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Representing the Continuum between Arguments and Adjuncts within Predicate-Frames

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Introduction

In the context of an automated task of acquisition of predicate-frames in Japanese, we introduce a method to observe and evaluate distinction criteria between arguments and adjuncts on a large scale. Rather than a binary classification, we are interested in a representation of the continuum between arguments and adjuncts.

complements = arguments U adjuncts

Method and resources

We aim at modeling the two extremes of the continuum between arguments and adjuncts.

Prototypical argument: a type of complement which appears in every predicate-frame (*i.e.* usage) of a given verb.

Prototypical adjunct: a type of complement which never appears in any predicate-frame of a given verb.

Here, the goal is to build two list of verbs, one list to retrieve prototypical arguments, one another to retrieve prototypical adjuncts. We rely on an existing resource: 動詞項構造シソーラス. We consider two case markers: *wo* (prototypical argument), and *de* (prototypical adjunct).

| | Verbs | Predicate-frames |
|--------------------------|----------------|------------------|
| <i>wo</i> -list of verbs | 2,560 49 % | 4,761 46 % |
| <i>de</i> -list of verbs | 4,954 95 % | 9,416 91 % |
| 動詞項構造シソーラス | 5,190 100 % | 10,364 100 % |

Table 1. Comparison of the two lists of verbs with 動詞項構造シソーラス

For each list of verbs we retrieve instances of predicate-frames. We process about 1.9M sentences from the BCCWJ with a dependency parser to build examples as in figure 1.

| |
|--|
| [...] とてもうれしそうな顔で私を見下ろしています。 [...] he is looking down at me with such a happy face. |
| ↓ |
| 見下ろす デ格:顔 ヲ格:私 アスペクト:テイル 101728176 |

Figure 1. Instance of a predicate-frame

We build two lists of examples. In the *wo*-list, every complement marked with the particle *wo* is considered as an argument. In the *de*-list, every complement marked with the particle *de* is considered as an adjunct.

| | Count | Arguments / adjuncts |
|-----------------------------|-----------|-----------------------|
| <i>wo</i> -list of examples | 1,041,818 | 504,391 (<i>wo</i>) |
| <i>de</i> -list of examples | 1,890,151 | 144,481 (<i>de</i>) |

Table 2. The two lists of examples

Experiment

We apply two existing argument/adjunct distinction criteria to our lists of examples to compute a measure of autonomy expressing the placement of complements along the

continuum. The autonomy measure ranges from 0 to 1. 0 corresponds to an argument. 1 corresponds to an adjunct.

Ordering: arguments tend to be closer to the verb than adjunct.

$$autonomy_{ordering}(c) = \frac{distance(c)}{number\ of\ complements}$$

Head dependence: arguments tend to cooccur with a narrower range of verbs than adjuncts.

$$autonomy_{head_dependence}(c) = \frac{productivity(c)}{count(c)}$$

Complements are sorted according to their degree of autonomy toward the verb.

