Determining the truth: Feature-Based Verification

Reusing syntactic feature clusters for the semantics of reciprocals

X.M. (Mattanja) Blaauwendraad-Kalle
RMA Linguistics, Utrecht University, Utrecht.

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Abstract
This paper deals with reciprocals, both plain reciprocals (symmetrical), such as *date*, and pseudo-reciprocals (non-symmetrical), such as *hug*. Kruitwagen et al. (2017) found that the truth value judgments for pseudo-reciprocals, especially in non-stereotypical situations, are dependent on typicality factors *Participation* and *Collective Intentionality*. However, how these factors are used by interlocutors to arrive at a truth value judgment still remains unclear. That is why I propose *Feature-Based Verification*, which uses notions of Participation and Collective Intentionality that are based upon the Theta System's syntactic feature clusters (Reinhart, 2003). This offers another major advantage: as different syntactic structures may have different syntactic clusters, this theory takes the syntactic structure into account. In this paper, I only show how Feature-Based Verification works for pseudo- and plain reciprocals, but it has the potential to be generalized to all verbs in future research.

1. Introduction

Reciprocal verbs, such as *date*, denote a mutual action and they can occur in transitive guise, exemplified in (1a), as well as in intransitive guise, such as (1b). They are necessarily symmetrical, as Linda cannot date Peter without Peter also dating Linda. There are also seemingly similar verbs, like *hug*, that are actually non-symmetrical: Linda can hug Peter, without Peter hugging Linda back. Winter (2016) names these verbs *pseudo-reciprocal* (pseudoR) to contrast them with the symmetrical ones, which he names *plain reciprocal* (plainR).

(1) a. Linda dates Peter.
  b. Linda and Peter date.

(2) a. Linda hugs Peter.
  b. Linda and Peter hug.

Since plainR verbs necessarily require both parties to perform the same action, transitive (1a) entails intransitive (1b). This does not hold for transitive pseudoR verbs, as (2a) does not entail (2b): they only require participation from the individual in the subject position.

Due to this observation, one may expect the intransitive form in (2b) to require the participation of both Linda and Peter, because they are both in subject position. Although this is how we often interpret such sentences, Kruitwagen et al. (2017) found that in situations with merely a one-sided hug, many (but not all) participants still judged such sentences as true. To account for their findings, they proposed two typicality factors: *Participation* and *Collective Intentionality*. However, as I will show in section 2, some issues remain unresolved.

To account for those, I propose that the Theta System (Reinhart, 2003) can offer the missing elements: based upon its syntactic feature value clusters and a slightly different use of the typicality factors proposed by Kruitwagen et al. (2017), the found truth value judgments for reciprocals can be predicted quite precisely. I name this theory, which takes into account the syntactic construction of the sentence, *Feature Based Verification*.

The structure of this paper is as follows. The next section looks into Kruitwagen et al.'s study: their exact findings and their solution via the typicality factors *Participation* and *Collective Intentionality*, along with a specification of what is still missing in their proposal. Section 3 offers an introduction to the Theta System's feature clusters (Reinhart, 2003) before it goes into the basic idea of Feature-Based Verification. Section 4 shows how this theory can account for the truth value judgments found for pseudo-reciprocals. Section 5 demonstrates the application of Feature-Based Verification to plain reciprocals. This includes the proposal of Winter (2016) on the conceptual difference between plainR and pseudoR verbs, as it is fundamental to the addition of *sum-strengthening* to Feature-Based Verification.

2. Participation and Collective Intentionality

Kruitwagen et al. (2017) presented participants with videos that provided contexts, according to which the participants had to judge sentences as either true or false. In these videos, there were two protagonists: Violet and Mark.

