultivate, dab, daub, drape, drizzle, dust, hang, heap, inject, jam, load, mound, pack, pile, plant, plaster, ?prick, pump, rub, scatter, seed, settle, sew, shower, slather, smear, smudge, sow, spatter, splash, splatter, spray, spread, sprinkle, spritz, squirt, stack, stick, stock, strew, string, stuff, swab, ?vest, ?wash, wrap.*

(35)



Thus different underlying D-structures are associated with different thematic roles.

There is additional evidence supporting the claim that the apparent direct object of the (b) case is not really a direct object. Following the idea that the adjectival passive is a diagnostic of unaccusativity, as discussed in Rappaport & Levin (1988), we have additional support for our theory of a transitive preposition.

Restrictions on the Adjectival Passive

As background to our discussion, note the basic difference between unaccusative and unergative verbs regarding their ability to form adjectival passives. Verbs which have no underlying direct object (the unergative verbs) do not have adjectival passives whereas verbs with underlying direct objects (transitives and unaccusatives) do have adjectival passives.

Let us consider the standard examples. The (a) cases below contain an unergative verb whereas the (b) cases contain an unaccusative.

(36) a. The glass broke.
b. The man ran.

In (36)a, *glass* is an underlying direct object but appears as the surface subject. In the (b) case, *man* is both the underlying and the surface subject of the unergative verb *run*.

With this in mind, consider the adjectival passive construction of these two sentences:

(37) a. a broken glass (glass is unaccusative)
b. * a run man (run is unergative)

The verb *run* does not participate in this construction, supporting the claim that *man* is not the object of the verb.

Let's revisit our *pile* example.

(38) a. I piled the books on the shelf.
b. I piled the shelf with books.

We make the prediction that the apparent direct object in (38)b of the verb will fail to participate in the adjectival passive.

As expected, the verb *pile* does not participate in this construction. In (39), we note that none of the Pile verbs participate in this construction[3]:

(39) a. *drizzled kittens
b. *a hung room
c. *a heaped shelf
d. *a mounded truck
e. *a piled shelf
f. *scattered land
g. *a settled cart
h. *a showered shelf
i. *a slathered shelf
j. *some spread bread
...

Essentially, this data confirms our claim that *shelf* in (38) is not a direct object of the verb. We hypothesize, *shelf* must belong to the prepositional phrase.

Thematic Assignment

There is another fact that we want to capture, namely, that in the case in which the PP does not appear, the direct object bears the THEME role. Our proposal that only direct objects can be themes, as illustrated by our example in (35), captures this fact.

Contrast the following two examples:

(40) a. * Leslie piled the shelf.
b. Leslie piled the books.

(41) a. Leslie loaded the wagon.
b. Leslie loaded the hay.

In (41), both a and b are acceptable. But notice that the *the wagon* is a LOCATION and the *the hay* is a THEME. [4] However, these constructions require the presence of an adjunct for a thematic role other than THEME to be realized. In (40) the shelf must be a THEME and can never be a LOCATION. Consider (42)

(42) a. Pat piled the shelf with books.
b. *Pat piled the shelf.

The adjunct *with books* is required for *the shelf* to have its locational thematic role.

However, a direct object of *pile* may appear without an adjunct, where the direct object is a THEME, as in (43)b.

(43) a. Pat piled books on the shelf.
b. Pat piled books.

[3] Unfortunately, our analysis does not apply across the board to all Spray/Load verbs, since both *loaded hay* and a *loaded wagon* are acceptable.

[4] Of course, it is possible (although awkward) for the *wagon* to play the role of THEME, the example being *Leslie loaded the wagon* on the interpretation of *Leslie loaded the wagon onto the truck*. In addition, it is possible for the *hay* (even more awkward, but possible) to play the role of a LOCATION, the example being *Leslie loaded the hay* on the interpretation of *Leslie loaded the needles onto the hay*.

The fact is the direct object of *pile* is a THEME in the absence of an adjunct, but it is a LOCATION when is appears with a *with* phrase.

The verbs in (44) take a LOCATION object, but only if the verb appears with an adjunct. [5]

(44) drizzle, hang, heap, mound, pile, pump, scatter, settle, shower, slather, spread, sprinkle, stack, string, crowd, dust, jam, plaster, prick, rub, stick, swab, wash, wrap.

For example:

(45) a. I scatter the seeds into the plot.
b. I scatter the plot with the seeds.
c. I scatter the seeds.
d. *I scatter the plot.

In (45)b, *the plot* is a LOCATION, but this thematic role is licensed (somehow) by the presence of the *with* phrase. When it is missing, as in (45)d, the direct object is only interpretable as a THEME.

PP Preposing

Our analysis also captures another fact, namely, that the *with* phrase cannot be preposed. The reason it cannot be preposed is that it is not really a PP, rather, it is a P'. We assume that movement, in this case preposing, applies to a maximal projection, and that the single-bar level P' is not a potential target for the movement.

Consider the following two sentences:

(46) a. On the shelf, Pat piled the books.
b. *With books, Pat piled the shelf.

The first sentence, (46)a, is acceptable. The second sentence, (46)b, sounds awkward. In both sentences, we have taken the prepositional phrase and preposed it.

Because the prepositional phrase in (46)b is unacceptable it supports our claim that *with books* is not a lone prepostional phrase, but that *the shelf with books* is a component of the sentence that cannot be broken up.

Although a lot seems to turn on this data, it seems to us that (47) is better than (48)[6].

(47) a. With hay, John loaded the wagon.
b. With hay, John piled the wagon.

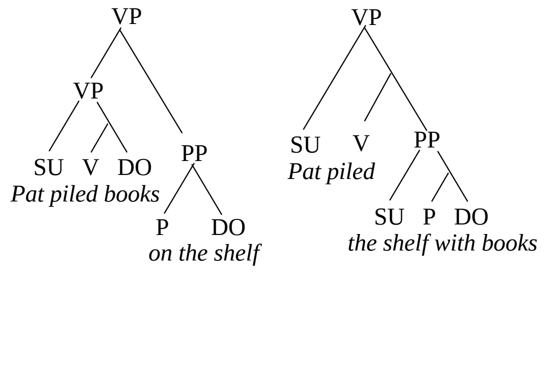
We think the same holds for (48)

(48) a. It was with hay that John loaded the wagon.
b. It was with hay that John piled the wagon.

One conclusion that we draw is that there are two lexical entries for *load*, one which takes a THEME direct object and the other that takes a LOCATION. Load can be modified by a PP adjoined to the VP. That PP is preposable.

However, are there two lexical entries for *pile*, too? We think that there is only one, if we make some other assumptions. Let's assume that the THEME is the default thematic role for a direct object. That is, the THEME is optional, but every NP that gets Case has to get a thematic role. Then for some reason, *pile* can take a PP complement (not a PP adjunct) as in (49)a. In the (49)b case, the default THEME role is assigned to the direct object. We say that the THEME assignment is optional because we don't want it to interfere with assigning the subject of the complement PP a LOCATION role, as in (49)a.

(49)



One thing to note is that in some cases, the two possible parses are string-vacuous. We assume that *load* has the following two possible structures:

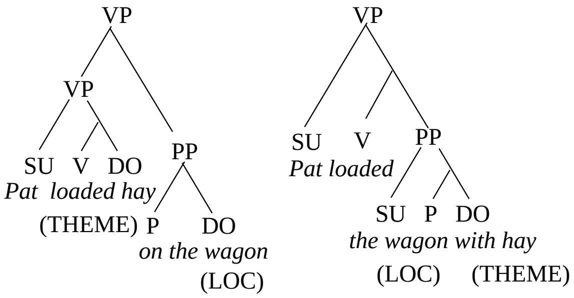
[5] A subset of these verbs could arguably be taking THEMES, even when the verb is modified by a *with* phrase: *crowd, dust, jam, plaster, prick, rub, stick, swab, wash, wrap.* For example, consider the paradigm in (i):

(i) a. I rub the water over the kittens.
b. I rubbed the kittens with the water.
c. * I rubbed the water.
d. I rubbed the kittens.

However, even in the (b) case, it is equally plausible that *the water* is the THEME. By standard assumptions, a verb cannot assign identical thematic roles to distinct clausemates. We therefore conclude that even in these cases, the direct object is a LOCATION, not a THEME.

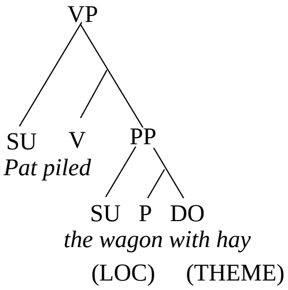
[6] This may be a processing effect because the sentence *John piled the wagon* sounds unacceptable.

(50)



Notice that there is no way to tell by looking at the sequence of words that (49)a doesn't have the structure of (50)a. How do we rule out (51)?

(51)



If (51) were a possible structure, then the PP should be preposable, thus allowing the following:

(52) With hay, Pat piled the wagon.

But, such a construction is awkward. We have an explanation, but it is highly stipulative. The stipulation is that there is a preference for the structure of (49)a, and the default THEME assignment is only overriden if a word that has a non-THEME direct object in the absence of a fully transitive PP has already been acquired. That is, normally, the P assigns the non-THEME role, but if there isn't one, then the language learner has to enter a new lexical entry for the marked case. In the absence of such a lexical entry, the (51) parse is not available, hence the PP is not preposable.

Our analysis assumes a locality requirement similar to that required for handling Exceptional Case Marking (ECM) verbs. For example, the verb *believe* assigns accusative case to a subordinate subject: Contrast (53)a with (53)b.

(53) a. I believe that he is intelligent.
b. I believe him to be intelligent.

Here we don't have preposing in this case, so we have to try a weaker condition; it falls under the area of "Case Adjacency": the verb has to be adjacent to the element that it assigns case to under ECM. That is to say, *him*, in (53)b, must be adjacent to *believe*. Now let's interfere with the adjacency and see what happens:

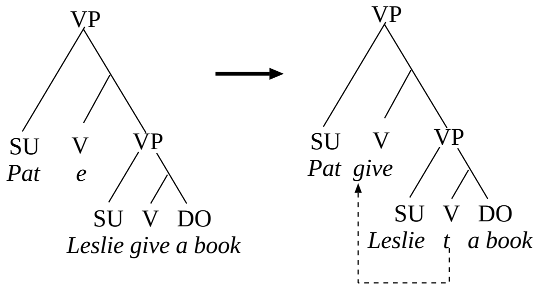
(54) a. I believe wholeheartedly that he is intelligent.
b. *I believe wholeheartedly him to be intelligent.

Consequently, we can return to the failure to PP prepose with the subject-containing PP's above and say that the subject of the PP must remain adjacent to the verb for reasons of case.

Future Work

The structures in (55) are similar to the ones proposed by Larson (1988) and Hale & Keyser (1993a) for ditransitive *give*. [7] Overlooking the details of the derivation in Larson (1988:353), the underlying structure of (55)a becomes (55)b (omitting some of the NP traces).

(55)



Notice that the THEME direct object of (56)a cannot be omitted, that is, (56)b is bad.

(56) a. Pat gave Leslie a book.
b. * Pat gave Leslie.

Our explanation for why *pile the shelf* is bad is analogous. The higher verb *pile* selects the *entire* transitive PP complement, just as the higher empty verb in (55)a selects the transitive VP.

Another area for exploration is that we have noticed that for some cases, adding a particle improves the sentence. Consider the following two examples:

(57) a. Pat piled the books high on the table.
b. Pat piled the table high with books.

(58) a. Pat pumped gas into the car.
b. Pat pumped up the car with gas.

At present, we do not know why the particles improve the sentences and we leave this for future work.

Conclusion

We assume that the Pile verbs select a transitive PP as a complement. From this analysis, we capture several facts. First, the *with* phrase is obligatory when the direct object is not a THEME. Second, the Pile verbs fail to form an adjectival passive. Third, the *with* phrase fails to prepose, since it is not a maximal category and is hence invisible to movement.

[7] We would like to thank Alec Marantz for pointing out this analogy to us.

Part IV
Comparisons of Verb Alternations in Korean and English

Franklin Cho

Introduction

This summer, I investigated how the English verb classes outlined in Beth Levin's work would map into Korean. The methodology that I adopted was to pick an English verb, semantically translate the verb into a Korean verb, and compare the syntactic behavior of the English verb and the corresponding Korean verb.

I chose to work with the spray/load alternation. Here is an example of a spray/load alternation (the Korean translation of "to spray" is "뿌리다", which transliterates as "ppurida"):

(59) a. 철수는 페인트를 벽에 뿌렸다
Cholsu-nun paint-rul byuk-e ppuryut-ta.
Cholsu-AP paint-OP wall-DP spray-PAST
Cholsu sprayed paint on the wall.

b. *철수는 벽을 페인트로 뿌렸다
Cholsu-nun byuk-ul paint-ro ppuryut-ta.
Cholsu-AP wall-OP paint-IP spray-PAST
Cholsu sprayed the wall with paint.

(On the third line of each example, "AP" stands for Auxiliary Particle, "OP" stands for Objective Particle, and "DP" stands for Dative Particle. There is a table of abbreviations and a table of Korean particles in the Appendix 1.)

The first case (case "a") is called the "locative" case and the second case (case "b") is called the "instrumental" case. According to the above example, the English verb "spray" exhibits spray/load alternation (since both cases are acceptable), but the Korean semantic equivalent "ppurida" only exhibits the locative case.

I chose to work with the spray/load alternation because it can be clearly translated into Korean, and the Korean spray/load alternation displays the "holistic/partitive" effect, just like English. For example, in the instrumental case of the above example, the wall is understood to be completely covered with paint. On the other hand, in the locative case, the paint does not have to cover the entire wall. This effect is called the "holistic/partitive" effect. This effect can be seen in both languages in the above example.

One can divide the verbs into four syntactic categories according to how the verb behaves with respect to the spray/load alternation. First, if both the locative and the instrumental cases are acceptable, then the verb can be assigned to the [+LOC +INST] category. "+LOC" stands for the locative case, and the second "+INST" stands for the instrumental case. Similarly, we can define the [+LOC -INST] category, where the locative case works, but the instrumental case does not work. [-LOC +INST] and [-LOC -INST] cases can be defined similarly.

English	Korean	Percent of Korean Verbs
[+LOC +INST]	[+LOC +INST]	12%
	[+LOC -INST]	82%
	[-LOC +INST]	6%
	[-LOC -INST]	0%
[-LOC +INST]	[+LOC +INST]	32%
	[+LOC -INST]	11%
	[-LOC +INST]	54%
	[-LOC -INST]	4%
[+LOC -INST]	[+LOC +INST]	10%
	[+LOC -INST]	81%
	[-LOC +INST]	4%
	[-LOC -INST]	4%

Table 1: Comparison of Spray/Load verbs in English and Korean

English	Korean
[+LOC +INST]	[+LOC -INST]
[-LOC +INST]	[+LOC +INST] or [-LOC +INST]
[+LOC -INST]	[+LOC -INST]

Table 2: Summary of Correspondence of Spray/Load verbs in English and Korean

The Results

I obtained a surprising result that although the syntactic behavior did not match, the categorical boundaries do match. Also, one category in English may break up into smaller categories in Korean. The same observations have been made in German (see Sauerland in this volume. Also, see the "Summary of Cross-Linguistic Correspondences in Bangla, German, English and Korean" in this volume.). Table (59) below demonstrate the results I obtained.

So, when the "Spray/Load" verbs that syntactically behave [+LOC +INST] in English are semantically translated into Korean, 12behaved [+LOC +INST], 82+INST] and none of them behaved [-LOC -INST]. To simplify the results, we can make the following generalization in Table (59).

(Please refer to Appendix 2 for the raw data). This result is similar to the result obtained with German, where the Spray/Load verb class and the Fill verb class broke down into finer classes (see Sauerland in this volume).

One of the problems I faced when I was collecting the data is that often times more than one verb in English translated into the same Korean verb. For example, both "daub" and "coat" translate into "칠하다"("chilhada") in Korean, although "daub" behaves [+LOC +INST], where "coat" behaves [+LOC -INST] in English. In Appendix 3, I put together a list, where all the duplicates like "coat" and "daub" are removed.

Explanations

I could not come up with a clear explanation on which factors cause these syntactic behaviors in Korean verbs. In this section, I will mention which hypotheses I have tested, hoping that it would be of some use to a future work in this area. I tried to explain what divided the English "fill" verbs into two syntactic categories in Korean.

"Real" vs. "Fake" Instrument

First, I noticed that there are two usages of the preposition "with": these usages I will call "real-instrumental" and "fake-instrumental". The "real-instrumental" refers to using an instrument in performing an action. For example, in "John tied Paul with a rope", the "with" is "real-instrumental". On the other hand, here is an example with a "fake-instrumental": "John filled the bucket with water". The water is not an instrument used to perform the action.

This idea explained some of the behavior. For example, when the verb takes a "real" instrument, it is likely to behave [+LOC +INST]. (e.g., "감다"("gamda", to wrap), "찌르다"("tchiruda", to prick), etc) There are a few exceptions to this rule, like "치다"("chida", to pound), which behaves [-LOC +INST]. Of course, this idea did not explain everything on which verbs behave [+LOC +INST]; there are many [+LOC +INST] verbs which take a "fake" instrument.

Verbs that take a real instrument that behaves [+LOC +INST]:

(60) prick (찌르다, tchiruda),

(61) stick (찌르다, tchiruda),

(62) swab (걸래질하다,gollaejilhada),

(63) wrap (감싸다, gamssada),

(64) carpet (깔다, kkalda),

(65) swaddle (둘둘 두르다, duldul duruda),

(66) swathe (감다, gamda),

(67) tile (덮다, dopta),

(68) veil (가리다, garida),

(69) coil(똘똘 감다, ttol ttolgamda),

(70) curl(감다, gamda),

(71) loop(두르다, duruda)

Verbs that take a real instrument that behaves [-LOC +INST]:

(72) lash ([채찍으로] 때리다, [whip-IP] ttarida),

(73) shroud (싸다, ssada),

(74) bang(탕 치다, tangchida),

(75) pound (치다, chida)

This idea was too weak to explain which factor divided the two categories of "fill" verbs. There were too many [+LOC +INST] "fill" verbs which were not explained by the above idea.

Morphological Analysis

I analyzed the verb morphology to see if it would shed any light on which factor divided the two categories of "fill" verbs. I came up with some interesting results, but I can not say that the results are conclusive.

All Korean verbs end in "-da". I divided the verbs into these categories:

- "아다", "-ada"
- "으다", "-uda"
- "우다", "-uda"
- "이다", "-ida" and
- "[받침]다", "-[consonant]da"

"Fill" Verbs that behave [+LOC +INST]:

("아다", "-ada")	40%
("으다", "-uda")	7%
("우다", "-uda")	10%
("이다", "-ida")	10%
("[받침]다", "-[consonant]da")	33%

"Fill" Verbs that behave [-LOC +INST]:

("아다", "-ada")	24%
("으다", "-uda")	8%
("우다", "-uda")	0%
("이다", "-ida")	45%
("[받침]다", "-[consonant]da")	22%

(Also look in Appendix 3 for the list of verbs).

From this evidence, it seems like the "fill" verbs that behave [+LOC +INST] are likely to have "-ada" ending, where the [-LOC +INST] "fill" verbs are likely to have "-ida" ending. But, the envidence is not strong enough to form a clear rule.

Optionality

I hypothesized that the optionality of the "with" phrase might have some connection to the syntactic behavior. After examining the verbs, I noticed that most verbs in fact do not require the "with" phrase, and the factor of optionality gives little insight into the syntactic behavior of the "fill" verbs.

Conclusion

As mentioned above, in spray/load alternation, the English and Korean verbs match categorically, but their syntactic behavior do not match. Also, a large verb category in English (like the "fill" verbs) break down into finer subcategories in Korean.

Appendix 1

Table of Abbreviations

AP	Auxiliary Particle
OP	Objective Particle
DP	Dative Particle
IP	Instrumental Particle
NP	Nominative Particle
AE	Adverbial Ending
AdnomP	Adnominal Particle
QP	Quotation Particle
DN	Dependent Noun

Appendix 2

Spray/Load Alternation

(76) a. 철수는 페인트를 벽에 뿌렸다
Cholsu-nun paint-rul byuk-e ppuryut-ta.
Cholsu-AP paint-OP wall-DP spray-PAST
Cholsu sprayed paint on the wall.

b. *철수는 벽을 페인트로 뿌렸다
Cholsu-nun byuk-ul paint-ro ppuryut-ta.
Cholsu-AP wall-OP paint-IP spray-PAST
Cholsu sprayed the wall with paint.

