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► **To cite this version:**

Pierre Marchal, Thierry Poibeau, Yves Lepage. Representing the Continuum between Arguments and Adjuncts within Predicate-Frames. NINJAL International Symposium on "Valency Classes and Alternations in Japanese", Aug 2012, Tokyo, Japan. hal-00783722

**HAL Id: hal-00783722**

**<https://hal.science/hal-00783722v1>**

Submitted on 1 Feb 2013

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

|   |
|---|
| [...] とてうれしそうな顔で私を見下ろしています。<br>[...] 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.

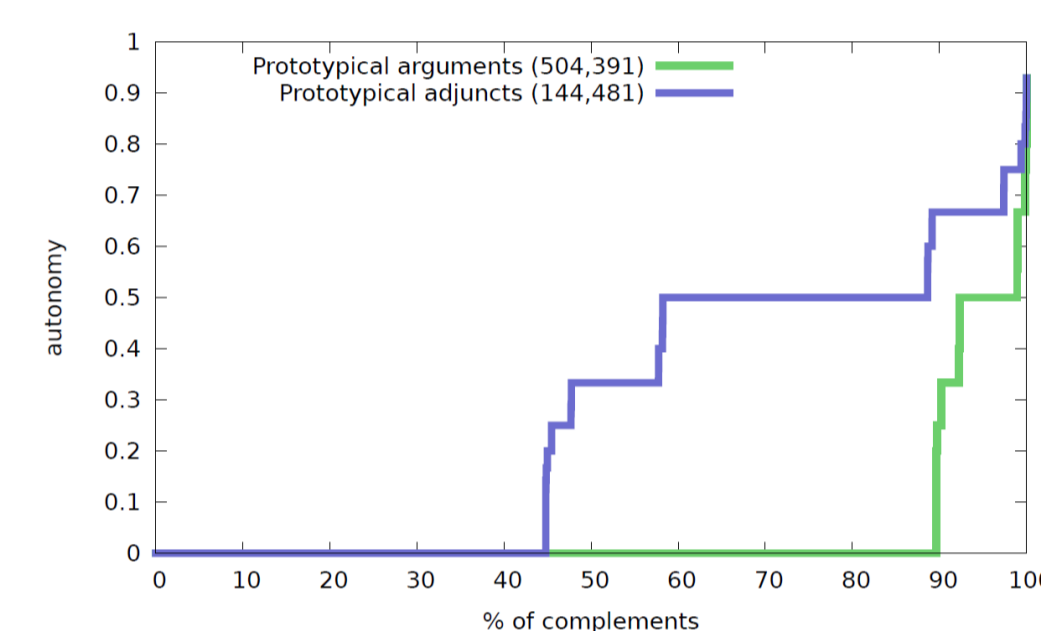
**Ordering:** arguments tend to be closer to the verb than adjunct.

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

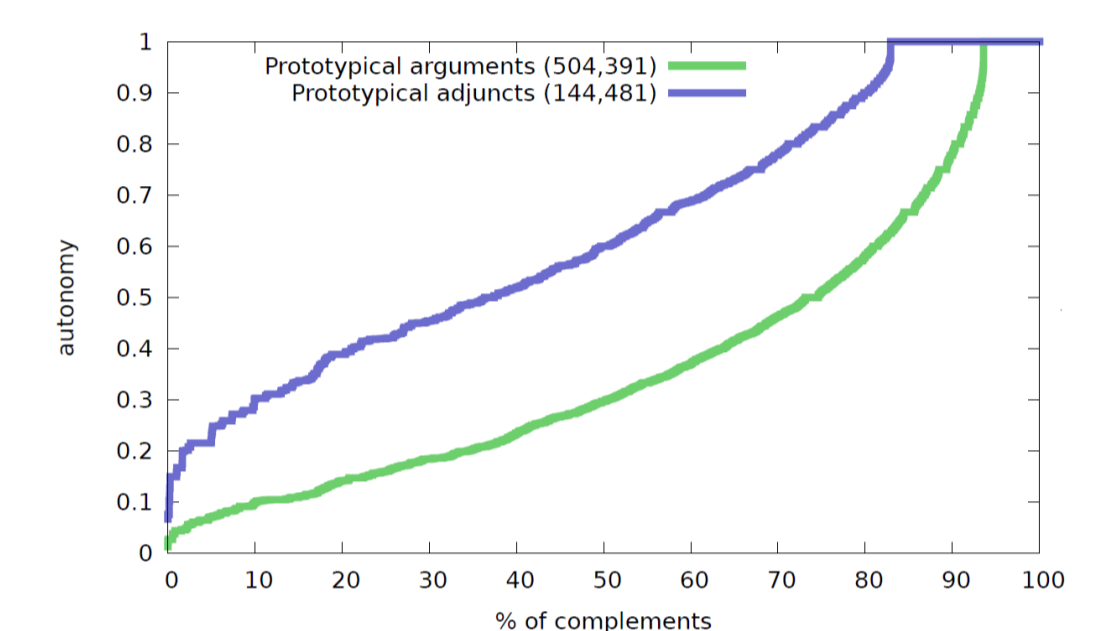
**Head dependence:** arguments tend to cooccur with a narrower range of verbs than adjuncts.

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

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              | <b>81.72</b> |

**Table 4.** Results of the evaluation