Kruitwagen et al. found that 91% of the participants accepted the intransitive pseudoR sentences if both individuals actively participated in the displayed action. If Mark did not actively participate, but was cooperative, thereby clearly sharing Violet's intention to e.g. hug, the sentence was accepted by 54% of the participants, even though 49% of them did not accept Mark as an active agent[1] (per verb a 36-80% decrease in acceptability compared to mutual participation, except for *botsen*, 'collide', which actually had an 8% increase). This shows that reciprocal participation is not required. Whenever Violet was active, but Mark was not cooperative, thus showing no intention to hug, the acceptability of the intransitive sentence dropped to 25% (per verb a 12-40% decrease compared to a shared intention, the 12% being for *appen*, 'sending Whatsapp messages', as it was only accepted by 20% in the shared intention context). Participants thus prefer cases of collective intentionality, i.e. where Mark was at least cooperative.

This experiment clearly shows that reciprocal participation is not necessary for intransitive pseudoR verbs, but it does not yet explain why the participants' judgments varied whenever Mark was passive, or at most, cooperative. Kruitwagen et al. account for this divergence by proposing the typicality factors *Participation* and *Collective Intentionality*.

1 If participants judged the transitive guise with Mark as the subject as false, this was taken as evidence that they had noticed he was not actively participating.

Participation is the number of pairs of individuals for which the transitive action (e.g. a one-sided hug) holds. *Collective Intentionality* yields a less specific value (either minimal or maximal), which represents the amount of evidence of a shared intention. For both factors, a higher value indicates a more typical instance of the event.

However, as Hampton (2007) argues, in the case of typicality, a threshold must exclude unacceptable cases as a member of the relevant category; for example, exclude events without hugs from the category of hug-events. How can we establish this threshold? And as the active participation and intention of Peter should not affect the acceptance of *Linda hugs Peter*, the mental verification system should take the syntactic structure into account. To resolve this problem, I argue that the Theta System's feature clusters (Reinhart, 2003) provide the structure-specific input, upon which the acceptability threshold for a sentence can be calculated.

3. Feature-Based Verification

3.1 Syntactic feature clusters

The syntactic feature clusters used by Feature-Based Verification, belong to the Theta System. Reinhart (2003) describes the Theta System as "the system enabling the interface between the systems of concepts and the computational system (syntax)" (p. 229). So, in the Theta System, the lexical entry of a verb must include a specification of the thematic roles of its arguments, which forms the input for the computational system. The formal encoding Reinhart proposes for the thematic roles consists of two features: */c*, which denotes whether the argument causes the change, and */m*, which represents the mental involvement of the argument. These can be combined into clusters, such as [+c+m] for θ-roles previously referred to as *agent* and [-c-m] for *themes* or *patients*. For instance, the verb *hug* has two arguments: a hugger, which causes the hug and is mentally involved, [+c+m], and a 'huggee', which doesn't have to cause the hug, nor be mentally involved, [-c-m].

3.2 Formulas and application

Feature-Based Verification requires revised definitions of Participation and Collective Intentionality. As each pair of individuals participating in a transitive relation has one agent, the Participation value can also be defined as the number of individual agents. This corresponds to the amount of */+c*'s in the Theta System's feature clusters (Reinhart, 2003), and can be calculated with the formula in (3). If you share someone's intention, you are *of a mind* to perform the relevant act, or at least to be cooperative and in this manner, you are mentally involved. As mental involvement is encoded by the Theta System's */m* feature, Feature-Based Verification defines Collective Intentionality as the number of */+m* features, relative to the amount of clusters that include */m*.[2] The CI-formula is shown in (4).

(3) $P = \sum / + c$

2 In the rest of this paper, to distinguish clearly between the definitions of Participation and Collective Intentionality by Kruitwagen et al. (2017), and those of Feature-based Verification, I will use the full names 'Participation' or 'Collective Intentionality' for their version, but abbreviate the Feature-based Verification ones to 'P' and 'CI'.