Alternating Verbs:

Spray/Load Verbs

Verbs that behave [+LOC +INST] in English, and also [+LOC +INST] in Korean

(77) daub (칠하다, chilhada)

(78) prick (찌르다, tchiruda)

(79) rub (문지르다, munjiruda)

(80) stick (찌르다, tchiruda)

(81) stuff (채우다, chauda)

(82) swab (걸래질하다, gollaejilhada)

(83) wrap (감싸다, gamssada)

Verbs that are [+LOC +INST] in English, and [+LOC -INST] in Korean

(84) brush(솔질하다, soljilhada)

(85) cram(채워넣다, chaewonotta)

(86) crowd(채워넣다, chaewonotta)

(87) cultivate(재배하다, jaebaehada)

(88) dab (두드려 붙이다, duduryo buchida)

(89) drape ([포장등을]치다, [cloth-OP] chida) ??

(90) drizzle ([이슬비가]내리다 [rain-NP] naerida)

(91) dust ([먼지등을]뿌리다,[dust-OP] ppurida)

(92) hang (걸다, golda)

(93) heap (쌓다, ssatta)

(94) inject (주사하다, jusahada)

(95) jam (쑤셔넣다, ssusyonotta)

(96) load ([짐을]싣다, [cargo-OP] sitta)

(97) mound (쌓다, ssatta) (the same word as to "heap")

(98) pack([짐을]꾸리다, [cargo-OP] kkurida)

(99) pile (쌓다, ssatta)

(100) plant (심다, simta) (as in "to plant a tree")

(101) plant (놓다, notta)

(102) plaster (바르다, paruda)

(103) pump ([펌프로]퍼올리다/넣다, [pump-IP] poollita, notta)

(104) scatter (흩뿌리다, hutppurida)

(105) seed ([씨를]뿌리다, [seed-OP] ppurida)

(106) settle (정착시키다, jongchaksikida)

(107) sew (바느질하다, banujilhada)

(108) shower (퍼붓다, pobutta)

(109) slather (두텁게 바르다, dutopke baruda)

(110) smear (바르다, baruda)

(111) sow ([씨를]뿌리다, ppurida)

(112) spatter (튀기다, twigida)

(113) splash (튀기다, twigida)

(114) splatter (튀기다, twigida)

(115) spray (뿌리다, ppurida)

(116) spread (바르다, baruda)

(117) sprinkle (흩뿌리다, hutppurida)

(118) spritz (분출시키다, bunchulsikida)

(119) squirt (분출시키다, bunchulsikida)

(120) stack (쌓다, ssatta)

(121) stock (저장하다, jojanghada)

(122) strew ([모래, 꽃, 씨들을] 뿌리다, [sand, flower, seed-OP] ppurida)

(123) string (꿰다, kkweda)

(124) vest (부여하다, buyohada)

Verbs that behave [+LOC +INST] in English, and [-LOC +INST] in Korean

(125) smudge (더럽히다, dorophida) ?

(126) wash (씻다, ssitta)

Non-Alternating "with" Only

FILL Verbs:

Verbs that behave [-LOC +INST] in English, and [+LOC +INST] in Korean

(127) bind(묶다, mukta)

(128) carpet (깔다, kkalda)

(129) clutter (어지르다, ojiruda)

(130) coat (칠하다, chilhada)

(131) cover(덮다, dopta)

(132) dapple (얼룩지게하다, ollukjigehada)

(133) deck (장식하다, jangsikhada)

(134) decorate (장식하다, hangsikhada)

(135) embellish (장식하다, jangsikhada)

(136) emblazon (장식하다, jangsikhada)

(137) encrust ([외피로]덮다, [skin-IP] dopta)

(138) face (겉칠을 하다, gutchilul hada)

(139) festoon ([꽃줄로]장식하다[wreath-IP] jangsikhada)

(140) fill (채우다, chauda)

(141) flood (범람시키다, bomramsikida)

(142) garland ([화환으로]장식하다,[wreath-IP] jansikhada)

(143) garnish (장식하다, jansikhada)

(144) imbue (물들이다, muldulida) ??

(145) interlace (섞어 짜다, sokko tchada)

(146) line (가득 채우다, gaduk chaeuda)

(147) litter (어질러놓다, ojillonotta)

(148) plug (틀어막다, tulomakta)

(149) replenish (다시 채우다, dasi chauda)

(150) stop up (틀어막다, tulomakta)

(151) stud (온통 박다, ontongbakta)

(152) suffuse (가득하게하다, gadukhagehada)

(153) swaddle (둘둘 두르다, duldul duruda)

(154) swathe (감다, gamda)

(155) tile (덮다, dopta)

(156) veil (가리다, garida)

Verbs that behave [-LOC +INST] in English, and [+LOC -INST] in Korean

(157) bombard (퍼붓다, pobutta)

(158) douse (끼얹다, kkiontta)

(159) dot ([점을]찍다, tchikta)

(160) endow (부여하다, buyohada)

(161) inlay (박아 넣다, baga notta)

(162) interlard ([이야기등에] 섞다, [story-OP] sokkta)

(163) interleave (끼워 넣다)

(164) intersperse ([사이에] 흩뜨리다, [gap-OP] hutt-turida)

(165) interweave (섞어 짜다, sokko tchada)

(166) repopulate (다시 거주시키다, dasi gojusikida)

(167) robe (입히다, iphida)

Verbs that behave [-LOC +INST] in English, and [-LOC +INST] in Korean

(168) fleck (얼룩덜룩하게 하다, olluktollukhake hada)

(169) adorn(꾸미다, kkumida)

(170) bathe(목욕시키다, mogyoksikida)

(171) bestrew(뒤덮다, duidopda)

(172) blanket(덮다, dupta)

(173) block (막다, makta)

(174) blot (더럽히다, dorophida)

(175) choke (질식시키다, jilsiksikida)

(176) cloak (뒤덮다, duidupta) ??

(177) clog (막다, makta)

(178) contaminate (오염시키다, oyomsikida)

(179) dam (막다, makta)

(180) dirty (더럽히다, dorophida)

(181) drench ([물에]적시다, joksida)

(182) edge ([날을]세우다, seuda)

(183) enrich (풍성하게 하다, pungsonghage hada)

(184) entangle (뒤얽히게 하다, duiolkhige hada)

(185) frame (틀에 끼우다, tule kkiuda)

(186) impregnate (수정시키다, sujongsikida)

(187) infect (감염시키다, gamyomsikida)

(188) lard ([말, 문장들을 불필요하게] 꾸미다, [talk, sentence-OP needlessly] kkumida)

(189) lash ([채찍으로] 때리다, [whip-IP] ttarida)

(190) mask (감추다, gamchuda)

(191) mottle (얼룩덜룩 하게하다, ulluktulluk hagehada)

(192) ornament (꾸미다, kkumida) ?

(193) pad (속을넣다, sogulnotta)

(194) pave (포장 하다, pojanghada)

(195) plate (도금하다, dogumhada)

(196) pollute (더럽히다, dorophida)

(197) riddle (구멍투성이로 만들다, gumongtusongiro mandulda)

(198) ring (울리다, ullida)

(199) ripple (잔물결을 일으키다, janmulgyolul ilukida)

(200) saturate (흠뻑 적시다, humppuk joksida)

(201) season (양념하다, yangnyomhada)

(202) shroud (싸다, ssada)

(203) smother (질식시키다, jilsiksikida)

(204) soak (적시다, joksida)

(205) soil (더럽히다, dorophida)

(206) speckle (얼룩덜룩 하게하다, ulluktulluk hagehada)

(207) splotch (얼룩덜룩 하게하다, ulluktulluk hagehada)

(208) spot (더럽히다, dorophida) ??

(209) staff (직원을 두다, jiwonul duda)

(210) stain (더럽히다, dorophida)

(211) stipple (얼룩덜룩 하게하다, ulluktulluk hagehada)

(212) surround (둘러싸다, dulossada)

(213) taint (더럽히다, dorophida)

(214) trim (다듬다, dadumta)

(215) vein (결을넣다, gyolulnotta)

(216) wreathe (고리로 만들다, goriro mandulda)

Verbs that behave [-LOC +INST] in English, and [-LOC -INST] in Korean

(217) deluge (범람시키다, bomramsikida)

(218) encircle (에워싸다, ewossada)

(219) inundate (범람시키다, bomramsikida)

Non-alternating Locative Preposition Only:

PUT verbs

All the "put" verbs behave [+LOC -INST] in both English and Korean

(220) put(놓다, notta)

(221) arrange(배열하다, bayolhada)

(222) immerse(담그다, damguda)

(223) install(장치하다, jangchihada)

(224) lodge(숙박시키다, sukpaksikida)

(225) mount (설치하다, solchihada)

(226) place (두다, duda)

(227) position (두다, duda)

(228) put(두다, duda)

(229) set(두다, duda)

(230) situate(놓다, notta)

(231) sling (내던지다, naedonjida)

(232) stash (감추다, gamchuda)

(233) stow (싣다, sitta)

Verbs of putting in a spatial configuration

All of these verbs behave [+LOC -INST] in both English and Korean

(234) tangle(매달다, maedalda)

(235) lay(놓다, notta)

(236) lean(기대다, gidaeda)

(237) perch(앉히다, anchida)

(238) rest(쉬다, swida)

(239) sit (앉히다, anchida)

(240) stand (세우다, seuda)

(241) suspend (매달다, maedalda)

FUNNEL verbs

"funnel" verbs that behave [+LOC -INST] in English and [+LOC +INST] in Korean

(242) wad (메우다, meuda)

(243) wedge ([쐐기를]박아죄다, [wedge-OP] bagajoeda)

"funnel" verbs that behave [+LOC -INST] in English and [+LOC -INST] in Korean

(244) funnel(흘리다, hullida)

(245) channel(보내다, bonaeda)

(246) dip(담그다, damguda)

(247) dump(내버리다, naeburida)

(248) hammer(망치질하다, mangchijilhada)

(249) ladle (푸다, puda)

(250) push (밀다, milda)

(251) ram (때려박다, ttaeryobakta)

(252) scoop (푸다, puda)

(253) scrape(긁어모으다, gulgomouda)

(254) shovel ([삽으로]뜨다, [shovel-OP] ttuda)

(255) siphon (빨아올리다, ppalaolida)

(256) spoon ([숟가락으로]뜨다, [spoon-OP] ttuda)

(257) squeeze (쑤셔넣다, ssussyonotta)

(258) squish (찌그려트리다, tchiguryoturida)

(259) squash (짓누르다, jitnuruda)

(260) sweep (쓸다, ssulda)

(261) tuck (밀어넣다, milonotta)

(262) wring(짜다, tchada)

"funnel" verbs that behave [+LOC -INST] in English and [-LOC +INST] in Korean

(263) bang(탕 치다, tangchida)

(264) pound (치다, chida)

"funnel" verbs that behave [+LOC -INST] in English and [-LOC -INST] in Korean

(265) rake ([갈퀴로]긁다, [rake-OP] gulkta)

(266) shake (흔들다, hundulda) wipe (닦다, dakkta)

Verbs of putting with a specified direciton

All of these verbs behave [+LOC -INST] in both English and Korean

(267) drop(떨어뜨리다, ttolotturida)

(268) hoist(끌어올리다, kkuloolida)

(269) lift(들어올리다, duloolida)

(270) lower(낮추다, natchuda)

(271) raise(올리다, olida)

POUR verbs

All of these verbs behave [+LOC -INST] in both English and Korean, except "slop"

(272) pour(붓다, butta)

(273) dribble(흘리다, hullida)

(274) drip(똑똑 떨어뜨리다, ttok ttok ttolotturida)

(275) slosh(튀기다, twigida)

(276) spew(토하다, tohada)

(277) spill(엎지르다, opjiruda)

(278) spurt(분출시키다, bunchulsikida)

slop(더럽히다, dorophida) behaves [+LOC -INST] in English and [-LOC +INST] in Korean.

COIL verbs

"coil" verbs that behave [+LOC -INST] in English and [+LOC +INST] in Korean

(279) coil(똘똘 감다, ttol ttol gamda)

(280) curl(감다, gamda)

(281) loop(두르다, duruda)

(282) twist (감다, gamda)

(283) wind(감다, gamda)

"coil" verbs that behave [+LOC -INST] in English and [+LOC -INST] in Korean:

(284) roll(굴리다, gulida)

(285) spin(돌리다, dolida)

(286) twirl(빙빙 돌리다, bing bing dolida)

(287) whirl (핑핑 돌리다, ping ping dolida)

Part V
Multilingual Wordnet: a Prospectus

Franklin Cho

Introduction

This summer, I added a number of features to the original WordNet lexical database. The WordNet database is organized around groups of synonyms called "synsets". The WordNet database encodes the semantic relations among these synsets, and displays them. The WordNet also contains other informations, such as the syntactic frames for the verbs. The enhancements that I made this summer include:

1. flexible addition of syntactic frames to the database.
2. allowing WordNet to input/output foreign characters.
3. allowing WordNet to display the syntactic frame in multiple lines.

Flexible Addition of Syntactic Frames

First, I made an enhancement so that new syntactic frames can be added, without resetting the WordNet software. The new syntactic frames (or sentences) are put in the file "evca.sent" in the directory specified in the environment variable "$EVCADIR". The information in the "evca.sent" file need not be a syntactic frame where the verb is "blanked out". It can be anything the user wants to display when the corresponding verb is looked up. The displayed information can span multiple lines. Here is an example entry from "evca.sent":

```
1       $50 build+s Molly the object.
        $50 is the count.
        Molly is the benefactive.
        The object is the object.
```

This example is generated by the "toy world" program (see Kohl in this volume.) The program will eventually include a morphological analyzer, so that "build+s" will be displayed as "builds".

The first entry on the first line is the syntactic frame number. Then, a tab character separates the syntactic frame number from the sample sentence. In subsequent lines, a tab character precedes each sentence.

The file "evca.dictionary" contains information on which verbs corresponds to which syntactic frames. Here is an example entry form "evca.dictionary":

```
abash 1 adc add ade 1db8
```

The first entry in the line is the verbs. The following number corresponds to the sense number. The sense number corresponds to the original WordNet sense number (the sense number that is displayed when the verb is looked up in WordNet.) If the word is not found in WordNet, the user can give the word an arbitrary sense number, starting from 1. A tab character separates the sense number from the rest of the line. The following hexadecimal numbers are the syntactic frame numbers. So, when the verb "abash" with sense number 1 is looked up, the syntactic frames corresponding to the hexadecimal numbers adc, add, ade, and 1db8 are displayed.

The user may use either the text-based display or an X-window based display. The text-based WordNet can be called with the command "wn", and the X-window based WordNet can be called with "xwn". Both of these executable files reside in "/home/nl/wordnet/sources/bin".

Making WordNet Multi-lingual

The second enhancement I made to WordNet this summer is that the WordNet software can now handle I/O in native scripts. Also, foreign words can be looked up using either the native script, the transliteration of the native script, or the English translation of the word. The following executable files, which all reside in the "home/nl/wordnet/sources/bin" directory, are used to access the database:

mwn$_e$ng: takes the English translation as an argument. mwn$_t$rans: takes the transliteration of the native word as an argument. mwn$_n$ative: takes the native script as an arguemtn.

For example, the translation of the verb "fill" is "" in Korean. The standard transliteration of this word is "chaeuda". I used the McCune-Reischauer phonetic system, which has been adopted by the Korean Ministry of Education as the official transliteration system.

Here is what is displayed when the user types in "mwn$_t$rans chaeuda -framv":

```
evca> 철수는 풀을 마차에 채웠다
    Cholsu-nun pul-ul macha-e chae-wot-da.
    Cholsu-NP grass-OP carriage-DP fill-PAST-VERB
    Cholsu filled the grass into the carriage.

evca> 철수는 마차를 풀로 채웠다
    Cholsu-nun macha-rul pul-lo chae-wot-da.
    Cholsu-NP carriage-OP grass-IP fill-PAST-VERB
    Cholsu filled the carriage with grass.
```

The "evca.dictionary" file is split into three separate files in the multi-lingual WordNet. These three files correspond to the native, transliteration and the English translation of the words. All these files reside in the directory pointed to by the environment variable EVCADIR. For example, in the /home/nl/vca directory, there are three files: "evca.dictionary.kr.eng", "evca.dictionary.kr.tnl", and "evca.dictionary.kr.native". Here is a sample line from "evca.dictionary.kr.eng":

```
fill 1 8e fe
```

Here's the corresponding line in "evca.dictionary.kr.tnl":

```
chaeuda 1 8e fe
```

Here is the corresponding line in "evca.dictionary.kr.native":

```
채우다 1 8e fe
```

The multi-lingual I/O is based on Mule. The most current version of mule is installed in "/home/jp/mule/bin" directory. Typing "mule" invokes mule. "m2ps" is a program that converts a mule file into a PostScript file, and the executable for this program is also contained in the same directory. (For a detailed discussion on how to use Mule and m2ps, look at "A special Tip on How to Use Mule and Related Software" in this volume.)

Part VI
Bangla Verb Classes and Alternations

Zeeshan R. Khan*

Introduction

This paper forms the initial report of a summer project surveying Bangla [2] verb classes and alternations. The survey was based on information on English verb classes as described in Levin (1993). In this report, my goals are to find out the verb-classes that are cross-linguistically constant, and to explore why the other verb-classes are different in English and Bangla. This is a work-in-progress, and ultimately I would like this to be the basis of a Bangla-English translator.

In the following survey of alternations, I use a four-line description of each sentence - the first one in the native Bangla script, the second one its word-for-word English gloss, the third one its word-by-word meaning in English, and the fourth one the sentence in English. I have put the following four signs as a quick summary of the comparison of the Bangla and English alternations:

- ☑ Almost exact match between Bangla and English.
- ☒ Alternation does not apply to Bangla.
- ? Needs more detailed investigation.

Transitive Alternation

Object of Transitive = Subject of Intransitive Alternations

Middle Alternation ☑

(288) a. কসাই মাংস কাটে।
koshai mangsho kate.
butcher meat cuts
The butcher cuts the meat

b. মাংস সহজে কাটে।
mangsho shohoje kate
meat easily cuts
The meat cuts easily.

(289) a. জোন উত্তরটা জানে।
joan uttor-ta jan-e
Joan answer knows
Joan knows the answer.

b. * উত্তরটা সহজে জানে।
Uttor-ta shohoje j an-e
Answer easily knows
The answer knows easily.

(290) a. বিল লোহা পিটালো।
bill loha pitalo
Bill metal beat
Bill pounded the metal.

b. * এই লোহা পিটাবে না।
ei loha pitabe na.
this metal beat not
This metal won't pound.

Comments: There seems to be an exact correspondence between Bangla and English in terms of the middle alternation. The characteristics of the English middle alternation, such as, lack of specific time reference, understood but unexpressed agent, usually inclusion of an adverbial or modal element, all seem to apply to Bangla.

Causative Alternation

Causative/Inchoative or Ergative Alternation ☑

(291) a. জ্যানেট কাপটা ভাঙ্গলো।
janet kap-ta bhang-lo.
Janet cup broke
Janet broke the cup.

b. কাপটা ভাঙ্গলো।
kap-ta bhang-lo.
cup broke
The cup broke.

(292) a. মার্গারেট রুটি কাটলো।
margaret ruti katlo.
Margaret bread cut
Margaret cut the bread.

b. * রুটিটা কাটলো।
ruti-ta kat-lo.
bread cut
The bread cut.

Comments: It seems like a smaller subset of Bangla verbs conform to the causative/inchoative alternation. But in general, the verbs go through syntactical change to fit in this alternation. For some verbs the causative marker -a- is inserted.

Induced Action Alternation ☒

(293) a. * সিলভিয়া ঘোড়াটাকে বেড়ার উপর দিয়ে লাফালো।
sylvia ghora-take bera-r upor diye lafalo.
Sylvia horse fence-of over along jumped
Sylvia jumped the horse over the fence.

*I would like to thank the coodinator of the VCA summer project at the MIT Al-Lab: Doug Jones, and also all the other participants in the project: Robert C.Berwick, Franklin Cho, Karen T.Kohl, Anand Radhakrishnan, and Brian Ulicny.

[2]In this paper, I choose to refer to the language spoken in Bangladesh and certain parts of India as 'Bangla' instead of the more western term 'Bengali'.

b. ঘোড়াটা বেড়ার উপর দিয়ে লাফালো।
ghora-ta bera-r upor diye lafalo.
horse fence over along jumped
Tile horse jumped over the fence.

Comments: Bangla verbs do not fit directly in this alternation. It requires a separate compound verb combination to work in Bangla. For example the following will work instead of (293)a:

(294) সিলভিয়া ঘোড়াটাকে বেড়ার উপর দিয়ে লাফ দেওয়ালো।
sylvia ghora-take bera-r upor diye lafa dewalo
Sylvia horse fence-of over along jumped
Sylvia jumped the horse over the fence.

Other Instances of Causative Alternations ☑

(295) a. আমি বাচ্চাটাকে ঢেকুর তুলালাম।
ami bachcha-ta-ke dhekur tulalam.
baby (burp pick-PAST-causative)
I burped the baby.

b. বাচ্চাটা ঢেকুর তুললো।
bachcha-ta dhekur tul-lo.
baby (burp pick-PAST)
The baby burped.

