

# Treatment of Zero Pronouns in the Framework of Lexical-Functional Grammar<sup>1</sup>

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## Abstract

This study presents both a Lexical-Functional Grammar (LFG) treatment and a typed-dependency grammar treatment of zero pronouns in the Japanese language. Japanese uses elliptic sentences quite often, and their functional-structural representation is problematic because they seem to violate the “completeness condition,” which states that all the core arguments of a predicate must be present in its functional structure. This study shows through a number of examples that this problem can be solved by positing the presence of zero pronouns with various semantic functions.

## Keywords

Lexical-Functional Grammar, Dependency Grammar, Japanese, Zero Pronouns

## 1 Introduction

This study presents both a *Lexical-Functional Grammar* (LFG) treatment and a *typed-dependency grammar* treatment of *zero pronouns* in the Japanese language. Japanese often uses *elliptic*<sup>2</sup> *sentences*, that is, sentences in which nouns with core grammatical functions such as subject or object are absent (Kanatani 2002; Mikami 1972; Toyama 1973, among others). In terms of functional well-formedness (Kaplan & Bresnan 1982), elliptic sentences are problematic because their functional structure seems to violate the *completeness constraint*, which states that a predicate and all its arguments must be present in an f-structure (Kaplan & Bresnan 1982, p. 211–212). Oya (2010) argued that such elliptic sentences contain *zero pronouns* that are the values of the core grammatical-function attributes, and that the completeness constraint is in fact observed because of the presence of zero pronouns in the functional structures of these sentences. In this study, we look at examples of Japanese sentences containing zero pronouns that belong to different semantic types, and explain how the completeness constraint is observed in the functional structures for these elliptic sentences.

## 2 Examples of Japanese elliptic sentences

It is often the case that Japanese sentences do not have subjects or objects. Consider the following

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<sup>1</sup> This study is based on my presentation at the 18th Conference of Pan-Pacific Association of Applied Linguistics (PAAL) at Ajou University in Suwon, South Korea, August 19–20, 2013.

<sup>2</sup> Actually, it will be argued later that they are not “elliptic” sentences, because they lack nothing. However, the terms “ellipsis” and “elliptic sentences” are used for a while in this section, in order to avoid misunderstanding.

dialogue.

(1)

Sarah: David, have you read this book?

David: Yes, I have.

Sarah: Is this interesting?

David: Yes, it is.

The natural spoken Japanese translation of this dialogue will be as follows in (2). Each sentence in (2) is followed by an English gloss in parentheses.

(2)

Sarah: David, kono hon yonda?

(Sarah: David, this book read-past)

David: Un, yodayo.

(David: Yes read-past-ending)

Sarah: Omoshiroi?

(Sarah: interesting)

David: Un, omoshiroiyo.

(David: Yes interesting-ending)

None of the sentences in (2) contains the subject. This fact, however, does not hinder native speakers of Japanese from understanding these sentences, because it is obvious for them from the context who read what. In this sense, native speakers of Japanese interpret sentences with more reference to the context than native speakers of English, which requires the presence of pronouns.<sup>3</sup>

### 3 Functional-structural representation of elliptic Japanese sentences

As indicated in Section 1, from the standpoint of Lexical-Functional Grammar, these elliptic sentences are problematic because they do not appear to observe the completeness constraint, which states that a predicate and all its arguments must be present in an f-structure (Kaplan & Bresnan 1982, p. 211–212). For example, the sentence “(Un,) yodayo” in David’s first utterance in dialogue (2) above lacks both a subject and an object. Its functional structure would be like Figure 1 below. This is not a well-formed functional structure, because it violates the completeness constraint; values are missing for both the SUBJ attribute and the OBJ attribute.

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<sup>3</sup> The Japanese language seems to reflect the *high-context culture* (Hall 1976) of Japanese people, while the English language seems to reflect the *low-context culture* of many English-speaking peoples.

PRED	'yonda<SUBJ, OBJ>'
SUBJ	[            ]
OBJ	[            ]
TENSE	PAST

Figure 1: The functional structure of “Yodayo.”