(4) $CI = \frac{\sum / +c}{\sum [m]}$

To determine whether a sentence can be judged true given a certain situation, first, the minimum P and CI values (P_{min} and CI_{min}) must be calculated with the above-mentioned formulas based upon the sentence's feature clusters. Then, one must assess the given situation[3] according to the same formulas to derive the actual P and CI values (P_{act} and CI_{act}): P_{act} is the number of individual agents and CI_{act} equals the amount of intention-sharing entities divided by the number of entities that could have been mentally involved. If the actual values are lower than the minimum values, the sentence must be considered false, however, if they do at least meet the minimum values, the sentence will not necessarily be judged true. Typicality may still influence the outcome: if the situation is too unlikely or unnatural in the participant's opinion, the participant may still judge the sentence as false.

In normal conversations (rather than an experimental setting), these formulas are applied to acquire information, rather than to judge sentences. Assuming the speaker is truthful, according to Grice's Maxim of Quality (1975), the hearer concludes that P_{act} and CI_{act} should at least meet P_{min} and CI_{min} (based upon the feature clusters of the uttered sentences) and may be expected to exceed them based upon the typicality of the inferred situation or other pragmatic effects. The derived P_{act} and CI_{act} values constitute an inferred situation, which is the hearer's interpretation of the sentence, which is then treated as the acquired information.[4]

4. Pseudo-reciprocals

4.1 Transitive pseudoR

PseudoR verbs in transitive guise yield the P_{min} and CI_{min} as they are calculated in (5). There are four possible 'actual' situations: Linda and Peter could both hug each other (the 'mutual hug'); Linda could hug Peter and while Peter shares her intention, but does not actually hug her (the 'one-sided shared hug'); Linda could hug Peter, without Peter sharing her intention (the 'one-sided unshared hug') and they could not participate in hugs at all ('no hug').[5]

(5) $\text{Linda}_{[+c+m]}$ hugs $\text{Peter}_{[-c-m]}$.

3 In real life, the given situation is whatever is known about the actual state of affairs. In the experiment of Kruitwagen et al. (2017), this is provided by the videos.

4 Evidently, certain pragmatic processes may be cancelled by additional information. If this is the case, the hearer adopts a modified version of the situation he had imagined that fits the additional information and whose P_{act} and CI_{act} meet or exceed P_{min} and CI_{min}. If P_{act} and CI_{act} fail to do so, the original and additional information are contradictory.

5 It is also possible to imagine the one-sided situations in which the roles are reversed. However, for the sake of clarity, these situations are disregarded for now, except for the following note: a sentence with reversed roles will not be incorrectly considered true, as it will be checked that the mentioned agent is among the set of participating individuals.
Theoretically, it is also possible to act without intention. Nevertheless, this does not make sense in 'the real world': if no one has the intention to hug someone, nobody will hug.

P_{min}: $\sum / +c = 1$

CI_{min}: $\frac{\sum / +m}{\sum [m]} = \frac{1}{2}$

To check whether a sentence may be true in a given situation, one must calculate P_{act} and CI_{act} for that situation. For instance, in 'mutual hug', $P_{act} = 2$, as a reciprocal hug can be seen as two 'transitive' hugs and thus both individuals are agents of one transitive hug. $CI_{act} = 2/2 = 1$, as out of the two individuals, two are mentally involved. Because $P_{act} = 2 \geq P_{min} = 1$ and $CI_{act} = 1 \geq CI_{min} = 1/2$, according to Feature-Based Verification, the sentence may be judged as true. The sentence also may be judged as true when in the actual situation, there is only one agent ($P_{act} = 1$) and no shared intention ($CI_{act} = 1/2$), because these still meet the minimum values.

In Table 1, Feature-Based Verification's predictions on the truth value judgments are compared to what they logically should be ('real TVJ') for each possible situation. Feature-Based Verification predicts the correct values.

Table 1.
The cluster's predictions for 'Linda hugs Peter' matches the real truth value judgments.