Comments: Here also the causative alternation requires syntactical changes, in Bangla. In 'tulalam' - the causative marker -a - is inserted.

Substance/Source Alternation ⊠

(296) a. * তাপ সূর্য হতে বিকিরণ করে।
tap shurjo hote bikiron kore.
heat sun from (radiation do)
Heat radiates from the sun.

b. সূর্য তাপ বিকিরণ করে।
shurjo tap bikiron kore.
sun heat (radiation do)
The sun radiates heat.

Unexpressed Object Alternations

Unspecified Object Alternation ☑

(297) a. মাইক কেকটা খেলো।
mike cake-ta khelo
Mike cake ate
Mike ate the cake.

b. মাইক খেলো।
mike khelo
Mike ate
Mike ate.

Comments: In Bangla, this alternation almost exactly corresponds to that of English.

Understood Body-Part Object Alternation ⊠

(298) a. বিদায়ী ভ্রমণকারী/প্যাসেঞ্জার

ভীড়ের দিকে তার হাত নাড়লো।

bidayi bhromonkari/passenger bhir-er dike tar haat narlo.
departing traveller/passenger crowd at his hand moved
The departing passenger waved his hand at the crowd.

b. * বিদায়ী ভ্রমণকারী/প্যাসেঞ্জার

ভীড়ের দিকে নাড়লো।

bidayi bhromonkari/passenger bhir-er dike narlo.
departing traveller/passenger crowd at moved
The departing passenger waved at the crowd.

(299) a. সেলিয়া তার চুল বেনী করলো।
celia tar chul beni korlo.
Celia her hair (braids did)
Celia braided her hair.

b. * সেলিয়া বেনী করলো।
celia beni korlo.
Celia (braids did)
Celia braided.

Comments: In general, the intransitive alternation does not seem to work in Bangla. Only when the verb is a compound verb, the alternation works, since the noun part of the compound verb carries on the implication of the body part.

Understood Reflexive Object Alternation ⊠

(300) a. * জিল তাড়াতাড়ি করে নিজেকে সাজালো।
jill taratari-kore nijeke shajalo.
Jill hurry -doing herself dressed
Jill dressed herself hurriedly.

b. জিল তাড়াতাড়ি করে সাজলো।
jill taratari-kore shajlo
Jill hurry-doing dressed
Jill dressed hurriedly.

(301) a. * আমি ফ্লস করলাম।
ami floss korlam
(floss did)
I flossed.

b. * আমি নিজেকে ফ্লস করলাম।
ami nije-ke floss korlam
myself-to (floss did)
l flossed myself.

(302) a. *Cecilia brushed herself.

b. *Celia brushed.

c. সেলিয়া দাঁত ব্রাশ করলো।
celia daat brush korlo

Celia teeth (brush did)
Celia brushed her teeth.

Same applies in Bangla, but consider (302)c

(303) a. আমরা নিজেদেরকে ছাড়িয়ে নিলাম।
amra nijeder-ke chariye nilam.
we ourselves free-d take-PAST
We pulled ourselves free.

b. * আমরা ছাড়িয়ে নিলাম।
amra chariye nilam
we free-d take-PAST
We pulled free.

Neither is acceptable in Bangla either. The teeth(= dath) object is required.

Comments: This alternation does not work in Bangla, because the reflexive object is implied in all cases, and so there is no need of a transitive with the reflexive object. (303) is interesting. The construction in (303)a is valid in Bangla but apparently (303)b does not work. Seems like some verbs require the reflexive object and other verbs don't.

Understood Reciprocal Object Alternation ?

(304) a. অ্যান ক্যাথির সাথে সাক্ষাত করলো।
Anne cathy-r shathe shakkhat korlo.
Anne Cathy with (met do-PAST)
Anne met Cathy.

b. * অ্যান আর ক্যাথি সাক্ষাত করলো।
anlle ar cathy shakkhat korlo.
Anne and Kathy (met happened)
Anne and Cathy met.

(305) a. * ইটালী ফ্রান্সকে ছোঁ য়।
italy france-ke chooy.
Italy France touches
Italy touches France.

b. * ইটালী আর ফ্রান্স ছোঁ য়।
italy aar france chooy
Italy and Franch touch
Italy and France touch.

c. ইটালী আর ফ্রান্স একে অপরকে ছোঁ য়।
italy aar france eke oporke chooy
Italy and France each other touch
Italy and France touch each other.

(306) a. * এলেন হেলেনকে গল্প করলো।
ellen helen-ke golpo korlo.
Ellen Helen storydo-PAST
Ellen chitchatted Helen.

b. এলেন আর হেলেন গল্প করলো।
ellen aar helen golpo korlo.
Ellen and Helen story do-PAST
Ellen and Helen chitchatted.

Comments: Most of the Bangla verbs seem to work in this alternation. But there isn't a one-to-one correspondence between the bangla and English verbs that fall in this alternation.

PRO-arb Object Alternation ⊠

(307) a. ঐ ছায়াছবিটা সবসময় মানুষকে অবাক করে।
oi chayachobi-ta shobshomoi manush-ke obak kore
that movie always people shock do-PRESENT
That movie always shocks people.

b. * ঐ ছায়াছবিটা সবসময় অবাক করে।মুগ্ধ করে/হতভম্ব করে/হতচকিত করে।
oi chayachobi-ta shobshomoi obaak kore/mugdho kore/hotobhombo kore/hotochokito kore
That movie always shock do-PRESENT
That movie always shocks.

Characteristic Property Alternations

Characteristic Property of Agent Alternation ☑

(308) a. ঐ কুকুরটা মানুষ কামড়ায়।
oi kukurta manush kamrae
that dog people bites
That dog bites people.

b. ঐ কুকুরটা কামড়ায়।
oi kukurta kamrae
that dog bites
That dog bites.

Characteristic Property of Instrument Alternation ☑

(309) a. আমি রুটিটা এই চাকু দিয়ে কাটলাম।
ami ruti-ta ei chaku diye katlam
break this knife with cut
I cut the bread with this knife.

b. এই চাকু রুটিটা কাটলো।
ei chaku ruti-ta katlo
this knife bread cut
This knife cut the bread.

c. এই চাকু কাটে না।
ei chaku kaate na
this knife cuts not
This knife doesn't cut.

(310) a. * এই চাবি খোলে না।
ei chabi khole na
this key open not
This key won't open.

b. এই চাবি তালাটা খোলে না।
ei chabi tala-ta khole na
this key lock open not
This key won't open the lock.

Comments: Both of these alternations work exactly the same way in Bangla.

Way Object Alternation ☒

(311) a. They pushed their way through the crowd.

b. They pushed through the crowd.

c. তারা ধাক্কা দিয়ে ভীড়ের মধ্যে নিজেদের পথ করে নিলো।
taara dhakka diye bhir-er moddhe nijeder poth kore nilo
they push by crowd in themselves-of way do take
They made their way by pushing though the crowd.

Comments:
There doesn't seem to be any comparable verb alternation in Bangla. The closest would be (311)c.

Instructional Imperative ☑

(312) a. কেকটা ৩০ মিনিট ধরে বেক করো।
kek-ta 30 minute ore bek koro
Cake 30 minutes for bake do
Bake the cake for 30 minutes.

b. ৩০ মিনিট ধরে বেক করো।
30 minute dhore bek koro
30 minutes for bake do
Bake for 30 minutes.

(313) a. * আইসক্রিমটা পছন্দ করো।
icecream-ta pochondo koro
Ice cream like do
Like the icecream.

(313) * চেখে দেখার পরে পছন্দ করো।
chekhe dekha-r pore pochondo koro
taste see after like do
Like after tasting.

Comments: Bangla verbs seem to follow this alternation the same way as English ones.

Conative Alternation ☒

(314) a. পলা বেড়াটাকে আঘাত করলো।
pola bera-take aaghaat korlo
Paula fence hit do-PAST
Paula hit the fence.

b. * পলা বেড়ার দিকে আঘাত করলো।
pola bera-r dike aaghat korlo
Paula fence towards hit do-PAST
Paula hit at the fence.

(315) a. জ্যানেট রুটিটা ভাঙ্গলো।
janet ruti-ta bhanglo
Janet bread broke
Janet broke the bread.

b. * জ্যানেট রুটিটার দিকে ভাঙ্গলো।
janet ruti-tar dike bhanglo
Janet bread towards broke
Janet broke at the bread.

Comments: This alternation doesn't seem to work in Bangla. There doesn't seem to be any verb form that captures the 'attempted to' meaning.

Preposition Drop Alternations

Locative Preposition Drop Alternation ☑

holistic/partitive effect

(316) a. মার্থা পাহাড় বেয়ে উঠলো।
martha paahaar beye uthlo
Martha mountain along rose/got on
Martha climbed up the mountain.

b. মার্থা পাহাড়ে উঠলো।
martha paahaar-e uthlo
Martha mountain-on rose/got on
Martha climbed the mountain.

c. মার্থা পাহাড়ের উপরে উঠলো।
martha paahaar-er upore uthlo
Martha mountain-of above rose/got on
Martha climbed to the top of the mountain.

(317) a. মহাশূণ্যযান পৃথিবীর চারদিকে ঘুরে।
mohashunnojan prithibi-r chardike ghure
spaceship earth-OF around revolves
The spaceship revolves around the earth.
b. * মহাশূণ্যযান পৃথিবীকে ঘুরে।
mohashunnojan prithibi-ke ghure
spaceship earth-OBJ revolves
The spaceship revolves the earth.

(318) a. শ্যারন ঘরে আসলো।
sharon ghor-e aashlo
Sharon room-IN came
Sharon came into the room.

b. * শ্যারন ঘরআসলো।
sharon ghor aashlo
Sharon room came
Sharon came the room.

With Preposition Drop Alternation ☑

(319) a. জিল সারার সাথে সাক্ষাত করলো।
jill sara-r shathe shakkhat korlo
Jill Sahah-OF with meet do-PAST
Jill met with Sarah.

b. জিল সারাকে সাক্ষাত করলো।
jill sara-ke shakkhat korlo
Jill Sarah-OBJ meet do-PAST
Jill met Sarah.

(320) a. * জিল সারাকে সাক্ষাত করলো।
jill sara-r shathe joriye dhorlo
Jill Sarah-OF with embrace held
Jill embraced with Sarah.

b. জিল সারাকে জড়িয়ে ধরলো।
jill sara-ke joriye dhorlo

Jill Sarah-OBJ embraceheld
Jill embraced Sarah.

Alternations Involving Arguments Within the VP

Dative Alternation ☒

(321) a. বিল টমকে/-এর কাছে একটা গাড়ী বিক্রি করলো।
bill tom-ke/-er kaache ekta gari bikri korlo
Bill Tom-to/-to one car sell do-PAST
Bill sold a car to Tom.

b. * বিল টম একটা গাড়ী বিক্রি করলো।
bill tom ekta gari bikri korlo
Bill Tom one car sell do-PAST
Bill sold Tom a car.

Comments: The Dative Alternation does not seem to work in Bangla. This might be because a case-marker is needed for the recipient of the action; this case-marker is in effect the semantic equivalent of a postposition, most usually one corresponding to the English preposition 'to'.

Benefactive Alternation ☑

(322) a. মার্থা বাচ্চাটার জন্য একটা খেলনা খোদাই করলো।
martha bachcha-ta-r jonno ekta khelna khodai korlo
Martha baby-THE-OF for a toy carve do-PAST
Martha carved a toy for the baby.

b. মার্থা বাচ্চাটাকে একটা খেলনা খোদাই করে দিলো/*করলো।
martha bachcha-ke ekta khelna khodai kore dilo/* korlo
Martha baby-TO a toy carve do gave/do-PAST
Martha carved the baby a toy.

Locative Alternation

Spray/Load Alternation ☑

(323) a. জ্যাক দেওয়ালে রঙ ছিটালো।
jack dewal-e rong chitalo
Jack wall-ON color sprayed/spread
Jack sprayed paint on the wall.

b. জ্যাক রঙ দিয়ে দেওয়াল ছিটালো।
jack rong diye dewal chitalo [3]
Jack color with wall sprayed/spread
Jack sprayed the wall with paint.

(324) a. জ্যাক খড় দিয়ে গাড়ী বোঝাই করলো।
jack khor diye gari bojhai korlo.
Jack hay with car loaded do-PAST
Jack loaded the car with hay.

b. জ্যাক গাড়ীতে খড় বোঝাই করলো।
jack gari-te khor bojhai korlo.
Jack car-ON hay loaded do-PAST
Jack loaded hay on to the car.

(325) a. জ্যাক কাপটা পানি দিয়ে ভরলো।
jack kaap-ta pani diye bhorlo
Jack cup-THE water with filled
Jack filled the cup with water.

b. জ্যাক কাপে পানি ভরলো।
jack kaap-e pani bhorlo.
Jack cup-lN water filled
Jack filled water into the cup. [4]

Comments: The holistic/partitive effect of the spray-load alternation is available in Bangla as well. Except for a few exceptions, most Bangla verbs corresponding to English spray-load verbs participate in this alternation.

(326) a. * জুন চাদরটা বাচ্চাটার উপর ঢাকলো।
june chador-ta bachcha-ta-r upor dhaklo
June blanket-THE baby-THE-OF over covered
June covered the blanket over the baby.

b. জুন চাদরটা দিয়ে বাচ্চাটাকে ঢাকলো।
june chador-ta diye bachcha-ta-ke dhaklo
June blanket-THE with baby-THE-OBJ covered
June covered the baby with a blanket.

Clear Alternation (transitive) ☒

(327) a. হেনরী টেবিল থালাবাসনের থেকে খালি করলো।
henry tebil theke thalabashon shoralo/*khali korlo.
Henry table from dishes removed/clear do-PAST
Henry Henry cleared dishes from the table.

b. * হেনরী টেবিল থেকে থালাবাসন সরালো/* খালি করলো।
henry table thalabashon-er theke khali korlo.
Henry table dishes-OF FROM clear do-PAST
Henry cleared the table of dishes.

c. হেনরী টেবিল খালি করলো।
henry table khali korlo.
Henry table clear do-PAST
Henry cleared the table.

Wipe Alternation ☑

(328) a. হেলেন দেওয়াল থেকে আঙ্গুলের ছাপ মুছে ফেললো।
helen dewal theke angul-er chap muche fello.
Helen wall from finger-OF mark wipe

[3] This example is marked with a "*" in the draft but I believe it is a typo. DAJ

[4] The draft marked this example with "*" but I believe that referred to the English gloss, not the Bangla example. DAJ

throw-PAST
Helen wiped the fingerprints off the wall.

b. হেলেন আঙ্গুলের ছাপ থেকে দেওয়ালটা মুছে ফেললো।
helen (*anguler chap theke) dewal-ta muche fello.
Helen (finger-OF markfrom) wall-THE wipe throw-PAST
Helen wiped the wall (* of fingerprints).

Swarm Alternation ☒

(329) a. মৌমাছি বাগানে জড়ো হয়েছে।
moumachi bagan-e joro hoyeche.
Bees garden-lN swarm has
Bees are swarming in the garden.

b. * বাগান মৌমাছি দিয়ে জড়ো হয়েছে।
bagan moumachi diye joro hoyeche.
garden bees with swarm has been
The garden is swarming with bees.

Clear Alternation (intransitive) ?

(330) a. আকাশ থেকে মেঘ কেটে গেলো/* পরিষ্কার হয়ে গেলো।
akash theke megh kete gelo/* porishkar hoye gelo.
sky from clouds cut went/* clear be went
Clouds cleared from the sky.

b. আকাশ (*মেঘ থেকে) পরিষ্কার হয়ে গেলো।
akaash (meghtheke) porishkar hoye gelo.
sky (cloud from) clear be went
The sky cleared (?of clouds).

Creation and Transformation Alternations

Material/Product Alternation (transitive) ☒

(331) a. মার্থা কাঠের টুকরাটা থেকে একটা খেলনা খোদাই করলো।
martha kath-er tukrata theke ekta khelna khodai korlo.
Martha wood-OF piece from one toy carve do-PAST
Martha carved a toy out of the piece of wood.

b. * মার্থা কাঠের টুকরাটা একটা খেলনাতে খোদাই করলো।
martha kath-er tukra-ta ekta khelna-te khodai korlo.
Martha wood-OF piece one toy-TO carve do-PAST
Martha carved the piece of wood into a toy.

Material/Product Alternation (intransitive) ☒

(332) a. * ঐ একর্নটা একটা ওক গাছে বড় হবে।
oi acorn-ta ekta oak-gach-e boro hobe.
that acorn one oak-tree-TO big (will become)
That acorn will grow into an oak tree.

b. ঐ একর্নটা থেকে একটা ওক গাছ বড় হবে।
oi acorn-ta theke ekta oakgach (*boro)hobe.
that acorn from one oak-tree big (will become)
An oak tree will grow from that acorn.

c. ঐ একর্নটা বড় হয়ে একটা ওক গাছ হবে।
oi acorn-ta borohoye ekta oakgach hobe.
that acorn big becoming one oak tree become
That acorn, when grown, will be an oak tree.

Total Transformation Alternation (transitive) ☑

(333) a. ডাইনী তাকে একটা ব্যাঙে পরিণত করলো।
daini take ekta bang-e porinoto korlo.
witch him one frog-TO become do-PAST
The witch turned him into a frog.

b. ডাইনী তাকে রাজকুমার থেকে ব্যাঙে পরিণত করলো।
daini take rajkumar theke bang-e porinoto korlo.
witch him prince from frog-TO become do-PAST
The witch turned him from a prince into a frog.

Total Transformation Alternation (intransitive) ☑

(334) a. সে একটা ব্যাঙে পরিণত হলো।
she ekta bang-e porinoto holo.
He one frog-TO become was
He turned into a frog.

b. সে রাজকুমার থেকে ব্যাঙে পরিণত হলো।
she rajkumar theke bang-e porinoto holo.
He prince from frog-TO become was
He turned from a prince into a frog.

Reciprocal Alternations

Simple Reciprocal Alternation (transitive) ☑

(335) a. আমি ডিমের সাদা থেকে কুসুম আলাদা করলাম।
ami dim-er shada theke kushum alada korlam.
egg-OF white from yolk separate do-PAST
I separated the yolk from the white.

b. আমি ডিমের কুসুম আর সাদা আলাদা করলাম।
ami dimer kushum ar shada alada korlam.
egg-OF yolk and white separate do-PAST
I separated the yolk and the white.

Together Reciprocal Alternation (transitive) ☑

(336) a. আমি মাখনের মধ্যে চিনি মিশালাম।
ami makhon-er moddhe chini mishalam.
butter-OF in sugar mixed
I mixed the sugar into the butter.

b. আমি মাখন আর চিনি একসাথে মিশালাম।
ami makhon ar chini ekshathe mishalam
butter and sugar together mixed
I mixed the sugar and the butter together.

Apart Reciprocal Alternation (transitive) ☑

(337) a. আমি ডাল থেকে শাখাটা ভেঙ্গে ফেললাম।
ami daal theke shakha-tabhenge fellam
branch from twig-THE broke throw-PAST
I broke the twig off the branch.

b. * আমি ডাল আর শাখা ভেঙ্গে আলাদা করলাম।
ami daal ar shakhabhenge alada korlam
branch and twig break separate do-PAST
I broke the twig and the branch apart.

Simple Reciprocal Alternation (intransitive) ☑

(338) a. ব্রেন্ডা মলির সাথে একমত হলো।
brenda moli-r shathe ekmot holo
Brenda Moli-OF with agreed be-PAST
Brenda agreed with Molly.

b. ব্রেন্ডা আর মলি একমত হলো।
brenda ar moli ekmot holo
Brenda and Moli agreed be-PAST
Brenda and Molly agreed.

Together Reciprocal Alternation (intransitive) ☑

(339) a. ডিমগুলো ক্রিমের সাথে মিশলো/মিশে গেলো।
im-gulo krim-er shathe mishlo/mishe gelo
egg-s cream-OF with mixed/mix go-PAST
The eggs mixed with the cream.

b. ডিম আর ক্রিম একসাথে মিশলো/মিশে গেলো।
dim ar krim ekshathe mishlo/ mishe gelo
Eggs and cream together mixed/ mix go-PAST
The eggs and the cream mixed together.

Apart Reciprocal Alternation (intransitive) ☑

(340) a. শাখাটা ডাল থেকে ভেঙ্গে গেলো।
shakha-ta daal theke bhenge gelo
twig-THE branch from break go-PAST
The twig broke offthe branch.

b. ডাল আর শাখা ভেঙ্গে আলাদা হয়ে গেলো।
daal ar shakhabhengealada hoye gelo
branch and twig break separate be go-PAST
The twig and the branch broke apart.