However, the fact that this sentence is natural for native speakers of Japanese with reference to a certain mutually understood context suggests that the functional structure for an elliptic sentence such as “Yodayo” is actually complete and there are no missing elements.

Oya (2010) argued that the presence of *zero pronouns* fills this gap. Zero pronouns are provided as part of lexical information, which is registered in the lexical entry for each verb. For example, the lexical information for the verb *yodayo* is as follows. This lexical entry contains equations for both subject and object zero pronouns.

- (3)
- (↑PRED)= 'yonda<SUBJ, OBJ>'
- (↑SUBJ PRED)='PRO'
- (↑SUBJ FORM)=ZERO
- (↑OBJ PRED)='PRO'
- (↑OBJ FORM)=ZERO
- (↑TENSE)=PAST
- (↑ENDING)='yo'<sup>4</sup>

The typed-dependency tree for the sentence “Yodayo” is shown below.

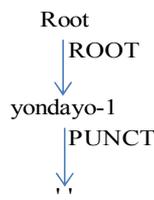


Figure 2: The typed-dependency tree for “Yodayo.”

Dependency types for Japanese sentences in this study are based on de Marneffe and Manning (2012) and Oya (2010). However, unlike in Oya (2010), case particles such as *-ga*, *-wo*, are all treated as postpositions, not as subject case markers or object case markers. This policy is based on the claim that a given particle functions not only as single case markers (Masuoka & Takubo 1992, p. 74).

The typed-dependency tree above is equivalent to the functional structure below. Notice that this functional structure contains both a subject zero pronoun and an object zero pronoun. These zero pronouns ensure that this functional structure is complete.

<sup>4</sup> Here, *-yo* is a *sentence-final particle* by means of which the speaker asserts the meaning of the sentence to the listener (Ono & Nakagawa 1997).

PRED	'yonda<SUBJ, OBJ>'
SUBJ	PRED 'PRO'
	FORM ZERO
OBJ	PRED 'PRO'
	FORM ZERO
TENSE	PAST
ENDING	'YO'
PUNCT	FORM '!
ROOT	STMT-TYPE DECLARATIVE

Figure 3: The functional structure for “Yondayo” with zero pronouns.

The zero pronouns contain no phonological features, and the context in which they are used determines their antecedents, whether *inter-clausally* or *intra-clausally*<sup>5</sup>. The word “inter-clausal” here means that the antecedent of a zero pronoun is found beyond the clause which contains this zero pronoun. In the sentence “Yondayo” in the dialogue (1) above, the antecedents of the zero pronouns are determined inter-clausally, or deictically as the speaker and the book.

Overt core arguments depending on a verb, if any, can function as the intra-clausal antecedents of the zero pronouns of that verb. They also have the function of making explicit the meaning of the zero pronouns. Instances of intra-clausal antecedence of zero pronouns will be illustrated in the next section.

#### 4 Semantic types of Japanese zero pronouns

Tomioka (2003, p. 324) claims that Japanese zero pronouns (*null pronouns* in his terms) have all the semantic functions of English overt pronouns, as summarized below<sup>6</sup>:

(4)(=9) in Tomioka 2003, p. 324)

- a. Referential
- b. Bound variable
- c. Unselectively bound variable
- d. Pronouns with pronoun-containing antecedents
- e. Indefinite pronouns
- f. Property anaphora

This section focuses on the typed-dependency tree representations of example sentences for each of these semantic functions of Japanese zero pronouns and on their equivalent functional-structural representations. It will be shown that the differences between these semantic functions derive from the types of the antecedents of these pronouns and their scope of reference (inter- or intra-clausal).

##### 4.1 Referential zero pronouns

Example (5) contains a referential zero pronoun (shown as PRO), which functions as the direct object of the

<sup>5</sup> Oya (2013) used the term “inter-sententially” and “intra-sententially,” yet these terms are misleading, because there are instances where a sentence contains more than one clause and a zero pronoun in one of the clauses refers to something in another clause. Such instances should be called inter-clausal reference.