	Mutual hug		**One-sided shared hug**		**One-sided unshared hug**		**No hug**	
Real TVJ	True		True		True		False	
P_{act} and CI_{act}	P:2 CI: 2/2 = 1		P:2 CI: 2/2 = 1		P:1 CI: 1/2		P:0 CI: 0/2 = 0	
Feature-Based Verification[6]	Possibly true	✓	Possibly true	✓	Possibly true	✓	False	✓

4.2 Intransitive pseudoR

The intransitive pseudoR verbs are more complicated, due to the conjunction in the subject position. The Theta System treats 'Linda and Peter' as a whole, whereas semantically (the way in which they must be interpreted by our P and CI calculations), they are not. Peter and Linda are not one being, so the system must allow for the two people to have different actions and intentions. Feature-Based Verification thus should interpret such constituents at the individual-level: each individual must receive its own 'semantic' feature cluster in order to be able to calculate the P_{min} and CI_{min}[7]. For this, there are two possible analyses: the *copy-analysis* and the *split-analysis*.

6 Throughout the whole paper, the symbol ✓ is used to indicate that the prediction of the feature cluster-based P's and CI's minimum values matches the real truth value judgment. Whenever it is not, this is indicated with the symbol ✗.

7 In the Theta System, only one cluster is assigned to each argument (Reinhart, 2003). Syntactically, *Linda en Peter* is one argument. However, the semantic clusters only exist in the semantic interpretation of the syntactic cluster. Therefore they do not form an anomaly within the Theta System.

The easiest choice is to copy the cluster for each of its individuals: the copy-analysis, which is visualised in Figure 1. The analysis will then become as shown in (6):

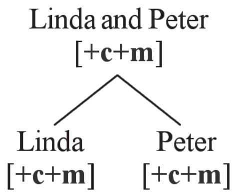

FIgure 1. The copy-analysis.

(6) SYN[8]: [*Linda and Peter*]$_{[+c+m]}$ *hug*.
(copy-analysis)
SEM: *Linda*$_{[+c+m]}$ *and Peter*$_{[+c+m]}$ *hug*.

P: $\sum / +c = 2$

CI: $\frac{\sum / +m}{\sum [m]} = \frac{2}{2} = 1$

Notice that this will always require the exact same truth conditions for each individual. Nevertheless, there is another possibility, allowing varying degrees of participation. We will approach the split-analysis from the speaker's perspective.

If the speaker wishes to convey a situation in which the individuals' level of participation differs, using a conjunction, the two differing semantic clusters (which represent the actual situation), must be encoded in one syntactic cluster. The hearer should be able to infer the roles of the individuals from this syntactic cluster. If the individuals have the same value for either */c* or */m*, the syntactic cluster will definitely have that value for that feature as well. However, for the features in which the semantic clusters differ, the speaker has to compromise. As the calculation of the P_{min} and CI_{min} values only depends on the plus-values in the feature clusters, the plus-values should be the dominant ones. Whenever a plus- and a minus-value have to be combined, it will result in a plus-value.

The hearer understands the importance of the plus-values and so, is able to assume its dominance; he knows that a syntactic plus-value represents at least one, but possibly two, semantic plus-values. Because only one semantic plus-value is certain per syntactic plus-value, the hearer assigns the plus-value to one semantic cluster, and assigns the other a minus-value. This way, P_{min} and CI_{min} will require at least one active individual, but also allow a more active interpretation.

So, according to the split-analysis, the speaker may only choose a syntactic structure that either conveys the exact underlying semantic feature clusters, or a 'stronger' (more posi-

8 I use the abbreviations SYN (syntactic) and SEM (semantic) to distinguish between the syntactic analysis and its semantic interpretation according to the Feature-based Verification.

tive) one, ensuring the hearer does not derive too low P_{min} and CI_{min} values and thus too weak truth conditions.

Thus, if the semantic clusters may differ per individual, plus-values must be dominant, which leads to the *split-analysis* of conjoined subjects, visualised in Figure 2. The calculation of the P_{min} and CI_{min} values is shown in (5).

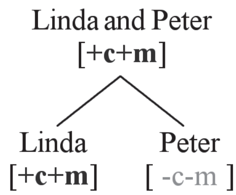

Figure 2. The split-analysis.