Fulfilling Alternation ☒

(341) a. বিচারক বিজয়ীকে একটি পুরস্কার দিলেন।
bicharok bijoyi-ke ekti puroshkar dilen
judge winner-TO a prize gave
The judge presented a prize to the winner.

b. * বিচারক বিজয়ীকে একটি পুরস্কার দিয়ে দিলেন।
bicharok bijoyi-ke ekti puroshkardiye dilen
judge winner-TO a prize give gave
The judge presented the winner with a prize.

Image Impression Alternation ☒

(342) a. স্বর্ণকার আংটিতে নামটা খোদাই করলো।
shornokar aangti-te naam-takhodai korlo
jeweller ring-ON name-THE inscribe do-PAST
The jeweller inscribed the name on the ring.

b. * স্বর্ণকার আংটিটা নামটা দিয়ে খোদাই করলো।
shornokar aangti-ta naam-tadiye khodai korlo
jeweller ring-THE name-THE with inscribe do-PAST
The jeweller inscribed the ring with the name.

With/Against Alternation ☒

(343) a. * ব্রায়ান লাঠিটা বেড়াতে পিটালো।
brayan lathi-ta bera-te pitalo
Brian stick-THE fence-on hit
Brian hit the stick against the fence.

b. ব্রায়ান লাঠি দিয়ে বেড়াটা পিটালো।
brayan lathi diye bera-ta pitalo
Brian stick with fence-thehit
Brian hit the fence with the stick.

Through/With Alternation ☒

(344) a. এলিসন সুঁচটা কাপড়ের মধ্যে বিধাঁলো।
elison shooch-ta kaapor-er moddhe bidhalo
Alison needle-THE cloth-OF in pierced
Alison pierced the needle through the cloth.

b. * এলিসন কাপড়টা সুঁচ দিয়ে বিধাঁলো।
elison kaapor-ta shooch diye bidhalo
Alison cloth-THE needle with pierced
Alison pierced the cloth with a needle.

Blame Alternation ☒

(345) a. * মিরা দুর্ঘটনাটা টেরিকে/র উপর দোষারোপ করলো।
mira durghotona-ta teri-ke/-r upor

dosharop korlo
b Mira accident-THE Terry-OBJ/-OFonblame do-PAST
Mira blamed the accident on Terry.

b. মিরা দুর্ঘটনার জন্য টেরিকে/র উপর দোষারোপ করলো।
mira durghotona-r jonnoteri-ke/-rupor dosharop korlo
Mira accident-OF for Terry-OBJ/OF on blame do-PAST
Mira blamed Terry for the accident.

Search Alternations ☒

(346) a. * আইডা হরিণের জন্য বন শিকার করলো।
aida horin-er jonno bon shikar korlo
Ida deer-OF for woods hunt do-PAST
Ida hunted the woods for deer.

b. * আইডা হরিণের জন্য বনে শিকার করলো।
aida horin-er jonnobon-e shikar korlo
Ida deer-OF for woods-lN hunt do-PAST
Ida hunted for deer in the woods.

c. আইডা বনে হরিণ শিকার করলো।
aida bon-e horin shikar korlo
Ida woods-IN deer hunt do-PAST
Ida hunted deer in the woods.

Body-Part Possessor Ascension Alternation ☑

(347) a. ঘোড়া সেলিনার পায়ে লাথি দিলো।
ghora selina-r paye lathi dilo
horse Selina-of leg-at kick give-PAST
The horse kicked Selina's leg.

b. ঘোড়া সেলিনাকে পায়ে লাথি দিলো।
ghora selina-ke paye lathi dilo
horse Selina-to leg-at kick give-PAST
The horse kicked Selina in the leg.

Possessor-Attribute Factoring Alternations ☑

Possessor Object

(348) a. আমি তার সাহসকে শ্রদধা করতাম।
ami taar shahosh-ke sroddha kortam
his courage-OBJ respect/admire do-PAST
I admired his courage.

b. আমি তার সাহসের জন্য তাকে শ্রদধা করতাম।
ami taar shahosh-er jonno taake sroddha kortam
his courage-of for him respect/admire do-PAST
I admired the honesty in him.

Attribute Object ?

(349) a. আমি তার সততাকে শ্রদধা করতাম।
ami taar shotota-ke sroddha kortam
his honesty-OBJrespect/admire do-PAST
I admired his honesty.

b. ? আমি তার মধ্যকার সততাকে শ্রদধা করতাম।
ami taar moddhokar shotota-ke sroddha kortam
his inside honesty-to respect/admire do-PAST
I admired the honesty in him.

Comments: Here I'm not sure if (349)b is correct. (349)a sounds a lot better than (349)b.

Possessor and Attribute Alternation ☑

(350) a. আমি তার সততার জন্য তাকে শ্রদধা করতাম।
ami taar shototar jonno taa-ke sroddha kortam
his honesty-of for him respect/admire do-PAST
I admired him for his honesty.

b. আমি তার সততাকে শ্রদধা করতাম।
am i taar shotota-ke sroddha kortam
his honesty-to respect/admire do-PAST
I admired the honesty in him.

Possessor Subject (transitive) ☑

(351) a. মার্ক তার একরোখা জেদ দিয়ে আমাকে সন্ত্রস্ত করলো।
mark taar ekrokha jed diye amake shontrosto korlo
Mark his single-minded determination with me terrified do-PAST
Mark terrified me with his single-mindedness.

(351) মার্কের একরোখা জেদ আমাকে সন্ত্রস্ত করলো।
mark-er ekrokha jed amake shontrosto korlo
Mark-of single-minded determination me terrified do-PAST
Mark's single-mindedness terrified me.

(352) a. সে তার ক্রীড়াশৈলী দিয়ে আমাদের আনন্দিত করলো।
she taar krirashoili diye amader anondito korlo
he his skills with us happy do-PAST
He amused us with his skills.

b. তার ক্রীড়াশৈলী আমাদের আনন্দিত করলো।
taar krirashoili amader anondito korlo
his skills us happy do-PAST
His skills amused us.

Possessor Subject (intransitive) ☑

(353) a. মাংস দামে পড়ে গেলো।
mangsho daame pore gelo
meat price-in fall go-PAST
Meat fell in price.

b. মাংসের দাম পড়ে গেলো।
mangsher daam pore gelo

meat-of price fall go-PAST
The price of meat fell.

As Alternation ☑

(354) a. প্রেসিডেন্ট স্মিথকে সেক্রেটারী নিযুক্ত করলো।
president smith-ke secretary nijukto korlo
president Smith-to secretary appointed do-PAST
The president appointed Smith press secretary.

b. প্রেসিডেন্ট স্মিথকে সেক্রেটারী হিসেবে/রূপে নিযুক্ত করলো।
president smith-ke secretary hishebe/rupe nijukto korlo
president Smith-to secretary as appointed do-PAST
The president appointed Smith as press secretary.

"Oblique" Subject Alternations

In these alternations, noun phrases typically in a prepositional phrase appear as the subject and the canonical 'agent' subjects are not expressed. The noun-phrases, which are found in prepositional phrases in the sentences with canonical 'agent' subjects, are referred to as oblique phrases.

This alternation conceptually translates well to Bangla. The use of this alternation is widely acceptable in a literary context.

Time Subject Alternation ☑

(355) a. ১৯৪২ সালে বিশ্ব এক নতুন যুগের সুচনা দেখেছে।
1942 shale bish-sho ek notun juger shuchona dekheche
1942 year world one new era beginning saw
The world saw the beginning of a new era in 1942.

b. ১৯৪২ সাল এক নতুন যুগের সুচনা দেখেছে।
1942 shal ek notun juger shuchona dekheche
1942 year one new era's beginning saw
1942 saw the beginning of a new era.

Natural Force Subject Alternation ☑

(356) a. * আমি সূর্যের মধ্যে কাপড়গুলো শুকোলাম।
ami shurjer moddhe kapor-gulo shukolun
sun-of in clothes dried-lpas
I dried the cloths in the sun.

b. সূর্য কাপড়গুলো শুকোলো।
sun kapor-gulo shukolo
shurjo clothes dried-3pers
The sun dried the clothes.

Instrument Subject Alternation ☒

(357) a. ডেভিড হাতুড়ি দিয়ে জানালা ভাঙ্গলো।
david haturi diye janala bhanglo
David hammer with window broke

b. * হাতুড়িটা জানালা ভাঙ্গলো।
David broke the window with a hammer.
haturi-ta janala bhanglo hammer window broke
The hammer broke the window.

(358) a. ডগ চামুচ দিয়ে আইসক্রিম খেলো।
doug chamooch diye icecream khelo
Doug spoon with icecream ate
Doug ate the icecream with a spoon.

b. * চামুচ আইসক্রিম খেলো।
chamooch icecream khelo
spoon icecream ate
The spoon ate the icecream.

Comments: This alternation does not work in Bangla, because the concept of an inanimate instrument carrying out an , action does not sound right in Bangla.

Abstract Cause Subject Alternation ☑

(359) a. সে চিঠিটা দিয়ে তার নিরপরাধ প্রমাণ করলো।
she chiti-ta diye tar niroporadh proman korlo
The letter with his innocence establish do-PAST
He established his innocence with the letter.

b. চিঠিটা তার নিরপরাধ প্রমাণ করলো।
chithi-ta taar niroporadh promaan korlo
letter his innocence prove/establish do-PAST
The letter established his innocence.

Locatum Subject Alternation ☒

(360) a. চিঠিটা তার নিরপরাধ প্রমাণ করলো।
ami balti-ta pani diye bhorlam
pail water with filled
I filled the pail with water.

b. * পানি বালতিটা ভরলো/ভরে ফেললো।
pani balti-ta bhorlo /bhore
fello water pail fill /fill drop-PAST
Water filled the pail.

Comments: This does not work in Bangla, the same way as instrument subjects.

(361) a. দেওয়ালটা গ্রামটা ঘিরে ছিল।
amra dewal diye gram-ta ghire fellam
we wall with village surround drop-PAST
We surrounded the village with a wall.

b. * আমরা দেওয়াল দিয়ে গ্রামটা ঘিরে ফেললাম।
dewal-ta gram-ta ghire chilo

wall village surround was
The wall surrounded the village.

Comments: (361)b does not sound right either in Bangla.

Location Subject Alternation ☒

(362) a. আমরা এই হোটেলে ছয়জনকে খাওয়াতে পারি।
amra ei hotel-e choy jon-ke khawate pari we
this hotel-in six person-to eat cando
We can feed six people in this hotel.

b. * এই হোটেল ছয়জনকে খাওয়াতে পারে।
ei hotel choy jon-ke khawate pare
this hotel six person-to eat cando
This hotel can feed six people.

Comments: This alternation is invalid in Bangla for the same reasons as described in the locatum subject alternations: the concept of a hotel feeding people does not sound right, the direct or indirect mention of a human subject is required.

Container Subject Alternation ☒

(363) a. * আমি এই পাতা থেকে খেলার ফলাফল বাদ দিয়েছি।
ami ei pata theke khela-r folafol baad diyechi
I this page from game-of results omit give-PAST
I omitted the results of the game from this page.

b. * এই পাতা খেলার ফলাফল বাদ দিয়েছে।
ei pata khela-r folafol baad diyeche
this page game-of results omit give-PAST
This page has omitted the results of the game.

Comments: The concept of a page omitting results does not sound right.

Raw Material Subject Alternation ☒

(364) a. ফাহরিয়া এই ময়দা থেকে ভালো কেক বানিয়েছিলো।
Fahria ei moida theke bhalo kek baniyechilo
Fahria this flour from good cake had made
Fahria had made(baked) a good cake from this flour.

b. * এই ময়দা ভালো কেক বানায়।
ei moida bhalo kek banae
this flour good cake makes
This flour makes(bakes) good cake.

c. এই ময়দা থেকে ভালো কেক হয়।
ei moida theke bhalo kek hoi
this flour from good cake is
Good Cakes are(can be) made from this flour.

Comments: Although (364)b does not sound right, (364)c where the subject is used in an oblique case is a valid way of expressing the same content in Bangla.

Sum of Money Subject Alternation ☑

(365) a. আমি তোমাকে ছয় টাকা দিয়ে একটা টিকেট কিনে দিয়েছি।
ami toma-ke choy taka diye ek-ta ticket kine diyechi
you-TO six (units of currency) with one ticket buy give-PAST
I bought you a ticket for $6.

b. ছয় টাকা তোমাকে একটা টিকেট কিনে দিবে।
choy taka toma-ke ek-ta ticket kine dibe
six (units of currency) you-to one ticket buy give-FUTURE
$6 will buy you a ticket.

c. ছয় টাকায় টিকেট পাওয়া যায়।
choy taka-e ticket pawa jae
six (units of currency) ticket receive go-PAST
Tickets are available for $6.

Comments: (365) does not sound right, since inanimate money should not be able to buy you anything. In (365)c a human subject is indirectly implied since the ticket has to be received by a human. This is probably the reason why (365)c is more acceptable than (365)b. Note: (365)c has a "poetic" feeling in Bangla.

Source Subject Alternation ?

(366) a. * মধ্যবিত্ত নতুন কর আইন হতে উপকার করবে।
moddhobitto notun kor ain hote upokar korbe
middle-class new tax law from benefit do-FUTURE
The middle class will benefit from the new tax laws.

b. মধ্যবিত্ত নতুন কর আইন হতে উপকৃত হবে।
moddhobitto notun kor ain hote upokrito hobe
middle-class new tax law from benefitted be-FUTURE
The middle class will be benefitted from the new tax laws.

c. নতুন কর আইন মধ্যবিত্তের উপকার করবে।
notun kor ain moddhobitter upokar korbe
notun tax law middle-class benefit do-PAST
The new tax laws will benefit the middle class.

Comments: In English the words 'profit'/'benefit' carry two senses, one is 'giving benefits', the other is 'receiving benefits'. In Bangla there are different verb-forms for these two senses, and that is why (366)a is not a valid translation, while (366)b is. Even though the actual verb form(upokrito-¿upokar) changes from (366)b to (366)c we can take (366)c as an example of the source subject alternation, since here the oblique object in (366)b has become the subject.

Reflexive Diathesis Alternations

Virtual Reflexive Alternation ?

(367) a. ছেলেটা জানালা খুললো।
chele-ta janala phullo
boy-THE window opened
The boy opened the window.

b. জানালাটা নিজে নিজে খুলে যায়।
janala-ta nije nije khule jae.
window-THE itself open go-PRESENT
The window just opens itself.

c. * জানালাটা নিজেকে খুলে ফেলে।
janala-ta nije-ke khule fele
window-THE itself-OBJ open throw-PRESENT

Comments: I have taken the closest translation of the English alternation, as the Bangla sentence in (367)b. Here instead of taking the reflexive as a direct object, the meaning is more like 'The window opens by itself'. If we want to make the object direct, then the (367)c will have to be used.

But the Bangla sentence (367)c is not acceptable. Therefore, depending on which Bangla sentence we take as the corresponding alternation, Bangla might or might not have the virtual reflexive alternation.

Reflexive of Appearance Alternation ⊠

(368) a. আমি গতকাল সমস্যাটির একটি সমাধান উপস্হাপন করেছিলাম।
i gotokaal shomoshsha-ti-r ekti shomaan uposthapon korechilam
yesterday problem-THE-OF a solution present do-PAST
I presented a solution to the problem yesterday.

b. *?
গতকাল সমস্যাটির একটি সমাধান নিজেকে উপস্হাপিত/প্রকাশ করেছিল।
gotokaal shomoshsha-ti-r ekti shomadhan nije-ke uposthapito/ prokaash korechilo
yesterday problem-THE-OF a solution itself-OBJ present/express do-PAST
A solution to the problem presented itself yesterday.

Comments:Although sentence (368)b is syntactically correct, semantically it does not sound right in Bangla. The concept of a solution, or any inanimate object for that matter, presenting itself, does not sound well in Bangla. This is the reason why I marked this alternation as invalid in Bangla.

Verbs - Passive Alternations

Verbal Passive ☑

(369) a. রাঁধুনি ব্যাঙ্গের ছাতা টুকরা টুকরা করে কাটলো।
radhuni banger chata tukro tukro kore katlo.
cook mushroom pieces did cut
The cook sliced the mushrooms.

b. ব্যাঙ্গের ছাতা রাঁধুনির দ্বারা টুকরা টুকরা করে কাটা হলো।
banger chata radhunt-r dara tukro tukro kore kata holo.
mushroom cook by pieces did cut was
The mushrooms were sliced by the cook.

(370) a. কলম্বাস পৃথিবীকে গোল বলে বিশ্বাস করতো।
columbus prithibi-ke gol bole bishshashko-rto.
Columbus earth -OBJ round as believe do-PAST
Columbus believed the earth to be round.

b. পৃথিবীকে গোল বলে বিশ্বাস করা হতো।
prithibi-ke gol bole bishshash kora hoto.
earth round as believe do was
The earth was believed to be round.

(371) a. কলম্বাস বিশ্বাস করতো যে পৃথিবী গোল।
columbus bishshash korto je prithibi gol
Columbus believe do-PAST that earth round
Columbus believed that the earth was round.

b. এটা বিশ্বাস করা হতো যে পৃথিবী গোল।
eta bishshash kora hoto je prithibi gol
it believe do-PAST was that earth round
It was believed that the earth was round.

(372) a. পুলিশ সন্দেহভাজন ব্যাক্তিদের উপর নজর রাখলো।
pulish shondehobhajon bekti-der upor no-jor rakhlo.
police suspected person-S-OF on tabs kept
The police kept tabs on the suspect.

b. সন্দেহভাজন ব্যাক্তিদের উপর নজর রাখা হলো।
shondehobhajon bekti-der upor nojor rakha holo.
suspected person-S-OF on tabs kept be-PAST
Tabs were kept on the suspect.

(373) a. কর্মচারীরা শিথিল তদারকীর সুযোগ নিলো।
kormochari-ra shithil todaroki-r shujog nilo.
employees lax supervision-of opportunity took-PAST
The employees took advantage of the lax supervision.

b. শিথিল তদারকীর সুযোগ নেওয়া হলো।
shithiltodaroki-r shujog newa holo.
Lax supervision-of advantage taken was

The lax supervision was taken advantage of.

Comments: In Bangla passive sentences the sentence is nominalized and there is no agreement between the verb and the subject marked with the genitive case. But as long as we accept this construction, the Bangla passive alternation works as a one-to-one translation schema from the English verbal passive alternation.

Prepositional Passive ☒

(374) a.
এই বিছানা(তে) জর্জ ওয়াসিংটনের দ্বারা ঘুমানো হয়েছিলো।
george washington ei bichana-te ghumato.
George Washington this bed -in slept.
George Washington slept in this bed. (unergative verb)

b. * জর্জ ওয়াসিংটন এই বিছানাতে ঘুমাতো।
ei bichana-te george washington-er dara ghumano hoyechilo
this bed -in George Washington by slept was
This bed was slept in by George Washington.

(375) a. জর্জ ওয়াসিংটন মঙ্গলবারে ঘুমিয়েছেন/ঘুমালেন।
george washington mongolbar-e ghumiyechen/ghumalen.
George Washington. Tuesday has slept /slept
George Washington slept on Tuesday.(unergative verb plus adjunct)

b. * মঙ্গলবার জর্জ ওয়াসিংটনের দ্বারা ঘুমানো হলো
mongolbar george washington-er dara ghumano holo.
Tuesday George Washington by slept was
Tuesday was slept on by George Washington.

(376) a. দিগন্তে একটা জলদস্যু জাহাজের আবির্ভাব ঘটলো।
digont-e ekta joldhoshshu jahaj-er abirbhab ghotlo.
horizon-at a pirate ship -of appearance happened
A pirate ship appeared on the horizon. (unaccusative verb)

b. *
দিগন্ত একটা জলদস্যু জাহাজের দ্বারা আবির্ভুত হলো।
ekta joldhoshshu jahaj-er dara abirbhuto holo.
horizon a pirate ship by appeared was
The horizon was appeared on by a pirate ship.

Comments: The prepositional Passive alternations does not exist in Bangla. This could probably be attributed to the relatively rigid word-order in Bangla and the fact that the functions of English prepositions are often served X by case-markers in Bangla; e.g., in (376)a above, in the word 'digont-e', the locative case-marker 'a' serves the semantic purpose of the English preposition 'at'.

Adjective Passive ☑

(377) a. পালকগুলো বালিশের মধ্যে ঠাসা ছিল।
palok-gulo balish-er moddhe thasha chilo.
feathers pillow in stuffed was
The feathers remained stuffed in the pillow.

b. বালিশটা পালক দিয়ে ঠাসা ছিল।
balish-ta palok diye thasha chilo.
pillow feathers with stuffed was
The pillow remained stuffed with feathers.

