For a unified treatment of particle verbs
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The problem

(1) a. The student gave up.
   b. The student moved the box.

In English, as well as in other languages, there exists a class of verbs composed of a collocation between a verb, and a particle which appears in a distinct syntactic position: the particle verbs. It is not clear if particles are morphological or syntactic elements (Martin Froot, Tracy Holloway King and Tibor Laczkó (2010)). From now on, we will adopt a syntactic treatment of particles in this paper. Particle verb constructions can be compositional or idiomatic. In compositional constructions such as in (1), the meaning of the combination of the two morphosyntactic elements is partly predictable from the meaning of each separate element, whereas in idiomatic constructions, i.e. the meaning of the combined elements is idiosyncratic, requiring a specific lexical entry for the idiomatic particle verbs.

Idiomatic constructions

Idiomatic constructions of particle verbs are those constructions where the meaning and the argument structure of the particle verb can not be derived from composing the meaning and argument structure of the verb and its particle. Idiomatic particle verbs must then be listed in the lexicon.

(2) a. John gave Mary the book.
   b. John gave the book to Mary.
   c. John gave up playing the piano.
   d. John gave up his house.
   e. John gave up on her.

In (2), we can see that gave takes three arguments:

\[ \text{<SUBJ1 | OBJ1 | OBJ2 | OBJ3 | OBJ4>} \]

while gave up takes two arguments:

\[ \text{<SUBJ | OBJ1 | OBJ2 | OBJ3 | OBJ4> \text{| XCOMP}>} \]

As the argument structure of gave and gave up are different (as illustrated in 2) while the other morphosyntactic information such as tense, aspect, agreement etc. may share between the two verbs, only the sub-categorization frame of the particle verb gave up is listed in the lexicon. The remainder of the feature structure of the particle verb is provided by the information in the lexical entry of 'gave up'.

Productive constructions

Productive constructions of particle verbs are those constructions where the meaning and argument structure of the particle verb is predictable from composing the meaning and argument structure of the verb and the particle.

These constructions are highly productive in English, especially with adverbial particles such as up, down, in and new uses of verb + particle constructions in a productive setting are regularly appearing in corpora. It is therefore uneconomical to list all the potential uses of productive particle verb constructions in the lexicon.

(3) a. John shot the ball.
   b. The pilot shot the plane down.

The known solutions

A satisfactory solution is the analysis of verbal particles introduced in the English and German ParGram (2) grammars (Martin Froot, Tracy Holloway King and Tibor Laczkó (2010)).

They propose:

- The compositional particle verbs are composed in the syntax.
- Idiomatic constructions are listed in the lexicon and have PRED values which are composed of the particle and the verb.
- The argument structure of these composed constructions may differ from the main verb.
- C-structure rules take into account the morphological analysis of particle verbs for German and Hungarian.

They note that systematically analyzing particle verbs as idiomatic constructions is a problem for the coverage of computational grammars, as every possible combination of a verb and a particle should explicitly be listed in the lexicon. However, some proposals are:

- A simplified abstract of the XLFG analyses of these sentences are the following:

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While the other features are given by the unification of the three lexical entries (verb, particle, and verbal particle).

PRED combination

Here, in summary, are the various combinations for unification between PRED, LEXEME and SUBCAT attributes in XLFG:

- The sub-categorization is given only by the # lexical entry, the concatenation of TO is not listed in the lexicon.

In order to introduce a new lexical entry from such a combination, XLFG makes available the # symbol by the following new lexeme as follow:

\[ \text{The feature structure that has resulted from unification is the following:} \]

Finally, the lexical entries for the main verb to gave and the particle up encoded as follow:

\[ \text{Given the lexical entries for the main verb to gave and the particle up encoded as follow:} \]

Our solution

Our solution is very close to the one proposed by Forch et al.

The main significant differences were driven by the composition of PRED for productive particle verbs: The composed PRED is systematic.

- The lemma is the concatenation of the verb stem and particle (similar to ParGram).
- The Sub-categorization is a combination of particle’s subject and verb’s subject.
- The argument structure is a combination of particle’s one and verb’s one.
- The particle’s F-Structure and verb’s F-Structure are unified in order to combine the semantic and syntactic properties of the two.

We use the XLFG (2) parser/framework which provides us with tools to efficiently combine lexical entries as we will show in the next section. It is well known that compositional particle verb constructions may be productive ([2]), a fact which can be difficult to handle in an electronic lexicon with a wide coverage.

Our approach seems to gracefully handle this difficulty for computational linguists: each lexical entry for non-compositional idiomatic particle verb contains only idiomatic information such as predicate argument structure and sub-categorization frame. It allows us to capture the fact that the argument structure of an idiomatic particle verb can differ from the argument structure of the same verb without a particle.

(4) a. The student gave it up.
   b. The student moved the box.

The approach we have taken to handle particle verb constructions combines these two strategies: we list all idiomatic particle verbs in the lexicon and generate compositional particle verb construction by combining the syntactic information contributed by both the verb and its particle.

References