<sup>6</sup> Along with these functions, deictic usage of zero pronouns must also be taken into consideration. Deictic zero pronouns refer to the participants in the discourse, such as the speaker or the hearer (Kim, Park, Song, Park, and Lee 2010, p.115). In this sense, deictic zero pronouns are subtypes of referential zero pronouns.

verb “sasotta” ‘invited’. The second sentence has two interpretations: one is that Sarah also invited John; the other is that John also invited David. This ambiguity is due to the fact that a noun with the focus marker *-mo* can express either the subject of the object of a verb, while the zero pronoun in the second sentence can refer to either the subject or the object of the first sentence. The reader/listener of this sentence must then judge whom this zero pronoun refers to, with reference to the context where it is uttered.

(5)

Sarah-wa            David-wo            sasoi            ,            John-mo            PRO            sasot-ta.  
*Sarah-topic        David-postp        invite-past-advcl    John-focus        PRO        invite- past*

“Sarah invited David, and she also invited John.” or “Sarah invited David, and John also invited him.”

The typed-dependency tree for the sentence above is shown below. Notice that there is no node for PRO. This is because this PRO is registered in the lexical entry of the verb “sasotta.”

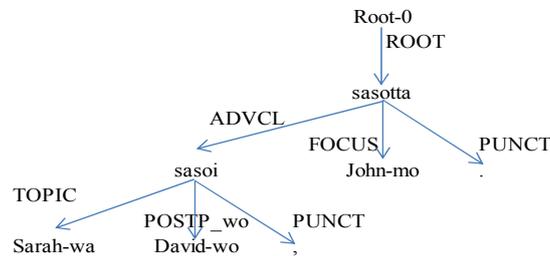


Figure 4: The typed-dependency tree for “Sarahwa Davidwo sasoi, Johnmo sasotta.” (meaning: “Sarah invited David, and she also invited John.” Or, “Sarah invited David, and John also invited him.”)

The typed-dependency tree above is equivalent to the functional structure below. Notice which elements the indices “i,” “j,” and “k” are assigned to in the structure. The subject zero pronoun of the verb “sasotta” in the functional structure for the second clause refers to “Sarah” (assigned the index “i”), while the object zero pronoun of the same verb refers to “John” (assigned “k”); therefore, the second clause means that Sarah invited John.

	PRED	'sasotta<SUBJ, OBJ>'	
	SUBJ	PRED 'PRO <sub>i</sub> '	
		FORM ZERO	
	OBJ	PRED 'PRO <sub>k</sub> '	
		FORM ZERO	
	FOCUS	PRED 'John <sub>k</sub> '	
		PRED 'sasotta<SUBJ, OBJ>'	
	SUBJ	PRED 'PRO <sub>i</sub> '	
		FORM ZERO	
	OBJ	PRED 'PRO <sub>j</sub> '	
		FORM ZERO	
	TOPIC	PRED 'Sarah <sub>i</sub> '	
	POSTP_wo	PRED 'David <sub>j</sub> '	
	TENSE	PAST	
	PUNCT	FORM ','	
ADVCL		STMT-TYPE DECLARATIVE	
	TENSE	PAST	
ROOT	PUNCT	FORM '.'	
		STMT-TYPE DECLARATIVE	

Figure 5: The functional structure for “Sarahwa Davidwo sasoi, Johnmo sasotta.” (meaning: “Sarah invited David, and she also invited John.”)

The following functional structure is also equivalent to the typed-dependency tree in Figure 4 above, yet it has a different semantic interpretation. Notice how the indices “i,” “j,” and “k” are assigned differently from those in the previous functional structure. The subject zero pronoun of the verb “sasotta” in the second clause refers to “John” and the object zero pronoun of the same verb refers to “David”; therefore, the second sentence means that John invited David.