(378) ভাঙ্গা কাঁচ, (না পাঠানো/অপ্রেরিত) চিঠি, কাটা ফুল
bhanga katch, (na pathano/oprerito) chithi, kata ful
broken glass, unsent letters, cut flowers

(379) অবিক্রিত গাড়ী, * অবিক্রিত ক্রেতা
obikrito gari, *obikrito kreta
unsold cars, *unsold customers

Comments: The participle form of Bangla verbs can be used as adjective the sa ne way as English participles.

Adjectival Perfect Participles(intransitive verbs) ☑

(380) UNACCUSATIVE VERBS:

a. সদ্য আগত মেহমান/অতিথি
shoddo agoto mehman/otithi
recently arrived guests

b. চপসে যাওয়া ফসফস
(?hupshe jawa) fushfusRk
collapsed lung

c. সর-উঠা দধ
shor-utha dffldh
curdled milk

d. ছড়ানো বরফ
chorano borof
drifted snow

e. কেটে যাওয়া সময়
kete/chole jawa shomo
elapsed time

f. পলাতক আসামী/পালিয়ে যাওয়া আসামী
polator ashami /paliye jawa as ami
an escaped convict

g. জমে যাওয়া হ্রদ
jome jawa hrod

a frozen lake

h. সদ্য প্রত্যাগত ভ্রমণকারী
shoddo prottagoto hromonkari
recently returned traveller

i. পচা আপেল
pocha aapel
rotten apple

j. আটকে যাওয়া জানালা
aatke jawa janala
stuck window

k. ডুবো/ডুবে যাওয়া গুপ্তধন
mar maw dubo /dube jawa guptodhon
sunken treasure

l. ফোলা পা
fola pa
swollen feet

m. মলিন রূপা
molin rupa
tarnished silver

n. বাঁকানো গাছের গুঁড়ি
bakano gaacher guri
twisted tree trunks

o. উধাও হয়ে যাওয়া সভ্যতা
udhao hoye jawa shobbhota
vanished civilizations

p. ঝরে পড়া ফল
jhore pora fut
wilted flower

q. ব্যর্থ আশা/ঝরে পড়া স্বপ্ন
bertho aasha/jhore pora sl'lopno
withered hopes

r. কুঁচকানো জামা
lOchkano jama
a wrinkled dress

(381) *UNERGATIVE VERBS

a. * হাঁটা মানুষ
haata manush
walked man

b. * কথা বলা রাজনৈতিক
kotha bola raajnoitik
talked politician

c. * ঘুমানো শিশু
is ghumano shishu
slept children

Comments: Unergative verbs do not undergo an adjective-perfect participle construction in Bangla just as in English. Overall, we can say that Bangla passive alternations, match English passives quite closely except for the prepositional passive.

Alternations Involving Postverbal "Subjects"

There-insertion ⊠

With the verb be:

(382) a. একটি ফুলগাছ জানালার উপরে আছে।
ekti ful-gach janala-r upore ache.
a flower-tree window-OF above is
A flowering plant is on the windowsill.

b. *There is a flowering plant on the windowsill.

c. এক যে ছিল দৈত্য।
ek je chilo doitto
one there was giant
Once there was a giant.

Comments: There is no counterpart for the there-structure in Bangla. So the same translation for (a) will be used for (b). Although the direct usage of 'there' is not available, the narrative construction of "once there was" is available in Bangla. In this case, the word 'je' can then be used as a translation for 'there'.

Locative Inversion ☑

With the verb be: ☑

(383) a. একটি ফুলগাছ জানালার উপরে আছে।
ekti ful-gach janala-r upore ache.
a flower-tree window on is
A flowering plant is on the windowsill.

b. জানালার উপরে একটি ফুলগাছ আছে।
janala-r upore ekti ful-gach ache.
window on a flower-tree is
On the windowsill is a flowering plant.

Comments: The locative inversion alternation works well in Bangla. Even change of state verbs undergo this construction in Bangla. A probable reason is the availability of word order substitution between preposition phrases and other noun-phrases(subject or object). Note that this assertion does not violate the claim of word-order /(rigidity of Bangla. In the usual case the subject is followed by an oblique noun phrase. But these positions can be changed without giving up grammatical correctness.

Other Constructions

Cognate Object Construction ☑

(384) সারাহ একটা সুন্দর হাসি হাসলো।
sarah ekti shundor hashi hashlo
Sarah a beautiful smile smiled
Sarah smiled a charming smile.

Comments: Cognate objects zero-related to verbs are widely available in Bangla.

Cognate Prepositional Phrase Construction ☑

(385) a. ত্রপা কড়া পাউডার দিলো।
tropa kora powder dilo
Tropa strong powder gave
Tropa powdered with strong powder.(put on strong powder)

b. সূর্য আকাশ রাঙা রঙে রাঙালো।
shurjo akash ranga rong-erangalo
sun sky red color colored
The sun colored the sky with a bright red hue.

c. সে আমাকে কঠোর বন্ধনে বাঁধলো।
she amake kothor bondhonebadhlo
he me-to strong knot tied
He tied me in a stong knot.

Comments: A much smaller subset of Bangla verbs participate in this kind of construction. The above few are the ones I could find from all the example English verbs in Levin(p.96). One reasons of less availability might be that compound verbs incorporate the functions of both the verb and the noun; e.g, in (385)a ' powder dilo'- 'give powder' is a compound verb but it has the noun 'powder' as a part of it.

Reaction Object Construction ⊠

(386) সে এক স্বাগতম হাসি হাসলো।
she ek shagotom hashi hashlo
She one welcome smile smile
She smiled a welcome smile.

Comments: This alternation does not work in Bangla, because whenever we try to translate a sentence like 'She smiled a welcome', we cannot use 'she shagotom hashlo' She welcome smiled but we have to use the Bangla sentence in (386)b above.

X's Way Construction ⊠

I couldn't found any corresponding alternation in Bangla for this.

Resultative Construction ⊠

(387) a. নদী জমে শক্ত হয়ে গেলো।
nodi jome shokto hoyegelo
river freeze solid become go-PAST
The river froze solid.

b. * নদী শক্ত জমে গেলো।
nodi shoktojome gelo
river solid freeze go-PAST
The river froze solid.

Comments: This alternation does not work in Bangla, because we are using the 'conjunctive participle' form of the X Bangla verb 'joma' in the above translation, which more precisely translates to 'The river, by freezing, turned solid'. Example (387)b is not valid in Bangla..

Unintentional Interpretation of Object

Unintentional Interpretation with Reflexive Object ⊠

(388) মুনিয়া আঘাত পেলো।
munia aghat pelo
munia hit received
Munia hit herself.

(389) পলা ব্যাথা পেলো।

a. pola betha pelo
Paula pain received
Pola hurt herself.

b. পলা নিজেকে ব্যাথা দিলো।
pola nijeke betha dilo
Paula herself pain gave
Pola hurt herself.

Comments: The above Bangla translations are sentences that carry the unintentional interpretation of the given action. But if we use the reflexive pronoun then the meaning in Bangla, is that someone did the action to himself/herself intentionally, e.g, (388)b.

It might be noted that in the unintentional interpretation the compound verb is pelo-'received', and in the intentional interpretation it is dilo-'gave'.

Unintentional Interpretation with Body-Part Object ⊠

(390) a. রিমার আঙ্গুল কেটে গেলো।
rimar angul kete gelo
Rima's finger cut go-PAST
Rima cut her finger.

b. রিমার তার আঙ্গল কেটে ফেললো।
rimar tar angul kete fello
Rima's her finger cut throw-PAST
Rima cut her finger.

Comments: The same kind of reasoning as the previous alternation applies to this one as well. A precise translation of the English sentence would be as follows, which does not carry the unintentional implication, as in (390)b.

Bound Non-reflexive Anaphor as Prepositional Object ☑

(391) সোমা তার/নিজের উপর চাদর টেনে নিলো।
shoma tar nijer upor chador tene nilo
Shoma her herself over blanket pull take-PAST
Shoma pulled the blanket over herself.

Comments: As shown in the example, there seems to be coreference of the pronoun in the prepositional phrase and the subject in Bangla just as in English.

Directional Phrases with Non-directed Motion Verbs ⊠

(392) a. রুনি দরজার দিকে হাঁটছিলো।
runi dorjar dike hatchilo
Runi door-of towards walking
Runi was walking to the door.

b. রুনি দরজার দিকে ট্রলি টানলো।
runi dorjar dike trolli tanlo
Runi door-of towards cart pulled
Runi pulled the cart to the door.

Comments: None of the Bangla counterparts of the English verbs that have this alternation, form sentences with an added sense of directed displacement; e.g, as in (392)b.

Here pull has a directed sense, but the Bangla sentence is not valid. As shown above, walk was found as one example that has a working Bangla counterpart, but 'walk' can be used in a directed sense anyway. For this reason, I noted this alternation as one that does not work in Bangla.

Part VII
German Diathesis and Verb Morphology

Uli Sauerland*

5 Introduction

This paper is partially a report for a summer project on verb classes and alternations. The goals of the project to verify the validity of the information on English verb classes contained in Levin (1993), to make this information online accessible, to provide a structural representation that explains the data, and to find out whether the verb classes of Levin's book are crosslinguistically constant.

Here I am largely concerned with the last goal: the comparison of German and English verb classes as determined by the alternations they allow. But since in German some the alternations show overt morphology, this will also make some insight into a possible structural representation possible. For the verb classes it will be shown that most of the small classes (up to twenty words) are preserved, but some of the larger classes break down into smaller classes. The overt morphology in alternations suggests that English in the same alternations has phonetically zero morphemes that fulfill the same functions.

This study should be seen in context with the studies on Bangla alternations (Khan, this volume) and Korean (Cho, this volume). The comparison of German and English has however a different character, because the two are closely related, both members of the of the Westgermanic family, and probably have only about 1500 years of a separate history (Nielsen 1989). This ensures that many of the verbs have close counterparts in the other language. This justifies in part that I for this following comparison assume that the pairs of German and English verbs I give are prefect translations of one another.

One of the most striking differences between German and English is the virtual omnipresence of case in German DPs vs. its virtual lack in English. German has four morphologically distinct cases: Nominative, Accusative, Dative, Genitive. It has already been tried by Plank (1980) and Hawkins (1986) root many of the differences between German and English in the case-marking differences. The problem with such explanations is that the

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often fail crosslinguistically. For example the free word order of DPs (determiner phrases, e.g. ein Mann (*a man*), das grüne Monster (*the green monster*)) seems to plausible explained by the overt case system, that preserves unambiguity for such sentences. But despite its plausibility this argument is falsified by the existence of Icelandic, a language with overt case-marking but fixed word order, and Bulgarian, a language without overt case-marking but variation in word order (see Müller (1993)). Hence I don't think I the case difference offers an immediate explanation of all the phenomena I will discuss below.

A second striking difference between German and English – and one that I think plays a great role – is that German has a number of productive verbal prefixes. Not only are there some designated verbal prefixes, but also can prepositions generally also be used as verbal prefixes. In a Talmy's (1985) terms German has a tendency to express the manner of an event in the verb root and the direction in a verbal prefix. Some of these prefixes will play a role below.

The following main chapter of this paper contains data on how some alternations behave in German, that are discussed for English in Levin (1993). The format in this chapter will be similar to Levin's. This is followed by a brief conclusion, that rather is an outlook on the things that are missing in this paper. At the end the reader will find a long list of references, of which many were not available to me at the time of writing. This meant as a service, but it is not ensured that all the papers will really be relevant.

In what follows it should be kept in mind that this paper is a progress report of a project and was written under time pressure. It should rather be seen as an indication of interesting phenomena that should be studied in more detail than a detailed analysis.

6 Verb classes and alternations

In this chapter I will look at a the German counterparts of a few selected alternations fromLevin (1993). Since it was impossible to cover a great number of alternations in any serious depth, I have selected a small number of alternations that have particularly interested. I will only briefly discuss some further alternations largely to show that they would not be as interesting as the ones I picked for the purposes of this study: to evaluate whether the groups of verbs that undergo the same alternations, are constant across languages, and how argument alternations should be structurally represented. The conclusion with respect to the first goal will be that the semantic fields delineated by the lines the alternations draw are often coextensive. This however does not mean – at least not in all cases – that the same verbs allow the same alternations in English and German. Rather only the weaker conclusion that the partitions of verbs achieved through the alternation tests match up. And even to this weaker claim there will be a number of exceptions.

There are prima facie three possibilities an alternation can be not a usual criterion for the goal of our study: it can be impossible in German, it can be freely allowed in German, or it can match the English distinction. In all three cases the distinction in the set of verbs that such an alternation gives us would be of no use for the purposes of finding different partitions of verbs in German and English. We can find examples of all three of these possibilities: Impossible are in German the induced action alternation Levin (1993:1.1.2.2), as illustrated by example (393), the sum of money subject alternation Levin (1993:3.9) as shown in (394), and the *their way*-alternation (Levin 1993:7.4) in (395).

(393) a. Das Pferd sprang über die Hürde.
the horse jumped over the hurdle

b. *Melanie sprang das Pferd über die Hürde.
Melanie jumped the horse over the hurdle

(394) a. Marion kauft Walter für 100 Mark eine neue Hose.
Marion buys Walter for 100 mark a new pair of trousers

b. *100 Mark kauften Walter eine neue Hose.
100 mark bought walter a new pair of trousers

(395) a. Sie schoben sich durch die Menge.
they pushed self through the crowd

b. *Sie schoben ihren Weg durch die Menge.
they pushed their way through the crowd

Two alternations that seem to be freely allowed in German are *there*-insertion Levin (1993:6.1) and the benefactive alternation Levin (1993:2.2). The German subject expletive *es* can occur with change of state verbs or transitives as shown in (396). Also the restriction that the postverbal subject has to have a weak quantifier as discussed in Milsark (1974), is not very strong in German, although in the examples (397) the resulting focus on the event described is stronger than with indefinite subjects. The explanation of this contrast between English and German is that the position *es* occupies in these sentences is not the subject position, but a topic position named *Vorfeld* in the traditional German grammars. This position is either the specifier of Comp – the classic GB-analysis of den Besten (1975) – or the specifier of a projection above all the Infl-projections like Müller's (1993) TP (topic phrase). This explains that in all the examples sentences there is sentential focus. The literal translation of the English *there* is *da*. But *da* usually has a more deictic interpretation than *there* and is not a pure pleonastic, as example (398) shows. This example shows that a comparison in the behaviour of verbs, is not possible, because the difference between *da* and *there* would affect the result.

(396) a. Es schmolz eine Menge des Schnees erst im April.
it melted a mass of the snow only in april

b. Es verlas der Bürgermeister eine neue Gebührenverordnung.
It read the mayor a new fee-order

(397) a. Es ereignete sich die Sensation des Tages.
It happened self the sensation of the day

b. Es fiel erst Wochen später Kekule die Ringformel ein.
It fell only weeks later Kekule the ring-formula in

(398) a. ??Da existiert ein neuer Laden, aber ich weiß nicht wo.
there exists a new shop but I know not where

b. Es existiert ein neuer Laden, aber ich weiß nicht wo.
it exists a new laden, but I know not where

The case of the Dative alternation that is freely allowed in German are benefactive datives. These can be inserted whenever a benefactive argument is compatible with the described event and there is not already a dative argument to the verb.[2] Even in cases where the verb has a non-benefactive dative argument this argument is ambiguous between the interpretation as an argument or as a benefactive dative:

(399) a. Robin Hood stahl dem armen Mann einen Sack Korn.
Robin Hood stole the poor man_{DAT} a sack corn

Robin Hood stole a sack of corn for/from the poor man.

Also seemingly freely permitted in German is the locative inversion as in (400). This is however due to the fact that the German word order is much more free than the English due to scrambling of NPs and PPs within the IP and verb second movement in combination with topicalization in main clauses. It is also possible that locative inversion in English is a remainder of scrambling, which was lost as a general rule since Old English. Then it is adequate to say that locative inversion is unconstrained in German. In any case the result is that locative inversion is not a useful alternation pattern for us to look at.

(400) In der Stadt öffnete eine neue Buchhandlung.
In the town opened a new book-shop

Finally there are alternations that do not seem to differ between English and German. For some of these it might be the case that they are actually results of the contact between the two languages, e.g. the image impression alternation (Levin 1993:2.7) in (401) with the verbs that undergo it in (402) and the instructional imperative (Levin 1993:1.2.8) in (403). Mauthner (1910) calls such cases *Lehnübersetzungen* ('loan translations') and they are very common in the domain of idioms. If this plausible explanation turned out to be true for the two alternations I mentioned, the parallelism of these expressions is not revealing at all. Hence I will not look at these alternations in any more detail.

(401) a. Der Uhrmacher schreibt den Namen auf den Deckel
the clockmaker writes the name on the lid

b. Der Uhrmacher beschreibt den Deckel mit dem Namen
the clockmaker be-writes the lid with the name

c. *Der Uhrmacher schreibt den Deckel mit dem Namen
the clockmaker writes the lid with the name

(402) schreiben (*write*), malen (*paint*), stempeln (*stamp*), emaillierte (*emaill*), tätowierte (*tatoo*)

(403) Backe den Kuchen 45 Minuten bei 200 Grad.
back the cake 45 minutes at 200 degrees

Theiare r a number of alternations in Levin's (1993) book that didn't prove useful for the crosslinguistic comparison for the above reasons that I haven't mentioned. Out of the remaining set of alternations I picked a number of alternations, that are known to be present in many languages, since we also investigated Bengali and Korean, and that seemed to differ between English and German in an interesting way. These alternations were with the section numbers from Levin's (1993) book: 1.1.1 the middle alternation, 1.1.2.1 the causative/inchoative alternation, 1.3 the conative alternation, 2.1 the dative alternation, 2.3 the locative alternation, and 2.5 the reciprocal alternations.

In the following section I will present for each of the above alternations the verbs I found that undergo this change. Then I will compare the regularities that emerge in German with the one of English. I will also present a structural analysis of the alternation based on the frame-

[2] As Alec Marantz (p.c.) brought to my attention, there is a similar constraint against double Datives in Japanese. However in German the constraint also prohibits cases where one of the datives is extracted or a weak pronoun, whereas in Japanese these cases are allowed:

(i) a. *Wem_1 sah Marion [den Einbrecher dem Klaus das Butterbrot t_1 stehlen]
who_{DAT} saw Marion the thief the $\text{Klaus}_{\text{DAT}}$ the sandwich steal

b. [Für $\text{wen}]_1$ sah Marion [den Einbrecher dem Klaus das Butterbrot t_1 stehlen]
for who saw Marion the thief the $\text{Klaus}_{\text{DAT}}$ the sandwich steal

c. ??Robin Hood klaute ihm_{DAT} dem Sheriff den Hut.
Robin Hood stole him the sheriff the head

work of lexical semantics of Hale & Keyser (1993a) and Hale & Keyser (1993b). In argumentation for a specific analysis I will also make use of evidence from other languages.

6.1 The locative alternations

The locative alternation (Levin 1993:2.3) reveals a very interesting difference between English and German: Whereas in English the verb-forms appearing in the examples (404) are identical, in the German translation of (404-b) the verbal prefix be- has to appear as shown in (405).

(404) a. Pete sprayed paint on the wall.
b. Pete sprayed the wall with paint.

(405) a. Peter sprühte Farbe an die Wand.
Peter sprayed paint on the wall
b. *Peter sprühte die Wand mit Farbe
Peter sprayed the wall with paint
c. Peter besprühte die Wand mit Farbe
Peter be-sprayed the wall with paint

While this use of the Prefix *be-* is not the only one in German, I will postpone a general analysis of *be-* to future work. Here I will only look at the properties of the *be*-prefix with respect to the locative alternation.

Whereas the omission of *be-* in (405-b) results in strong ungrammaticality, this isn't universally true. I will argue that this is a separate alternation, and the one that is the counterpart of the Englsih alternation discussed by Levin (1993) is the prefixed form. Hence we will look at some differences between the prefixed and unprefixed verb forms, where both seem permissible. In all such cases almost paradoxically the unprefixed verb form is semantically more constrained and more specific than the prefixed verb form. Examples of this are

(406) a. *Hans lud den Wagen mit Heu.
Hans loaded the wagon with hay.
b. *Hans lud die Kanone mit Schießpulver.
Hans loaded the canon with gunpowder

(407) a. Wibke malte die Wand mit grüner Farbe
Wibke painted the wall with green color
*Wibke applied green color on the wall.
Wibke created a picture of the wall using green color.
b. Wibke bemalte die Wand mit grüner Farbe
Wibke *be*-painted the wall with green color
Wibke applied green color on the wall.
*Wibke created a picture of the wall using green color.

The contrast in meaning between the two constructions is also apparent if we replace the *mit*-PP with an *ohne*-PP. What the contrast in (408) points out is, that the *mit*-PP with the prefixed form can be interpreted as an *locatum* argument, which as introduced by Clark & Clark (1979) refers to a substance whose loaction is changed, rather than instrument. With the unprefixed form only an instrument interpretation is available for the *mit*-phrase.