(7) <u>SYN</u>: [*Linda and Peter*]$_{[+c+m]}$ *hug*.
(split-analysis)
<u>SEM</u>: *Linda*$_{[+c+m]}$ *and Peter*$_{[-c-m]}$ *hug*.[9]

P_{min}: $\sum / +c = 1$

CI_{min}: $\frac{\sum / +m}{\sum [m]} = \frac{1}{2}$

In Table 2, the predictions of the two analyses are compared to Kruitwagen et al. (2017)'s findings for the acceptance of the intransitive guise of the Dutch pseudoR verb *knuffelen* ('hug') in each situation.

Naturally, both analyses predict the intransitive pseudoR sentence to be true in 'mutual hug' situations and false in 'no hug' ones. Kruitwagen et al. have shown, however, that the truth value judgments for one-sided hugs are more complicated and thus these cases will provide insight into which analysis is the better fit.

According to the copy-analysis, the sentence must be false in 'one-sided shared hug', because P_{act} 1 < P_{min} 2. The split-analysis, on the contrary, is satisfied with $P_{act} = 1$ and $CI_{act} = 1/2$, and thus predicts the sentence to possibly be accepted as true. Kruitwagen et al. found that 64% of the participants judged the sentence to be true in this situation. This contradicts the prediction of the copy-analysis, but fits with the split-analysis: many participants do accept the sentence, what the split-analysis allows for, but it is not unanimous. This is where typicality comes into play. A one-sided shared hug is not the most typical one (a mutual hug is), and therefore, some participants did not find the situation 'typical enough' to suit the sentence and hence, labelled it as false. Remember, typicality is reflected by the P and CI values: the lower the values of a situation, the less

9 According to the split-analysis, the clusters could also be assigned the other way around: *Linda*$_{[-c-m]}$ *and Peter*$_{[+c+m]}$ *hug*. However, as this only reverses the roles of Linda and Peter, but in no way alters the test results, this analysis is superfluous and thus not elaborated upon any further.

typical it is and the more likely the sentence is to be rejected, even when its minimum values are met or even exceeded.

Table 2.
Testing the copy- and split-analysis for 'Linda and Peter' hug.

	Mutual hug		One-sided shared hug		One-sided unshared hug		No hug	
Acceptance	100%		64%		24%		0%[10]	
P_{act} and CI_{act}	P:2 CI: 2/2 = 1		P:2 CI: 2/2 = 1		P:1 CI: 1/2		P:0 CI: 0/2 = 0	
Copy-analysis	Possibly true	✓	False	✗	False	✗	False	✓
Split-analysis	Possibly true	✓	Possibly true	✓	Possibly true	✓	False	✓

The same conclusion can be drawn for an unshared one-sided hug. The copy-analysis renders the sentence false, but the split-analysis does not: both P and CI fail the copy-analysis's requirements (P_{act} 1 < P_{min} 2; CI_{act} 1/2 < CI_{min} 1), but are equal to those of the split-analysis (P_{act} 1 = P_{min} 1; CI_{act} 1/2 = CI_{min} 1/2). Again, the percentage of acceptance obtained by Kruitwagen et al., 24%, doesn't support the copy-analysis, but is possible under the split-analysis. The low percentage even reflects that it is only borderline acceptable: for the majority, the situation is so atypical, that they reject the sentence. The participants' disagreement reflects an influence of typicality. Clearly, only the split-analysis fits the results and thus is adopted in Feature-Based Verification.

4.3 Division of Pragmatic Labor

According to the split-analysis, the transitive ('Linda hugs Peter') and intransitive guise must thus have the same semantic clusters (one [+c+m] and one [-c-m]), but only in the case of intransitive pseudo-reciprocals, some participants consider the one-sided actions too atypical to be considered true.