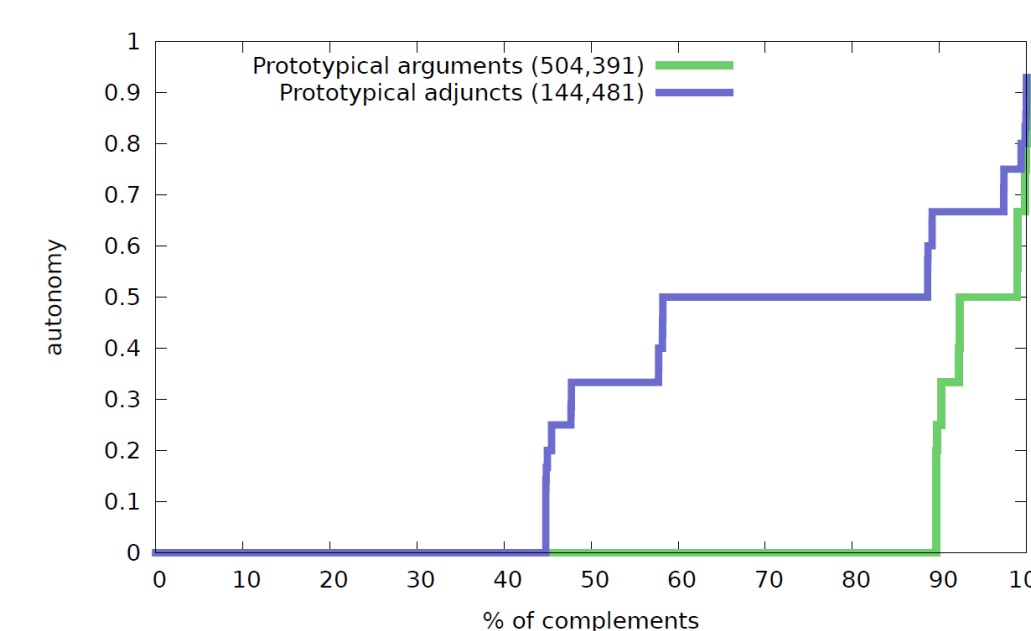


Figure 2. Ordering

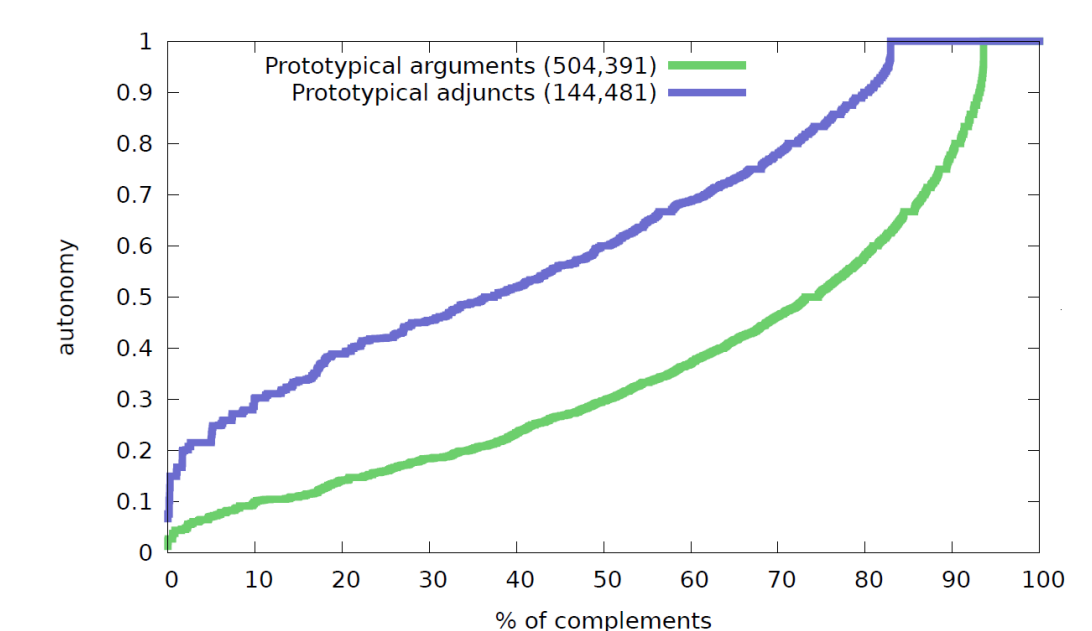


Figure 3. Head dependence

With both criteria it appears that prototypical arguments tend to have a lower autonomy than prototypical adjuncts.

Evaluation

We evaluate distinction criteria on 31,531 examples, all containing at least one complement marked with the *wo* particle and one complement marked with the *de* particle.

We add an extra criterion which is the combination of ordering and head dependence (*i.e.* the product of their degree of autonomy).

Our evaluation method rely on the idea of a continuum between arguments and adjuncts. For a criterion to be relevant to this task, it needs to order properly the complements along the continuum. That is, even if a criterion assigns a low autonomy to an adjunct it can still be accurate if it assigns – in the same context – an even lower autonomy to an argument (as shown in table 3).

| | ヲ格 (<i>wo</i>) | デ格 (<i>de</i>) |
|----------------------|------------------|------------------|
| Ordering (C1) | 0 | 0.5 |
| Head dependence (C2) | 0.29 | 0.32 |
| C1 + C2 | 0 | 0.16 |

Table 3. Evaluation on the example of figure 1

It appears that accuracy can be slightly improved by combining different criteria.

| | Accuracy |
|----------------------|--------------|
| Ordering (C1) | 81.40 |
| Head dependence (C2) | 75.07 |
| C1 + C2 | 81.72 |

Table 4. Results of the evaluation