(408) a. Caspar malte eine Landschaft ohne rote Farbe.
Caspar painted a landscape without red ink
b. ?Marion bemalte die Wand ohne rote Farbe
Marion *be*-painted the wall without red paint

Additional evidence that the unprefixed form allows only the instrument interpretation of the *mit*-PP whereas the the prefixed form allows an instrument and a locatum interpretation comes from coordination: Coordination of locatum and instrument in (409-b) is odd.

(409) a. Caspar malte eine Landschaft mit Ölfarben und einem Pinsel.
Caspar painted a landscape with oil-color and a brush
b. ??Marion bemalte die Wand mit Ölfarben und einem Pinsel.
Marion *be*-painted the wall with oil-color and a brush

Furthermore the prefixed form allows to *mit*-phrases, one a locatum, the other an instrument, whereas the unprefixed form allows only one, even if one would be a plausible locatum:

(410) a. *Nägeli sprühte mit einer Leiter einen Kreis mit schwarzer Farbe.
Nägeli sprayed with a ladder a circle with black paint
b. Nägeli besprühte mit einer Leiter die Wand mit schwarzer Farbe.
Nägeli *be*-sprayed with a ladder the wall with black paint

Also the semantic properties of the objects differ among the two forms. The unprefixed form a PP-adjunct expressing a goal or location is freely permitted, whereas with the prefixed form the specified location has to be a subregion of the direct object:

(411) a. Der Hersteller stempelte sein Logo auf den Karton.
the manufacturer stamped his logo on the box
b. *Der Hersteller bestempelte sein Logo auf den Karton
the manufacturer *be*-stamped his logo on the box

c. Der Hersteller bestempelte sein Logo
the manufacturer *be*-stamped his logo
auf der Rückseite
on the back-side

In summary the following thematic grids seem to be possible for verbs of the *spray/load*-class:

V:	⟨ Locatum, *auf* Location ⟩
V:	⟨ Theme, *mit* Instrument ⟩
be+*V*:	⟨ Location, *mit* Locatum, *mit* Instrument⟩

In the following I will only investigate the alternation that corresponds to the English *spray/load*-alternation, which is the alternation between the first and the third line of the above table. The paradigmatic example is

(412) a. Der Junge schmierte Butter auf das Brot.
the boy smeared butter on the bread
b. Der Junge beschmierte das Brot mit
the boy be-smeared the bread with
Butter.
butter

References: Becker (1971), Braun (1982), Günther(1973, 1987), Höhle (1982), Olsen (1986, 1989, 1990a), and Wunderlich(1987, 1990)

6.1.1 *spray/load*-alternation

The English Alternation is described in Levin (1993:2.3.1, p.50).

- SPRAY-LOAD-verbs that behave the same in German and English, namely they allow the alternation.[3]

  drängen (*crowd*), festigen (*mound*), hängen (*hang*), häufen (*heap*), kleben (*stick*), klecksen (*daub*), laden (*load*), liefern (*stock*), malen (*paint*), nähen (*sew*), packen (*pack*), pflanzen (*plant*), pflastern (*plaster*) pinseln (*brush*), pumpen (*pump*), säen (*seed, sow*), schichten (*pile up*), schmieren (*smear*), siedeln (*settle*), spannen (*string*), sprenkeln (*sprink*), spritzen (*spritz, spatter, splash, squirt*), sprühen (*spray*), stapeln (*stack*), stäuben (*dust*), stechen (*prick*), streichen (*spread*), streuen (*strew, scatter*), streuseln (*scatter*), sudeln (*smudge*), tupfen (*dab*), wickeln (*wrap*)

  (413) a. Sebastian pflanzte Bohnen auf den
  Sebastian planted beans on the
  Balkon.
  porch
  b. Sebastian bepflanzte den Balkon mit
  Sebastian be-planted the porch with
  Bohnen.
  beans

- SPRAY-LOAD-verbs, that allow only the in/auf/an/über-form in German:

  [drapieren] (*drapieren*),[4] [injizieren] (*inject*), quetschen (*cram*), pressen (*stuff*), stopfen (*stuff*), reiben (*rub*), wischen (*swab*)

  (414) a. Uta quetscht ihre Strümpfe in den
  Uta crams her socks in the
  Koffer.
  suitcase
  b. *Uta bequetscht den Koffer mit
  Uta be-crams the suitcase with
  Strümpfen
  socks

- SPRAY-LOAD-verbs of that only the prefixed form is possible in German:

  beduschen (*shower*), beflecken (*daub*), beschmutzen (*smudge*)

  (415) a. *Stefan fleckte Soße auf den Tisch.
  Stefan daubed sauce on the table
  Stefan befleckte den Tisch mit
  Stefan be-daubed the table with
  Soße.
  sauce

- FILL-verbs, that behave the same in German and English, namely they allow the mit-form of the alternation only:[5]

  ausstatten (*endow*), baden (*bathe*), bandagieren (*bandage*), blockieren (*block*), bombardieren (*bombarde*), dämmen (*dam*), dekorieren (*decorate*), dichten (*tighten*), ersticken (*choke*), halten (*hold, stop*), hemmen (*clog*), kacheln (*tile*), maskieren (*mask*), polstern (*pad*) punktieren (*dot*), rahmen (*frame*), sättigen (*saturate*), schmücken (*deck*), seifen (*soap*), spicken (*lard*), stoppen (*stop*), tapezieren (*paper*), tarnen (*camouflage*), tränken (*imbue*), überschwemmen (*deluge*), verhüllen (*cloak*), würgen (*choke*), würzen (*season*), verzieren (*decorate*)

- FILL-Verbs, that only occur prefixed in German:

  belasten (*clog*), benässen (*drench*), bereichern (*enrich*), beschweren (*clog*)

  (416) a. Der Maler rahmt seine Bilder
  the painter framed his paintings
  mit Gold.
  with gold

[3] In the listings of verbs I will try to keep the semantic groupings of Levin (1993), as if the translations were always perfect. Within each group I will further divide into those that behave the same in both languages and those where the languages differ.

[4] Since the prefixation of be- is in general only possible – there are some lexicalized exceptions – if the verb root has initial stress, verbs that don't satisfy this constraint are enclosed in brackets in the following list.

[5] All the verbs in this list don't have the be--prefix. To allow the alternation however they would need the prefix when used with a mit-phrase. See the discussion below.

b. *Der Maler berahmte seine Bilder
the painter be-framed his paintings
mit Gold.
with gold

c. *Der Maler rahmte Gold auf seine
the painter framed gold on his
Bilder.
paintings

- FILL-verbs, that alternate in German, but allow only the *with*-form of the alternation in English:
  decken (*cover*), füllen (*fill*), netzen (*drench*), peitschen (*lash*), pflastern (*pave*), punkten (*dot*), säumen (*edge*), sieben (*sieve, riddle*), sprenkeln (*dapple*), streichen (*coat*), tüpfeln (*dot, spot*)
- PUT-verbs that allow the mit/*with*-form only in both German and English:
  [arrangieren] (*arrange*) [installieren] (*install*) [plazieren] (*place*) [positionieren] (*position*)
- PUT-verbs that alternate in German, but allow only the *with*-form of the alternation in English:
  laden (*stash*) legen (*put, cause to lie on*), setzen (*put, cause to sit on*), schlingen (*sling*) stauen (*stow*) stellen (*put, cause to stand on*), tauchen (*immerse*)
- Verbs of putting in a spatial configuration that don't alternate in both German and English:
  [balancieren] (*balance*)
- Verbs of putting in a spatial configuration that alternate in German, but allow only the *with*-form of the alternation in English:
  hängen (*hang, dangle*), legen (*lay*), lehnen (*lean*), setzen (*sit, perch*), stellen (*stand*)
- FUNNEL-verbs that behave the same in German and English:
  [zu-schlagen] (*bang*)
- Verbs of putting in a spatial configuration that alternate in German, but allow only the *with*-form of the alternation in English:
  dippen (*dip*) hämmern (*hammer*) harken (*rake*) kippen (*dump*) löffeln (*scoop*) schaufeln (*shovel*) scheffeln (*scoop*) schöpfen (*ladle*) schütteln (*shake*) trichtern (*funnel*)
- Verbs of putting with a specified direction that don't alternate in both German and English:
  heben (*raise*) senken (*lower*)
- POUR-verbs that alternate in German, but allow only the *with*-form of the alternation in English:
  gießen (*pour*), schwappen (*spill*), tröpfeln (*drip*), tropfen (*drop*)
- COIL-verbs that don't alternate in both German and English:
  wenden (*turn*), locken (*curl*) (?)
- COIL-verbs that alternate in German, but allow only the *with*-form of the alternation in English:
  drehen (*spin*), ringeln (*curl*), rollen (*roll*), wickeln (*coil*), wirbeln (*twirl*), wehen (*wind*)
- Some other verbs that allow the alternation in German:
  bauen (*build*), drucken (*print*), feiern (*celebrate*), feuern (*fire*), füttern (*feed*), kritzeln (*scribble*), prosten (*cheer*), reden (*talk*), saufen (*drink*), scheißen (*shit*), schmeißen (*throw*), segeln (*sail*), singen (*sing*), spucken (*spit*), strahlen (*radiate*), trinken (*drink*), werfen (*throw*), zeichnen (*draw*)

(417) a. Die Kinder werfen Steine auf die
the children throw stones on the
Fische
fish

b. Die Kinder bewerfen die Fische mit
the children be-throw the fish with
Steinen
stones

c. *Die Kinder werfen die Fische mit
the children throw the fish with
Steinen
stones

Summary The two big classes of SPRAY/LOAD-verbs and FILL-verbs that showed uniform behaviour in English break down in German. The smaller classes fare much better, if we take into account that the bracketed verbs are excluded from the alternation for a morphophonological reason.

The affixation of be adds an direction to the alternation, that wasn't evident i English. Most of the FILL-Verbs are ruled out from the alternation, because their base-from has the argument structure of a prefixed form, and the derivation of the nonprefixed is impossible. Since many English verbs show the same behaviour it seems to be the case that the alternation is directional in English as well. Although the nature of the transformation not visible, we may speculate that English has a phonetically zero derivational affix corresponding to the German be-.

This derivational account of the alternation for English seems to contradict the findings of Gropen *et al.* (1991). They show that English speaking children show don't acquire the presumably derived form any later than the basic form, and are aware of the affectedness effect in the locative alternation. It would be interesting to conduct a similar study with German speaking children, but to my knowledge this hasn't been done yet.

6.1.2 Intransitive Locative Alternations

Intransitive locative alternations are much less restricted in German than in English. This is due to the fact most German locative prepositions can also appear as verbal prefixes. In this section I will only briefly present some data.

- Complex predicate formation with auf (*on*):
  fahren (*drive*), gehen (*walk*), giessen (*pour*), hopsen (*hop*), hüpfen (*jump*), klettern (*climb*), kraxeln (*climb*), kritzeln (*scribble*), laden (*load*), malen (*paint*), schreiben (*write*), schriften (*write*), spielen (*play*), sprengen (*water*), springen (*jump*), steigen (*climb*), zeichnen (*draw*)

(418) a. Der Papst steigt auf das Matterhorn
the pope climbed up the Matterhorn
b. Der Papst besteigt das Matterhorn
the pope climbed the Matterhorn
c. *Der Papst steigt das Matterhorn
the pope climbed the Matterhorn

- Complex predicate formation with in (*in*):

steigen (*climb*), klettern (*climb*), treten (*step*), gehen (*walk*), stechen (*prick*)

(419) a. Der Papst steigt in den Baum
the pope climbed in the tree
b. Der Papst besteigt den Baum
the pope climbed the tree
c. *Der Papst steigt den Baum (in)
the pope climbed the tree (in)

- Complex predicate formation with entlang (*along*):

radeln (*cycle*), schliddern (*slide*), fahren (*drive*), segeln (*sail*), rudern (*row*), rutschen (*glide*)

(420) a. Uli radelt entlang des Minuteman-Trail.
Uli cycles along the minuteman-trail
b. Uli radelt den Minuteman-Trail entlang.
Uli cycles the minuteman-trail along
c. *Uli beradelt den Minuteman-Trail.
Uli be-cycles the minuteman-trail

6.1.3 *clear*-alternation

reinigen (*clean*), leeren (*empty*), entladen (*unload*)

(421) a. Die Arbeiter entladen die Äpfel vom Wagen
the workers unload the apple from-the truck
b. *Die Arbeiter entladen den Wagen von Äpfeln
the workers unload the cart of apples
c. Der Wissenschaftler reinigt den Tisch von Verunreinigungen
the scientist cleans the table of impurities
d. *Der Wissenschaftler bereinigt den Tisch von Verunreinigungen
the scientist be-cleans the table of impurities
e. Der Wissenschaftler bereinigt die Affäre
the scientist cleans the affair

bauen (*built*), backen (*bake*), kochen (*cook*)

(422) a. Heidi bäckt einen Kuchen aus zehn Eiern
Heidi bakes a cake out-of ten eggs
b. *Heidi bäckt zehn Eier in den Kuchen
Heidi bakes ten eggs into the cake
c. Heidi verbäckt zehn Eier in den Kuchen
Heidi ver-bakes ten eggs into the cake

formen (*form*) biegen (*bend*)

(423) Martha formt den Zinn in eine Kugel
Martha forms the tin into a ball
(423) Martha formt eine Kugel aus dem Zinn
Martha forms a ball out of the tin

6.2 The dative alternation

The dative alternation and the double object construction have generated an enormous body of work and are found in many languages. The basic syntactic features – the binding and negative polarity licensing contrast of Lasnik & Barss (1984) – are similar in German despite the overt case marking and scrambling in German. As mentioned above the benefactive alternation (Levin 1993:2.2) is freely allowed in German. But the Dative can also express a different θ-role, namely Source or Goal. In these cases the Dative is in most cases ambiguous between a Benefactive and a Source/Goal interpretation, however not in all cases. Another difference between English and German is that, while in English the preposition is for all verbs that allow the alternation *to*, in German different prepositions occur with different verbs.

The following list is sorted by this three parameters: thematic role expressed by the Dative, ambiguity with Benefactive, and the preposition occuring in the prepositional form.

References: Dikken (1991), Gallmann (1993), Müller (1993), Plank (1980), and Wyngaerd (1989)

- Verbs where the θ-role of the Dative is Source that allow the alternation (the preposition is always von):

  klauen (*steal*), nehmen (*take*), rauben (*rob*), stehlen (*steal*), stibitzen (*steal*)

  (424) a. Hans nahm den Apfel von dem Haufen
  Hans took the apple from the pile
  b. *Hans nahm dem Haufen den Apfel
  Hans took the pile the apple

  Like in English the availability of the alternation is governed by its semantic effects. Not only is the dative form restricted to animate DPs, but also in reverse the prepositional form is not used for animate DPs:

  (425) a. Der Mann nahm dem Nachbarn die Frau
  the man took the neighbor the wife
  b. *Der Mann nahm die Frau von dem Nachbarn
  the man took the wife from the neighbor

- Verbs where the θ-role of the Dative is Source that don't allow the alternation, but only the double-object form:

  ab-kaufen (*buy*), ab-nehmen (*take away*), ent-nehmen (*take out of*), entwenden (*steal*)

- Verbs where the θ-role of the Dative is Source that don't allow the alternation, but only the prepositional form:

  borgen (*borrow*), kaufen (*buy*)

- THROW-verbs; the θ-role of the dative is Goal, the preposition is zu:

  werfen (*throw*), schleudern (*fling*), schiessen (*shoot*), schnippen (*snip*), stellen (*set (volley-ball)*), katapultieren (*catapult*), hin-werfen (*throw*), passen (*pass*), flanken (*kick*), schmeissen (*throw*)

(426) a. Der Torwart passte seinem Mitspieler den Ball
the goalkeeper passed his team-mate the ball

b. Der Torwart passte den Ball zu seinem Mitspieler
the goalkeeper passed the ball to his team-mate

c. Der Torwart passte seinem Mitspieler den Ball zu
the goalkeeper passed his team-mate the ball to

d. *Der Torwart passte den Ball zu seinem Mitpsieler zu
the goalkeeper passed the ball to his team-mate zu

This verbs seem to display overt incorporation of the preposition zu.

- PUSH-verbs; don't allow the alternation, but only the prepositional form with an+accusative case:

  schieben (*push*), drücken (*push*), ziehen (*pull*), rücken (*shift*)

(427) a. *Heidi schob der Wand den Schrank
Heidi pushed the wall the wardrobe

b. Heidi schob den Schrank an die Wand
Heidi pushed the wardrobe at the wall

- Verbs with the θ-role Goal and the preposition zu that allow the alternation:

  sagen (*say*), berichten (*report*), zeigen (*show*), gestehen (*confess*), beantworten (*answer*), mitteilen (*notify*), beichten (*confess*), erzählen (*narrate*), demonstrieren (*demonstrate*)

(428) a. Der Professor zeigte dem Publikum ein Skelett
the professor showed the audience a skeleton

b. *Der Professor zeigte ein Skelett zu dem Publikum
the professor showed a skelett to the audience

- Verbs with θ-role Goal and the preposition an assigning accusative case, that allow the alternation:

  telegraphieren (*telegraph*), schreiben (*write*), faxen (*fax*), übermitteln (*transmit*), morsen (*morse*), funken (*radio*)

(429) a. Uta schreibt mir einen Brief
Uta writes me a letter

b. Uta schreibt einen Brief an mich
Uta writes a letter to me

c. *Uta schreibt einen Brief zu mir
Uta writes a letter to me

In English *phone* and *telephone* belong to the same class, but the German telephonieren (*phone*) is intransitive:

(430) a. Tanja telefoniert
Tanja phones

b. *Tanja telefoniert (mir) die Neuigkeiten
Tanja phones me the news

Summary The following table summarizes the behaviour of the verbs of the semantic classes, in the comparison English vs. German.

Verb Class	English	German
give-verbs	DO/*to*	DO/an + Acc
offer-verbs	DO/*to*	DO/an + Acc
bring and take	DO/*to*	DO/zu + Dat
send-verbs	DO/*to*	DO/an + Acc
slide-verbs	DO/*to*	DO/zu + Dat
carry-verbs	?DO/*to*	DO/zu + Dat
drive-verbs	??DO/*to*	*DO/zu Dat
throw-verbs	DO/*to*	DO+zu/zu + Dat
write-verbs	DO/*to*	DO/an + Acc
fax-verbs	DO/*to*	DO/an + Acc
latinate verbs	*DO/*to*	n.a.
say-verbs	*DO/*to*	DO/*PP
confess-verbs	*DO/*to*	DO/*PP
shout-verbs	*DO/*to*	DO/an + Acc
drop-verbs	*DO/*to*	*DO/auf + Acc
present-verbs	*DO/*to*	DO/an + Acc
ask-verbs	DO/*PP	DO/*PP
bill-verbs	DO/*PP	DO/*PP
appoint-verbs	DO/*PP	*DO/zu+Dat
dub-verbs	DO/*PP	DO/*PP
declare-verbs	DO/*PP	DO/*PP

A significant result is that the same classes show uniform behaviour with respect to this alternation in both German and English. I found only one exception, namely the intransitive telefonieren in example (430).

Also German displays the same behaviour for the prototypical classes near the top of the table. However in in the other classes the behavior differs, and in the case of SAY and APPOINT verbs is even the complete contrary.

The most interesting case for linguistic theory is the one of the THROW-verbs, where it looks very much like overt incorporation of the preposition zu in the sense of Baker (1988). None of the popular linguistic theories of Double Object formation has an account for this behavior.

6.3 The middle alternation

The middle construction in German shows an overt reflex of the omission of the subject θ-role: The reflexive sich, which has clitic properties has to occur. By virtue of this overt reflex the middle form in example (431-a) is distinct from the inchoative in (431-b). In English the only difference between the two forms, is that most middle construction obligatorily need a manner adverbial, and that the interpretation is different.[6]

(431) a. Glas bricht leicht
glass breaks easily
b. Glas bricht sich leicht
glass breaks self easily

Instead of the licensing the middle by a manner adverbial, it can also be licensed in the light verb construction in (432), called the lassen-passive or lassen-middle. This construction allows a wider class of verbs.

(432) Glas lässt sich zerbrechen.
Glas lets self break into pieces

Another striking contrast to the English middle is that German allows impersonal middles of intransitive verbs as schwimmen (*swim*) in (433). This is in parallel with the fact that German allows impersonal Passives, whereas English doesn't (see e.g. Baker *et al.* (1989)).

(433) Es schwimmt sich gut im Bodensee.
it swims self good in-the Lake Constance
'To Swim in the Lake Constance is well possible.'