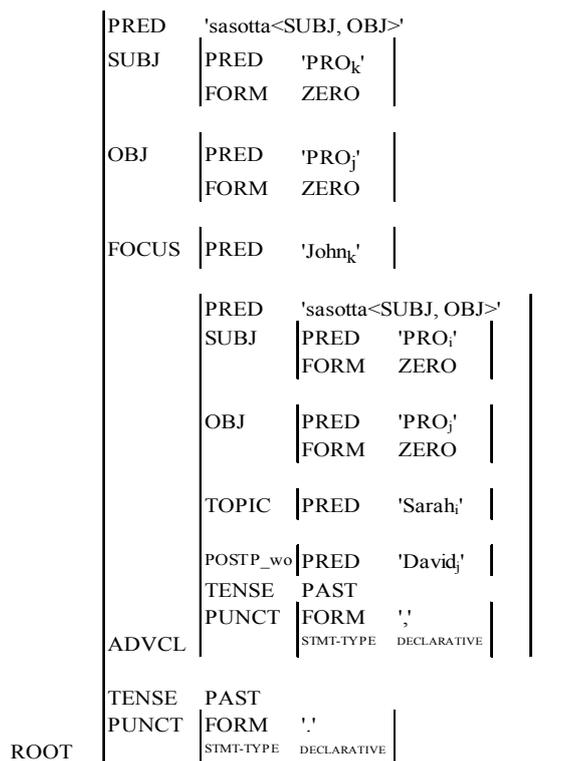


Figure 6: The functional structure for “Sarahwa Davidwo sasoi, Johnmo sasotta.” (meaning: “Sarah invited David, and John also invited him.”)

As we have seen in the functional structures above, either subject or object zero pronouns can refer to the noun “John” intra-clausally. In both cases, the antecedents of zero pronouns of this type are referential.

#### 4.2 Bound variables

Example (6) contains a zero pronoun as a bound variable functioning as the subject of the verb “okorareta” ‘was scolded’. The construction “dono ~ mo” means ‘every ~’ if the sentence is affirmative, or ‘no ~’ if the sentence is negative.

(6)

Dono    gakusei-mo      Sarah-ni      PRO    okorare-ta-to      it-ta.  
*Which student-focus Sarah-postp PRO be.scolded.at-past-ccomp say-past*  
 “Every student said that he or she was scolded by Sarah.”

The typed-dependency tree for the sentence above is shown below.

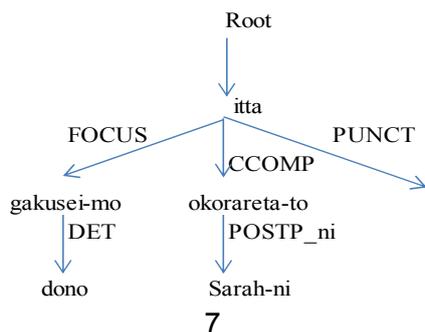


Figure 7: The typed-dependency tree for “Dono gakuseimo Sarahni okoraretato itta.” (“Every student said that he or she was scolded by Sarah.”)

The typed-dependency tree above is equivalent to the functional structure below. The index “i” is assigned to the subject zero pronoun “itta” ‘said’, the subject zero pronoun “okorareta” ‘be scolded’, and the local functional structure, which is the value of the attribute FOCUS. The noun “gakusei” ‘student(s)’ with the focus marker “-mo” is modified by an interrogative determiner “dono,” and this construction means ‘every student’, as mentioned before. Therefore, the zero pronouns with the index “i” in the functional structure below refer to the every student.

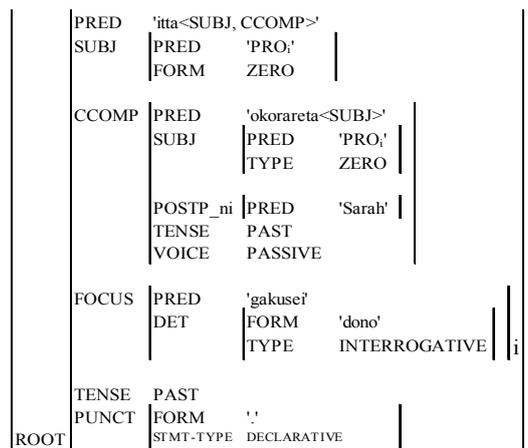


Figure 8: The functional structure for “Dono gakuseimo Sarahni okoraretato itta.” (“Every student said that he or she was scolded by Sarah.”)