This can be explained with the Division of Pragmatic Labor (Horn, 1984), which states that the simplest forms are used to convey the more standard meanings, and more complicated forms then are 'reserved' for other meanings. Precisely because the semantic clusters are exactly the same, the intransitive form (for which the cluster's features must be splitted over the individuals and thus is the more complicated one) implicates that it encompasses more information than the transitive one. The extra information would be the suggestion that the action is not entirely one-sided. This implicature may be further motivated by the resemblance of the intransitive guise to intransitive plainR verbs.

10 Kruitwagen et al. (2017) have not tested the acceptance of the intransitive form in a 'no hug' context. Nevertheless, logically speaking, when there is no hug, 0% of the participants should be able to accept the sentence and thus the table states a 0% acceptance. As this is not one the Kruitwagen et al.'s results, however, it is printed grey.

The participants that accepted the sentence as true in the less typical situations in spite of the implicature, must have taken the video of the unlikely situation as motivation to cancel this implicature.

5. Plain reciprocals

5.1 Ordered pairs and sums

Winter (2016) proposes that the conceptual difference between plainR and pseudoR verbs lies in how the predicate combines with its arguments. In his analysis he includes 'normal' *binary* verbs, such as *push*, which he proposes only take *ordered pairs* (e.g. ⟨l,p⟩). So, there is a clear distinction in the role of the subject and the object of binary verbs. Plain reciprocals, however, have no such clear distinction and even in transitive guise, both the subject and object are interpreted to perform the relevant action, although the focus is placed on the actions of the subject. Winter suggests that plain reciprocals do not constitute ordered pairs from their arguments, but rather combine them into a *sum*, (e.g. *l+p*). He refers to such verbs as *collective*. Pseudo-reciprocals behave partly as plain reciprocals and partly as 'normal' binary verbs, and thus, he reasons, they can organise their arguments in both ways: pseudo-reciprocals are both *collective* and *binary*.

This conceptual difference also causes the difference in symmetry: a *collective* reading results in symmetrical interpretations, even in transitive guise, and a *binary* reading is non-symmetrical. For plainR verbs, only a collective reading is possible, so, they must always be interpreted as symmetrical. For pseudoR verbs, a collective reading is possible, as well as a binary one, causing them to not necessarily be interpreted as symmetrical. For 'normal' binary verbs, a binary reading is the only option, ensuring it does not receive a reciprocal interpretation.

5.2 Sum-strengthening

When a verb combines its arguments into a sum, which, unlike an *ordered* pair, does not distinguish between the roles of its elements and thus, they are 'interchangeable'. If conceptually, the roles for the arguments are interchangeable, the semantic feature clusters must be exactly the same. Therefore, if there is a discrepancy between the semantic feature clusters, this must be resolved for the *collective* verbs.

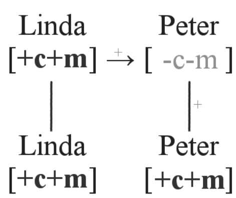

FIgure 3. Sum-strengthening.

There are two possible directions for modification of semantic clusters: you can change plus-values into minus-values or vice versa. As we have already established that plus-values are dominant (section 4.2), we know only the latter direction fits Feature-Based Verification. So, I propose *sum-strengthening*: whenever a verb combines arguments into sums, as many minus-values as necessary are *strengthened* into plus-values until the semantic feature clusters match completely. This is visualised in Figure 3. The Feature-Based Verification analysis of sentences (1a) and (1b) then becomes as shown in (6) and (7) respectively.

(8) SYN: *Linda*$_{[+c+m]}$ *dates Peter*$_{[-c-m]}$.
SEM1: *Linda*$_{[+c+m]}$ *dates Peter*$_{[-c-m]}$.
(sum-strengthening)
SEM2: *Linda*$_{[+c+m]}$ *dates Peter*$_{[+c+m]}$.