An interesting parallel between the passive and middle constructions that has been overlooked even in Fagan's (1992) monograph on the German middle is that middles from verbs assigning dative case are permitted as in example (434-a). The only examples with the verb helfen that are found in the literature, are of the type of (434-b). There the DP der alte Mann is assigned nominative case, and the sentence is clearly ungrammatical. But as the examples (434-c) and (434-d) show the passive construction displays the same contrast: Passive formation is possible, if the direct object receives lexical case, but the lexical case marking has to be preserved.[7]

(434) a. Dem alten Mann$_{\mathrm{DAT}}$ hilft sich leichter, seitdem er netter ist.
the old man$_{\mathrm{DAT}}$ helps self more easily since he nicer is
b. *Der alte Mann$_{\mathrm{NOM}}$ hilft sich leichter, seitdem er netter ist.
the old man$_{\mathrm{NOM}}$ helps self more easily since he nicer is
c. Dem alten Mann$_{\mathrm{DAT}}$ wird geholfen
the old man$_{\mathrm{DAT}}$ was helped
d. *Der alte Mann$_{\mathrm{NOM}}$ wird geholfen
the old man$_{\mathrm{NOM}}$ was helped

References: Abraham(1993, n.d.), Ackema & Schoorlemmer (1994), Beedham (1982), Brinker (1969), Brinker (1971), Fagan (1985, 1989, 1992), Fellbaum (1987), Grewendorf (1989), Haider (1985), Hoekstra (1984), Höhle (1978), Lenerz (1977b), Maling (1994), and Pitz(1987, 1994)

The class of verbs allowing the alternation are a very broad class, more than I can possibly list here. I will only list the verbs form Fagan (1992:appendix) and some more examples here.

- schneiden (*cut*), bedienen (*operate*), bemessen (*measure*), fahren (*drive*), gehen (*walk*), heizen (*heat*), imponieren (*impress*), schreiben (*write*), essen (*eat*), nehmen (*take*), lernen (*learn*), lesen (*read*), sagen (*says*), spielen (*play*), stricken (*knit*), tragen (*wear*), verkaufen (*sell*), waschen (*wash*), frieren (*freeze*)

(435) a. Der Metzger schneidet das Filet
the butcher cuts the filet
b. Das Filet schneidet sich leicht
the filet cuts self easily
c. Das Filet lässt sich schneiden
the filet lets self cut
d. *Das Filet schneidet leicht
the filet cuts easily
e. *Es schneidet sich das Fleisch leicht
it cuts self the meat easily

[6] In German however the middle is superficially similar to reflexive ergatives like:

(i) a. Marion öffnete die Tür
Marion opened the door
b. Die Tür öffnete sich
The door opened self
c. *Die Tür öffnete
The door opened

The question whether the inchoative of a transitive verb is formed with sich like with öffnen or without it like brechen, I didn't study in detail.

[7] This is not universally true for Dative Case. In Icelandic (Maling 1994) the middle construction causes an object that receives dative case to become a nominative subject in (i). So in Icelandic dative and accusative case behave alike, and like accusative case in German.

(i) a. Barniđ hellti niđur mjólkinni
the child$_{\mathrm{NOM}}$ spilled down the milk$_{\mathrm{DAT}}$
b. Mjólkin hellist síđur niđur úr þessum bolla
the milk$_{\mathrm{NOM}}$ spills-MIDDLE less down from this cup

- Verbs that don't allow the middle, but the lassen-middle in German:
  zerbrechen (*break into pieces*), zerschlagen (*hit*)

(436) a. Das Kind zerbricht eine Vase
the child breaks a vase

b. *Eine Vase zerbricht sich leicht
a vase breaks self easily

c. Eine Vase lässt sich zerbrechen
a vase lets self break

d. Eine Vase zerbricht leicht
a vase breaks easily

- Transitive verbs that allow the middle construction in German, but not in English:
  ähneln (*resemble*) assistieren (*assist*), danken (*thank*) erkennen (*recognize*), folgen (*follow*), gedenken (*remember*), helfen (*help*), kündigen (*cancel*), verstehen (*understand*), widersprechen (*contradict*)

(437) a. Der Beobachter erkennt die Absicht
the spectator recognizes the intent

b. Die Absicht erkennt sich leicht
the intent recognizes self easily

c. Die Absicht lässt sich erkennen
the intent lets self recognize

d. *Die Absicht erkennt leicht
the intent recognizes easily

- Transitive Verbs that allow the middle construction in German and English:
  fürchten (*fear*), passieren (*happen to*), schmecken (*taste*), widerfahren (*befall*), wissen (*know*), zürnen (*be annoyed with*) ziemen (*be befitting for*),
- Ditransitives that allow the middle construction in German:
  berichten (*report*), borgen (*borrow*), geben (*give*), fragen (*ask*), kaufen (*buy*), schenken (*donate*), schicken (*send*), zu-werfen (*to-throw*)
- Intransitive verbs that allow the impersonal middle construction:
  arbeiten (*work*), fahren (*drive*), hängen (*hang*), giessen (*pour*), gratulieren (*congratulate*), jodeln (*yodel*), laufen (*run*), leben (*live*), reisen (*travel*), reiten (*ride*), singen (*sing*), schimpfen (*curse*), schreiben (*write*), sitzen (*sit*), spielen (*play*), sterben (*die*), träumen (*dream*), trinken (*drink*), weinen (*cry*), wohnen (*live*), atmen (*breathe*), experimentieren (*experiment*), gehen (*walk*), lachen (*laugh*), leben (*live*), haus-halten (*keep house*), nach-denken (*contemplate*), reden (*talk*), sprechen (*speak*), sterben (*die*), verhandeln (*negotiate*), widersprechen (*contradict*), zweifeln (*doubt*), verhungern (*starve*), verdienen (*earn*), sterben (*die*)

(438) a. Uta arbeitet
Uta works

b. Es arbeitet sich leicht
it works self easily

c. Es lässt sich arbeiten
it lets self work

d. *Es arbeitet
it works

e. *Leicht arbeitet
Easily works

- Resultatives allow the middle construction in both German and English:
  glatt klopfen (*smooth knock*), glatt hämmern (*smooth hammer*), blank polieren (*polish clear*), sauber wischen (*wish clean*)

(439) a. Der Schmied hämmert das Blech glatt
the smith hammers the metal smooth

b. Das Blech hämmert sich leicht glatt
The metal hammers self easily smooth

c. *Das Blech hämmert leicht glatt
The metal hammers easily smooth

Summary The English aspectual restriction that only change-of-state verbs may appear in the middle construction is weaker, but still present in German. Purely stative verbs like wissen (*know*) don't allow the alternation. Other stative verbs like ähneln (*resemble*) can undergo middle formation, but then receive an agentive interpretation.

In ditransitives the thematically higher object has to be promoted to the subject position.[8]

Since for ditransitives the thematically higher object

[8]This can be strikingly seen when the verb is one of the few double-accusative verbs:

(i) a. Der Boss fragt sich den Wochentag nur schwerlich.
the boss$_{\mathrm{NOM}}$ asks self the day of the week$_{\mathrm{ACC}}$ only with difficulty

The boss ask himself the day of the week only with difficulty.

b. Der Wochentag fragt sich den Boss nur schwerlich.
The day of the week$_{\mathrm{NOM}}$ asks self the boss$_{\mathrm{ACC}}$ only with difficulty

It is difficult to ask the boss the day of the week.

I assume that der Boss is a Location or Goal argument, whereas der Wochentag is a Theme. In this respect the middle and the passive differ as both object can move to the subject position in the passive:

(ii) a. Der Boss wird den Wochentag gefragt.
the boss$_{\mathrm{NOM}}$ is the day of the week$_{\mathrm{DAT}}$ asked

b. Der Wochentag wird den Boss gefragt.
The day of the week$_{\mathrm{NOM}}$ is the boss$_{\mathrm{DAT}}$ asked

has in German always accusative case in the base form, in the middle it always receives nominative case. In transitives lexical case (Dative or Genitive) is preserved under middle formation.

The middle formation is in many aspects parallel to the passive, which is unexpected under Baker *et al.*'s (1989) theory of the passive, which attributes all crosslinguistic differences of the passive to the lexical entry of the passive morpheme *-en*.

6.4 The conative alternation

The conative alternation in English separates pure change-of-state verbs like *break* from verbs of contact and/or motion. The basic paradigm for English is:

(440) a. Doug pushed the file cabinet.
b. Doug pushed at the file cabinet.

The semantic difference is that in example (440-a) the described action has to take successfully place – the file cabinet must have moved –, whereas in (440-b) this doesn't have to be the case. All of the above observations are also true for German: The contrast in affectedness is similarly strong in the German examples (441), and the German verb brechen (*break*) also may not undergo the alternation:

(441) a. Doug stösst den Ball.
Doug pushed the ball
b. Doug stösst an dem Ball
Doug pushed at the ball

(442) *Carolin brach an dem Stock
Carolin broke at the stick

Nevertheless the German middle has wider distribution as we see from the following list. The verbs are sorted by the preposition they take in the in the PP-form alternation.

References: none.

- Verbs of contact by impact that allow the alternation with the preposition an assigning accusative case:

  blasen (*blow*), rempeln (*tackle*), schlagen (*beat*), schrappen (*scrap*), stossen (*push*) trampeln (*stomp*), treten (*kick*),

  (443) a. Der Junge schlägt die Tür
  the boy hits the door
  b. Der Junge schlägt an die Tür
  the boy hits at the door

- Verbs of contact by impact that allow the alternation with the preposition an assigning dative case:

  arbeiten (*work*), bauen (*built*), beissen (*bite*), biegen (*bend*), bohren (*drill*), buddeln (*dig*), drechseln (*carve by turning*), drehen (*turn*), drücken (*push*), essen (*eat*), falten (*fold*), feilen (*file*), graben (*dig*), häkeln (*knit*), hobeln (*plane*), kauen (*chew*), klettern (*climb*), klöppeln (*knit*), kneten (*knead*), knibbeln (*pick*), kochen (*cook*), komponieren (*compose*), korrigieren (*correct*), kratzen (*scratch*), lesen (*read*), malen (*paint*), mauern (*build a wall*), meisseln (*chisel*), nähen (*seam*), photopraphieren (*photograph*) polieren (*polish*), rütteln (*rattle*), raspeln (*file*), reiben (*rub*), reissen (*tear*), revidieren (*revise*), sägen (*saw*), saugen (*suck*), schneiden (*cut*), schnitzen (*carve*), schrappen (*scrap*), schreiben (*write*), sticken (*embroider*), stricken (*knit*), treten (*kick*), trinken (*drink*), üben (*practice*), werkeln (*work*), ziehen (*pull*), zimmern (*carpenter*),

  (444) a. Der Junge malt ein Porträt
  the boy paints a protrait
  b. Der Junge malt an einem Porträt
  the boy paints at a portrait

  an with accusative case can here only receive a purely directional interpretation together with an existential interpretation for the elided object:

  (445) Der Junge malt an die Tür
  the boy paints on the door
  The boy paints something on the door

- Verbs of contact by impact that don't allow the alternation, but only the direct object form:

  färben (*color*), faulen (*play unfair*), filetieren (*filet*), karrikieren (*caricature*), lochen (*punch holes*), mähen (*mow*), mahlen (*grind*), mangeln (*mangle*), ordnen (*sort*), perforieren (*perforate*), pulverisieren (*pulverize*), rezipieren (*recipe*), rezitieren (*recite*), schärfen (*sharpen*), schlitzen (*slit*), schnitzeln (*slice*), singen (*sing*), skizzieren (*sketch*), sortieren (*sort*), spielte (*play*), spiessen (*spear*), träumen (*dream*), wässern (*water*), wringen (*mangle*) würfeln (*dice*), würzen (*spice*),

  (446) a. Der Junge skizziert die Tür
  the boy sketches the door
  b. *Der Junge skizziert an der Tür
  the boy sketches at the Tür

- Alternating verbs of state don't allow the alternation

  brechen (*break*), knacken (*crack*), sprengen (*make explode*), spalten (*split*), teilen (*part*), halbieren (*split into halves*), dritteln (*split into thirds*), vierteln (*split into fourths*), fragmentieren (*fragment*), knicken (*crease*), öffnen (*open*), schliessen (*close*)

  (447) a. Der Spieler knackte die Bank
  the gambler cracked the bank
  b. *Der Spieler knackte an der Bank
  the gambler cracked on the bank

- TOUCH-verbs don't allow the alternation

  berühren (*touch*), küssen (*kiss*), kitzeln (*tickeln*), massieren (*massage*), streicheln (*stroke*)

  (448) a. Der Bauch berührte die Wand
  the belly touched the wall

b. *Der Bauch berührte an die Wand
the belly touched on the wall

- DESTROY-verbs don't allow the alternation
ruinierte (*ruin*), verschwendete (*waste*)

(449) a. Der Manager ruinierte die Firma
the manager ruined the company
b. *Der Manager ruinierte an der Firma
the manager ruined at the company

- SLIDE-verbs don't allow the alternation, but the effect is not that strong:
schieben (*shove*), rollen (*roll*)

(450) a. Der Vater schob den Kinderwagen
the father pushed the baby carriage
b. ??Der Vater schob an dem Kinderwagen
the father shoved at the baby carriage

- DEVOUR-verbs allow the alternation: schlucken (*swallow*), schlingen (*devour*)

(451) a. Der Hai schluckte ein Makrele
the shark swallow macrel
b. Der Hai schluckte an einer Makrele
the shark swallowed at a macrel

- Verbs of contact with impact that allow the alternation with the preposition auf assigning accusative case:
schlagen (*hit*), ein-schlagen (*smash*), schiessen (*shoot*), jagen (*hunt*), ein-treten (*kick*), kauen (*chew*), hacken (*hack*), hämmern (*hammer*), drücken (*press*), hauen (*hit*), trampelte (*stomp*), ballerte (*shoot*), ein-stechen (*stab*), wettete (*bet*), sprühen (*spray*), sprenkeln (*sprinkle*), prügeln (*cane*)

(452) a. Der Junge schlägt die Tür
the boy hits the door
b. Der Junge schlägt auf die Tür
the boy hits at the Tür

- Verbs that allow the alternation only if a directional PP is present: krümeln (*crumble*), stäuben (*dust*), strahlen (*radiate*), bröseln (*crumble*), bröckeln (*crumble*), peitschte (*whip*)

(453) a. *Der Junge krümelt den Kuchen
the boy crumbles the cake
b. Der Junge krümelt auf den Tisch
the boy crumbles sth. at the table
c. Der Junge krümelt den Kuchen auf den Tisch
the boy crumbles the cake on the table

- READ-verbs allow the alternation:
lesen (*read*), schreiben (*write*)

(454) a. Der Junge liest den Roman
the boy reads the novel
b. Der Junge liest in dem Roman
the boy reads in the novel
The boy in the novel reads. / The boy reads some pages of the novel.

- Verbs with the aspectual prefix zer- never allow the prepositional form of the alternation.
zerschlagen (*smash*), zerdrücken (*crunch*), zertreten (*stomp*), zerreiben (*rub*), zerfeilen (*file*), zersägen (*saw up*), zertrampeln (*stomp*), zerteilen (*partition*), zerhacken (*chop*), zerschneiden (*cut*), zerraspeln (*file*), zerspalten (*split*), zerreissen (*rip*), zerlegen (*take apart*), zermahlen (*grind*), zerfetzen (*tear up*), zersprengen (*burst*), zerlassen (*melt*), zerfliessen (*melt away*), zerstreuen (*disperse*), zerstückeln (*cut up*), zertrennen (*rip up*), zertrümmern (*smash*), zerbrechen (*break*), zerkleinern (*crush*), zerbröseln (*crumble*), zerkrümeln (*crumble*), zerkauen (*chew up*), zerrinnen (*melt away*), zerschmettern (*smash*), zersetzen (*decompose*), zerbröckeln (*crumble*), zermürben (*wear down*), zerstampfen (*pound*), zerstäuben (*spray*), zerstören (*destroy*), zerplatzen (*burst*), zerspringen (*burst*), zerstampfen (*pound*), zerstrahlen (*radiate*), zerstossen (*crush*), zermörsern (*mortar*), zerballern (*shoot*), zersingen (*sing up*), zerschellen (*wreck*), zerpflücken (*tear into pieces*), zerpressen (*press*), zerhauen (*split*)

(455) a. Der Junge zerschlägt die Tür
the boy smashes the door
b. *Der Junge zerschlägt an die Tür
the boy smashes at the door

Summary The following table summarizes the availability of the conative alternation and contrasts German with English:

Verb Class	English	German
hit-verbs	at	an/auf + Acc
swat-verbs	at	an + Dat
poke-verbs	at	an + Dat
cut-verbs	at	an + Dat
spray-verbs	at	auf + Acc
push/pull-verbs	at	auf + Acc
eat-verbs	at/of	an/von + Acc
break-verbs	*	*
touch-verbs	*	??
destroy-verbs	*	*
send-verbs	*	(*)
slide-verbs	*	*
devour-verbs	*	an + Dat
gobble-verbs	*	an + Dat
carve-verbs	*	an + Acc
hack-verbs	*	auf + Acc
spank-verbs	*	auf + Acc

6.5 The reciprocal alternations

The reciprocal alternation again shows how the additional morphology German has can shed light on some properties of the English alternations. This is important since the lexical properties that decide whether the reciprocal alternation is possible are not clear to me. The basic pattern of the alternation is:

(456) a. Janet mischt Mehl mit Wasser.
Janet mixes flour and water

b. Janet mischt Mehl und Wasser miteinander.
Janet mixes flour and water with each other

c. Janet mischt Mehl und Wasser.
Janet mixes flout and water

d. ??Janet mischt Mehl und Wasser miteinander zusammen.
Janet mixes flour and water with each other together

The alternation should not be seen as an alternation between (456-a) and (456-c), but rather as one between (456-b) and (456-c). Then the alternation really is the deletion of the prepositional phrase miteinander (*with each other*) in context where it is reconstructible. There are a number of arguments for this view: First of all (456-a) and (456-b) are not synonmous, neither in German nor in English.[9] The relevant condition Levin (1993) describes as: *all participants constituting the object NP if the verb is transitive, or the subject NP if the verb is intransitive, must be of comparable status, ...* E.g. (456-c) would be odd if the amount of water was much smaller than the amount of flour. With verbs like *resemble*, *collide*, or *fight* the effect is even stronger. No such difference in interpretation exists between (456-b) and (456-c). Also a derivation of (456-c) from (456-a), already violating the constraints of syntax for (456-c), is impossible for case where the object is a plural DP or a conjunct of three DPs.

Interacting with the alternation between (456-b) and (456-c) is the in English are the clause final particles *together* and *apart*. For *tape* in (457) *together* enables the alternation, whereas *alternate* in (458) is incompatible with *together*, but otherwise allows the alternation.

(457) a. Naomi taped the label and the cover.
b. Naomi taped the label and the cover together.

(458) a. Harriet alternated folk songs and pop songs.
b. Harriet alternated folk songs and pop songs together.

The combination of *together* and *with each other* is redundant, so *together* in effect forces the elision of *with each other* (also shown in (456-d)). German has a particle zusammen which behaves a lot like *together*, but no equivalent to *apart*. In addition the verbal prefixes ver- and zer- have in this alternation a meaning that resembles the *together* and *apart* respectively quite closely. As we will also see ver- is in complementary distribution with zusammen.

The following list is organized by transitivity, the preposition of the elided PP, and whether the particle zusammen is allowed.

References: none.

- Verbs allowing the alternation with the preposition mit:

  assoziieren (*associate*), essen (*eat*), kombinieren (*combine*), korrellieren (*correlate*), kreuzen (*cross*), paaren (*pair*), reimen (*rhyme*),

  (459) a. Der Tanzlehrer paart Jungen und Mädchen (miteinander).
  the dancing teacher pairs boys and girls (with each other)

  b. Der Tanzlehrer paart Jungen und Mädchen zusammen.
  the dancing teacher pairs boys and girls together

- zusammen-verbs, which allow the alternation, but not the reciprocal PP:

  zusammen binden (*bind together*), zusammen befehlen (*order together*), zusammen beordern (*order together*), zusammen bringen (*bring together*), zusammen drängen (*push together*), zusammen gießen (*pour together*), zusammen halten (*hold together*), zusammen heften (*attach together*), zusammen inhaftieren (*arrest together*), zusammen internieren (*arrest together*), zusammen kippen (*pour together*), zusammen kleben (*glue together*), zusammen kuppeln (*connect together*), zusammen löten (*solder together*), zusammen legen (*lay together*), zusammen leimen (*glue together*), zusammen mengen (*mix together*), zusammen mischen (*mix together*), zusammen mixen (*mix together*), zusammen nähen (*seq together*), zusammen nageln (*nail together*), zusammen packen (*pack together*), zusammen plazieren (*place together*), zusammen rühren (*stir together*), zusammen reimen (*rhyme together*), zusammen schütten (*pour together*), zusammen schicken (*send together*), zusammen schmeißen (*throw together*), zusammen schmelzen (*melt together*), zusammen schmieren (*smear together*), zusammen schrauben (*screw together*), zusammen schweißen (*solder together*), zusammen senden (*send together*), zusammen setzen (*put together*), zusammen stellen (*put together*), zusammen treiben (*drive together*), zusammen tuen (*put together*), zusammen unter-bringen (*house together*), zusammen weben (*weave together*), zusammen werfen (*throw together*), zusammen wirren (*mingle together*)

[9] **?** and Langendoen (1978) point this out for:

(i) a. The image resembles the man.
b. The man resemble the image.

(460) a. Uta schraubte das Blech und den
Uta screwed the metal and the
Rahmen zusammen.
frame together

b. Uta schraubte das Blech mit dem
Uta screwed the metal with the
Rahmen zusammen.
frame together

c. ??Uta schraubt das Blech und den
Uta screwed the metal and the
Rahmen miteinander zusammen.
frame with each other together

- Verbs that allow the alternation, but don't allow the particle zusammen:

abwechseln (*alternate*), alternieren (*alternate*), assoziieren (*associate*), kontrastieren (*contrast*), verbinden (*connect*), verbünden (*unite*), vergleichen (*compare*), verheiraten (*wed*), verkuppeln (*connect*), vermengen (*mix*), vermischen (*mix*), vermixen (*mix*), vernetzen (*interconnect*), verrühren (*stir*), verschmelzen (*melt*), verschmieren (*smear*), verschneiden (*blend*), vertauschen (*exchange*) verweben (*interweave*), verwirren (*confuse*),

(461) a. Der Winzer verschneidet Riesling
the vine-dresser blends riesling
und Glykol
and glykol

b. *Der Winzer verschneidet Riesling
the vine-dresser blends riesling
und Glykol zusammen
and glykol together

- Verbs that allow the alternation with the preposition an assigning accusative case

an-gliedern (*affiliate*), an-lehnen (*lean against*)

(462) a. Der Chef gliedert Abteilung A und
the boss affiliates division A and
Abteilung B (aneinander) an
division B (to e.o.) to

b. Der Chef gliedert Abteilung A an
the boss affiliates division A to
Abteilung B an
division B to

c. *Der Chef gliedert Abteilung A und
the boss affiliates division A and
Abteilung B zusammen
division B together

- Verbs that allow the alternation with the preposition von:

spalten (*split*) trennen (*separate*),

(463) a. Die Chemikerin trennt den Alkohol
The chemist separates the alcohol
und das Wasser (voneinander)
and the water (from e.o.)

b. Die Chemikerin trennt den Alkohol
the chemist separates the alcohol
von dem Wasser
from the water

- Verb with the prefix zer- allow only the conjunctive form:

zerteilen (*separate*), zerschneiden (*cut*), zertrennen (*separate*), zerspalten (*split*)

(464) a. Die Näherin zertrennt das
the seamstress separates the
Vorderteil und das Hinterteil
front piece and the back piece
(*voneinander)
(*from each other)

b. *Die Näherin zertrennt das
the seamstress separates the
Vorderteil von dem Hinterteil
front piece and the back piece

- Some verbs that don't allow the elision of the reciprocal:

folgen (*follow*), zu-ordnen (*categorize*), zu-rechnen (*count-as*), zu-weisen (*assign*)

(465) a. TK und Extrabreit folgen
TK and Extrabreit follow
unmittelbar aufeinander
immediately on-one-another

b. TK und Extrabreit folgen
TK and Extrabreit follow
einander unmittelbar
one-another immediately

c. *TK and Extrabreit folgen
TK and Extrabreit follow
unmittelbar
immediately

d. TK folgt unmittelbar auf
TK follows immediately on
Extrabreit
Extrabreit

Summary The most surprising fact about both English and German is that while reflexive anaphors can be elided in the argument position of a verb like in (466), reciprocal anaphors cannot, but can be elided with the prepositional phrase that contains them.

(466) John shaves (himself).

We also find a complimentary distribution between zusammen and the verbal prefix ver- where both of them frequently facilitate the alternation.

6.6 Lexical Case

German offers additional grammatical criteria for finding verb classes that don't exist in English. One that has been extensively studied in Grewendorf (1989) is auxiliary selection in the present perfect. Like in Dutch and Italian this could display the unaccusative/undergative distinction, although Shannon(1988, 1990) disagrees with this analysis.

Another criterion that doesn't exist in English, but in German is the assignment of lexical case. For this I will provide some data in this section.

- Dative case:

  ab-raten (*dissuade*), ab-sagen (*refuse*), ähneln (*resemble*), an-gehören (*belong to*), an-haften (*adhere to*), applaudieren (*applaud*), assistieren (*assist*), auf-fallen (*be noticed by*), auf-gehen (*dawn on*), auf-lauern (*ambush*), aus-weichen (*make way for*), begegnen (*meet*), behagen (*please*), beipflichten (*agree with*), bei-stehen (*help*), beistimmen (*agree with*), bei-treten (*join*), beiwohnen (*attend*), bekommen (*agree with*), belieben (*please*), bevorstehen (*approach*), bleiben (*remain*), danken (*thank*), dienen (*serve*), drohen (*threaten*), ein-fallen (*occur to*), ein-leuchten (*be clear to*), entfallen (*escape from*), entfliehen (*flee from*), entgegen-gehen (*go to meet*), entgegentreten (*stand up to*), entgehen (*escape from*), entlaufen (*run away from*), entrinnen (*run away from*), entsagen (*renounce*), entsprechen (*comply with*), entstammen (*descend from*), entwachsen (*outgrow*), erliegen (*succumb to*), erscheinen (*appear to*), fehlen (*lack*), fluchen (*curse*), folgen (*follow*), frommen (*benefit*), gebühren (*be due*), gegenüber-sitzen (*sit opposite*), gegenübertreten (*face*), gehorchten (*obey*), gehören (*belong to*), gelingen (*succed*), genügen (*satisfy*), geraten (*prosper to*), gleichen (*resemble*), glücken (*succeed*), gratulieren (*congratulate*), grollen (*bear ill will towards*), helfen (*help*), huldigen (*pay hommage to*), imponieren (*impress*), kondolieren (*condole with*), kündigen (*give notice*), lauschen (*listen to*), leicht-fallen (*be easy for*), liegen (*lie before*), missfallen (*displease*), misslingen (*fail*), missraten (*turn out badly for*), misstrauen (*mistrust*), munden (*taste good*), nach-blicken (*gaze after*), nach-eifern (*emulate*), nach-eilen (*pursue*), nach-fahren (*drive after*), nach-geben (*yield to*), nach-gehen (*follow*), nach-laufen (*run after*), nachschauen (*gaze after*), nach-spüren (*track*), nachstellen (*lie in wait for*), nach-trauern (*mourn*), nahen (*approach*), nutzen (*profit*), nützen (*be of use to*), parieren (*obey*), passen (*suit*), passieren (*happen to*), reichen (*suffice or long to*), schaden (*harm*), schmecken (*taste*), schmeicheln (*flatter*), schwer-fallen (*be a burden to*), sein (*feel*), stehen (*suit*), telegraphieren (*telegraph*), trauen (*trust*), trotzen (*defy*), unterlaufen (*occur*), unterliegen (*succumb*), unterstehen (*be subordinate to*), vertrauen (*trust*), verzeihen (*forgive*), voran-gehen (*preceede*), voraus-eilen (*hurry on ahead of*), vorstehen (*oversee*), weg-laufen (*run away from*), wehtun (*hurt*), weichen (*yield to*), weiter-helfen (*help on*), widerfahren (*befall*), widersprechen (*contradict*), widerstehen (*oppose*), widerstreben (*be hated by*), willfahren (*comply with*), winken (*wave to*), ziemen (*be befitting for*), zu-blinzeln (*wink at*), zufallen (*fall to*), zu-fliegen (*fly to*), zu-hören (*listen to*), zu-jauchzen (*cheer*), zu-jubeln (*cheer*), zukommen (*belong to*), zu-laufen (*run to*), zu-lächeln (*smile at*), zu-prosten (*toast*), zu-raten (*advise*), zu-reden (*advise*), zürnen (*be annoyed with*), zusagen (*promise*), zu-schauen (*look on*), zu-sehen (*watch*), zu-setzen (*pursue*), zu-stimmen (*agree with*), zu-trinken (*drink to*), zuvor-kommen (*prevent*), zuwinken (*wink at*), zuzwinkern (*wink at*)

  (467) Karl hilft seinem Vater
  Karl helps his father$_{\mathrm{DAT}}$

- Accusative and genitive case:

  belehren (*teach*), bemächtigen (*get hold of*), berauben (*rob*) beschuldigen (*blame*), bezichtigen (*blame*), enthalten (*abstain*) verdächtigen (*suspect*),

  (468) Marion beschuldigte den Hans der Untat
  Marion blamed den Hans$_{\mathrm{ACC}}$ the crime$_{\mathrm{ACC}}$

- Double accusative case:

  fragen (*ask*), lehren (*teach*), predigen (*preach*)

  (469) a. Claude lehrte die Kinder Französisch
  Claude taught the children French

7 Conclusion and Outlook

This paper compared a few alternations from Levin's (1993) book with their German counterparts. The major focus has been placed on alternations where German exhibits overt morphology interacting with the alternation. Such a comparison is benificial towards a better understanding of the nature of both the English and German alternations and also the properties of the verbal prefixes that German has. A major purpose of this paper was to aid future detailed studies of verb classes that are distinguished by alternations with broader coverage. I also hope to have provided motivation for such an undertaking.

One of the questions that the VCA-summer project was trying to answer was whether the verb classes that are given in Levin's work, are crosslinguistically the same. Especially interesting with respect to this question are of the above alternation the dative alternation in section 6.2, the conative alternation in section 6.4, and the locative alternation in section 6.1. The data of the dative and the conative alternation showed that the English and German verb classes match up quite nicely. This is very striking evidence especially in those case where the same class shows different behavior with respect to the alternation. Here a class as a whole may behave differently, but it has to behave uniformly.

The locative inversion shows a different picture: The big classes that Levin considers are the SPRAY/LOAD-verbs and the FILL-verbs. Both of them break down in German and different classes emerge. But these two classes are far bigger than the classes in the dative alternation. What this seems to suggest, that if crosslinguistically valid semantic classes of verbs exist, then they tend to be rather small, containing only around ten verbs.

The section on the middle contained new data showing that the passive and the middle are much more alike than distinct. The only two differences that remain are that the sich of the middle cannot control PRO, whereas the passive sometimes can as shown in (470), and that in the middle, but not in the passive the thematically highest accusative object has to raise to the subject position and receive accusative case.[10]

Adopting the analysis of Baker *et al.* (1989) for the moment, both of these contrast can be explained in an analysis where sich has no referential features at all, whereas the passive morpheme has referential features. For the analysis I assume a version of binding- and control-theory that is based on the concept of filling in of features like eg. Richards (1994). Then it follows that the passive morpheme since it can provide features can control, but the middle sich cannot. But also the other contrast follows as sich, if we assume that in (471-a) the DP der boss has to bind sich, whereas in (471-b) der Wochentag need not bind sich, but sich can be bound by existential closure. While many details of this proposal still remain to be worked out, this hopefully will provide an accurate account for the data. Such an analysis should provide more insight into the largely parallel behavior of middle and passive in German, which Baker *et al.* (1989) doesn't do, but on the other hand account for the two differences accurately.[11]

(470) a. Der Politiker$_i$ wurde bestochen um PRO$_i$
the politician$_i$ was bribed to PRO$_i$
das Projekt durchzusetzen.
the project put through

b. *Der Politiker$_i$ bestach sich leicht um
the politician bribed self easily to
PRO$_i$ das Projekt durchzusetzen.
PRO$_i$ the project put through

(471) a. Der Boss fragt sich den
the boss$_{\text{NOM}}$ asks self the
Wochentag nur schwerlich.
day of the week$_{\text{ACC}}$ only with difficulty

The boss ask himself the day of the week only with difficulty.

*It is difficult to ask the boss the day of the week

b. Der Wochentag fragt sich den
The day of the week$_{\text{NOM}}$ asks self the
Boss nur schwerlich.
boss$_{\text{ACC}}$ only with difficulty

It is difficult to ask the boss the day of the week.

Originally I planned to write another chapter on German verbal prefixes, but at the moment the following remarks have to suffice:

The prefixes of German fall into three classes: inseparable prefixes (be-, ent-, er-, ver-, zer-, and sometimes um-, über-, and durch); prepositions acting as seperable particles (an-, auf-, um-, ab-, nach-, vor-, zu-, zusammen, ...), and double-particles (hinan, herauf, herüber, vorüber, ...) (see Eichinger (1982b), especially Eroms (1982), and Wellmann (1973)). The inseparable prefixes are destressed, the separable particles are stressed. In infinite clauses with zu (*to*) the zu goes between the verb and a seperable prefix, but before an inseparable prefix. Historically all the prefixes are derived from prepositions (Wunderlich (1987)).

The distibution of the prefixes generally seems to be: There is maximally one inseparable and one separable prefix, and the separable one preceedes the inseparable one. However a number of exceptions with two inseparable prefixes can be found, which I presume are lexicalized: verbeamten (*give tenure*), zerbelichten (*destroy by too much light*). Generally the prefixation of a verb that doesn't have initial stress is illformed, so the constraint against the multiple prefixation with two inseparable prefixes. The other constraints however remain unexplained.

Additionally the conative alternation in 6.4 showed that ver and zusammen are mutually exclusive, whereas zusammen allows other inseparable prefixes, namely be. The Dutch prefix ver was studied in Neeleman & Schipper (1993), and analysed as ensuring a theme argument.[12] This is also true for German and suggests in the framework of Hale & Keyser (1993a) that ver- occupies a deep-structural position where it theta-marks the theme position of the verb. The position this could be, is the position of the lower V in s VP-shell structure. For zusammen one can assume the same position, based on their complementary distribution.

I will not discuss the other prefixes here. All that was to be seen here, was that the analysis of the alternations also can help with the analysis of the verbal prefixes.

Finally it should be mentioned that no dictionary of German that I checked provided information on the availability of e.g. the middle or the conative construction in a verb entry. The Duden contains at least data on auxiliary selection in the present perfect and on lexical case. The availability of such information would facili-

[10] Another possible contrast may be the alledged strong crossover effects of the passive morpheme that e.g. rule out the interpretation *Jim likes himself.* for (i). But neither in English nor in German this effect proved to be very stable – even the data given in Baker *et al.* (1989) was not accepted by most of the English speakers, I consulted –, and for the middle the effect is simply absent in German since sich is a reflexive, and hence can be bound, whereas for English the data is so far unclear to me.

(i) Jim was liked.

[11] This speaks against the adoption of Fujita's (1994) proposal for English that passive, middle and ergative are all driven by a [+EN]-feature in a special functional projection.

[12] Neeleman & Schipper (1993) bases his analysis on the notion of theta-role percolation from Selkirk (1982). Neeleman (1994) argues for the complex predicate analysis, which assumes that verb and prefix are base-generated as a complex head. I cannot discuss his arguments at the moment.

tate the study of verb classes a lot. Much work remains to be done in this direction.

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Part VIII
Using VCA-databases to generate PAPPI's lexical entries

Uli Sauerland

In the Verb Classes and Alternations (VCA) project we generated databases that contain a lot of detailed information about 3000 English and several hundred German words. In this note I will discuss the possibility of using this information to expand the lexicon of the Principles and Parameters Parser (PAPPI) and report on a small program I wrote to that purpose. This program generated 1973 new lexical entries and 3171 entries for derived forms for the US-English lexicon, that follow regular morphology and English spelling rules while double entries are avoided. This entries represent all transitive and intransitive verbs contained in the EVCA2 database of Karen Kohl.
The format of the VCA-database entries lists a number of verbs with a list of patterns they allow. The patterns are formed by a list of example sentences, either marked as grammatical of ungrammatical. Accompanying each example is a description of the syntax, which is a little different for `evca2.pl` and `gvca.pl`. A typical example from `evca2.pl` is:

(472) a. The spaceship revolves the earth.
b. `[v,np,[p(around_0,1),np]]`

Here the thematic information has been reduced to zero propositions and omitted altogether for underlying external arguments (= agents) and V-complements (= themes). The representations of `gvca.pl` were more explicitly designed with the needs of PAPPI in mind. A typical entry is:

(473) a. Karl hilft seiner Mutter.
Karl helps his mother
b. `[nom(agent), v, dat(goal)]`

Here the case of the NP's and their thematic roles are represented. This information is more directly convertible to PAPPI entries. But since English doesn't have lexical case and the thematic roles can be recovered from the prepositions, `evca2.pl` ultimately gives you just as much information.
PAPPI's lexical entries consist of the a clause for the base form plus clauses for all derived forms. An entry for the base form would be:

(474) `lex(collapse,v,[morph(collapse,[]),`
`grid([],[theme]),noCasemark(+)]).`

This associates the verb 'collapse' with a list of features. Since this is the entry for intransitive, unaccusative 'collapse' as in

(475) The building collapsed.

the list of features indicates a thematic entry that doesn't have an external argument – the empty list following that is the first argument of `grid` – but an internal argument with the role theme. Burzio's generalization that Verbs without an external role don't case-mark their complement has to entered with every entry, marking the verb as `noCasemark(+)`. The entries for derived forms contain the inflectional information, by reference to an inflectional morpheme (/-s/, simple past /-ed/, past participle /-ed/, and /-ing/ for English) plus a reference to the underlying form, of which all the other features are inherited.
The conversion from VCA to PAPPI would be straightforward if it wasn't for two problems: irregular morphology and spelling rules and a difference in the underlying linguistic theory between the two projects.
The morphological bottleneck could be circumvented by utilizing the KIMMO program which is available for both English and German. However the task of interfacing the VCA and Pappi, which are both written in Quintus Prolog, is likely to be quite time-consuming, even for someone who knows more about KIMMO than I do. Since English regular morphology is so simple for the trial program I chose to add these rules to the program itself. This however generated wrong entries for irregular verbs like 'say', 'tell', 'hit', ..., of which there are around 100 in English. Additional trouble comes from English spelling rules, that require e.g. that /y/ becomes /i/ if it is followed buy /e/, giving forms like 'atrophies', 'multiplied', and 'dirties'. More complicated the rule for doubling a word-final consonant if followed by an affix beginning with a vowel, given here in Prolog:

```
double_consonant(Vc,Vcc) :-
      midstring(Vc,LastTwo,Onset,_,2,0),
      midstring(Onset, X, _,_,1,0),
      \+ member(X,[e,o,u,i,a,y]),
      midstring(LastTwo,V,C,0,1,1),
      member(V, [e,o,u,i,a,y]),
      member(C, [p,l,b,g,m,r,d,n]),
      midstring(Vcc, Vc, C, 0).
```

This rule doubles the consonants /p/ ('clipped'), /l/ ('travelling'), /b/ ('clubbing'), /g/ ('jogged'), /m/ ('humming'), /r/ ('transferred'), /d/ ('sodded'), and /n/ ('running'), if there are preceeded a Consonant-Vowel sequence. In some case however this rule overgenerates, e.g. for 'deliver', 'cover', and for 'nickel', 'nickelled', 'nickelling'. Sometimes the doubling is only according to the OED only optional and we incorrectly generate only one form: 'tassel'. Hence the output of the program would require manual verification and corrections. It is to be expected that the richer inflectional morphology of German is even more difficult to approximate with a simple program, and should better be treated with the already implemented KIMMO system.
That both, VCA and PAPPI, are programmed in Prolog makes it very easy to avoid double entries. All that is

necessary is to read in the file `lexiconUSEnglish.pl` before generating the new entries, and to check before writing out a new entry, whether it is already present.

The problem of the slightly different linguistic frameworks that PAPPI and VCA assume, has been avoided by me, since I chose only to convert the simple cases of transitives, and unaccusative and unergative intransitives. A conversion of other verb entries would have to take into account prepositional phrases (PPs). Pappi allows a PP as an VP-adjunct only if a the verb entry licenses such an 'extension'. The licensing is represented by adding one of the features `allowExt`(⟨thematic role⟩) and `requireExt`(⟨thematic role⟩) to the verbs feature list. PP's in argument position are to my knowledge not implemented in PAPPI. The same is true for the VP-shells that are an important part of the theory of the lexical syntax of Hale and Keyser, on which the representations of `evca2.pl` are based. In principle however PAPPI is flexible enough to allow the adaptation of such theoretical shifts, which would enable greater use of the data in the VCA-databases.

In summary we find two major obstacles against a full utilization of the VCA-data within the PAPPI system. Firstly the irregular morphology and spelling rules do not allow automatic generation of the derived verb forms without additional resources. This problem could be overcome by using the KIMMO morphological parser. Secondly the theories of argument structure that underlie the VCA-representations and PAPPI's lexical entries are different. This problem can be circumvented in simple cases like unaccusatives vs. unergatives by equating EVCA's structural positions with PAPPI's thematic roles. In other cases however changing PAPPI's theory towards the Hale & Keyser theory is indicated.

Part IX
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