P_{min}: $\sum / +c = 2$

CI_{min}: $\frac{\sum / +m}{\sum [m]} = \frac{2}{2} = 1$

(9) SYN: [*Linda and Peter*]$_{[+c+m]}$ *date.*
(split-analysis)
SEM1: *Linda*$_{[+c+m]}$ *and Peter*$_{[-c-m]}$ *date.*
(sum-strengthening)
SEM2: *Linda*$_{[+c+m]}$ *and Peter*$_{[+c+m]}$ *date.*

P_{min}: $\sum / +c = 2$

CI_{min}: $\frac{\sum / +m}{\sum [m]} = \frac{2}{2} = 1$

It appears inefficient that a syntactic [+c+m] cluster gets split into [+c+m] and [-c-m] if the latter is changed to [+c+m] anyway through sum-strengthening. Seeing as for plain reciprocals, it ends up having two [+c+m] clusters and due to typicality, the preferred interpretation of pseudo-reciprocals is mutual as well, it could be that the semantic cluster assignment mechanism by default uses the copy-analysis. Only if there is evidence suggesting that the situation may not be as typical as one assumes out of efficiency, we turn to the split-analysis. In assuming what is true for the majority of cases, we reduce the amount of underspecifications to keep track of, until a specification is given.

Note that this possibility does not render the split-analysis or sum-strengthening useless: the split-analysis is necessary to account for the results Kruitwagen et al. (2017) found for intransitive pseudoR verbs and without sum-strengthening, we cannot account for the symmetrical interpretation of transitive plainR verbs. Also, as Feature-Based Verification is mainly concerned with the *minimum* values for a sentence to be considered true, it focuses on the lowest minimum values, which are the ones yielded by the split-analysis.

As both the transitive and the intransitive guise of plainR verbs can only be judged true in situations of mutual dating, and their P_{min} and CI_{min} values are the same (P_{min} = 2 and CI_{min} = 1), Table 3 shows that the predictions of Feature-Based Verification match the truth value judgments for both guises.

Table 3.

The semantic cluster's predictions for 'Linda dates Peter' and 'Linda and Peter date' match the real truth value judgments.

	Mutual dating	One-sided shared dating	One-sided unshared dating	No dating
Real TVJ	True	False	False	False
P_{act} and CI_{act}	P:2 CI: 2/2 = 1	P:2 CI: 2/2 = 1	P:1 CI: 1/2	P:0 CI: 0/2 = 0
Feature-Based Verification	Possibly true ✓	False ✓	False ✓	False ✓

6. Conclusion

In this paper, we have seen that Feature-Based Verification can account for the truth value judgments for both transitive and intransitive guises of both pseudo- and plain reciprocals. As Feature-Based Verification derives its truth value judgments from the syntactic clusters, it automatically takes into account the syntactic structure. From these syntactic clusters it derives semantic clusters, using split-analysis to provide individual clusters for the elements of conjoined arguments and sum-strengthening to ensure the roles of collective predicates are interchangeable. The main assumption underlying both processes is that plus-values are dominant, as these provide the input for the P- and CI-formulas. Those formulas are based upon the Participation and Collective Intentionality notions of Kruitwagen et al. (2017).

Because Feature-Based Verification is based upon the syntactic clusters, it is interesting to check its validity by looking into other syntactic structures as well. For instance, sentences with comitative arguments, such as 'with Peter' in 'Linda collided with Peter'. As they are theorized to be discontinuous intransitive forms (Dimitriadis, 2008; Siloni, 2008) and thus derived from forms as 'Linda and Peter collided', the analysis may be quite similar to the intransitive guise. Future research should test whether the difference in the P_{min} and CI_{min} of intransitive guises of plainR and pseudoR verbs is maintained in comitative structures.

Due to Feature-Based Verification's dependency on the syntactic clusters, Theta grid operations, which derive verbs with different syntactic clusters (Reinhart, 2003), should also be reflected in the P_{min} and CI_{min} of such sentences. Future research should also check the generalizability of Feature-Based Verification to other types of verbs, such as reflexives and the 'normal' binary verbs. If it can indeed be generalized, Feature-Based Verification may clarify how we translate structure to meaning. ■

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