This example suggests that zero pronouns as bound variables refer to their antecedents intra-clausally.

### 4.3 Unselectively bound variables

Unselectively bound variables are those whose antecedents are not referential, and they appear beyond the scope of their antecedents (Tomioka 2003, p. 322); in other words, zero pronouns of this type refer to a definite entity, while their antecedents refer to an indefinite entity. They refer to their antecedents inter-clausally. For more detail of this type of pronouns, see Heim (1990). Example (7) contains a zero pronoun as an unselectively bound variable.

(7)

Sarah-wa	David-ni	atarashii	hon-wo	kat-ta-ga,
<i>Sarah-topic</i>	<i>David-postp</i>	<i>new</i>	<i>book-postp</i>	<i>buy-past-advcl,</i>
David-wa	suguni	PRO	nakushi-ta.	
<i>David-topic</i>	<i>immediately</i>	<i>PRO</i>	<i>lose-past</i>	

“Sarah had bought a new book for David, but he immediately lost it (the new book that Sarah bought).”

The typed-dependency tree for the sentence above is shown in the figure below.

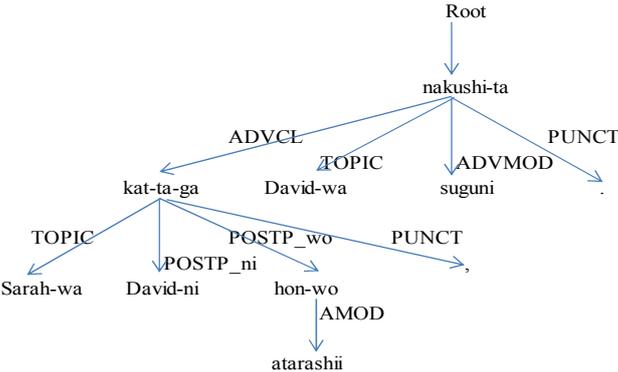


Figure 9: The typed-dependency tree for “Sarahwa Davidni atarashii honwo kattaga, Davidwa suguni nakushita.” (“Sarah had bought a new book for David, but he immediately lost it.”)

The typed-dependency tree above is equivalent to the functional structure below. Notice how the indices “i,” “j,” and “k” are assigned.

	PRED	'nakushita<SUBJ, DOBJ>'	
SUBJ	PRED	'PRO <sub>i</sub> '	
	FORM	ZERO	
DOBJ	PRED	'PRO <sub>j</sub> '	
	FORM	ZERO	
ADVCL	PRED	'katta<SUBJ, OBJ>'	
	SUBJ	PRED	'PRO <sub>i</sub> '
		TYPE	ZERO
	OBJ	PRED	'PRO <sub>j</sub> '
		TYPE	ZERO
	TOPIC	PRED	'Sarah <sub>k</sub> '
	POSTP_ni	PRED	'David <sub>k</sub> '
	POSTP_wo	PRED	'hon'
		AMOD	PRED
			'atarashii'   j
	TENSE	PAST	
TOPIC	PRED	'David <sub>k</sub> '	
ADVMOD	PRED	'suguni'	
TENSE	PAST		
ROOT	PUNCT	FORM	'.'
		STMT-TYPE	DECLARATIVE

Figure 10: The functional structure for “Sarahwa Davidni atarashii honwo kattaga, Davidwa suguni nakushita.”

The example above suggests that Japanese zero pronouns, as unselectively bound variables, refer to their antecedents inter-clausally, and that their antecedents themselves are not referential.

4.3 Pronouns with a pronominal-containing antecedent

Example (8) contains a zero pronoun with a pronominal-containing antecedent.

(8)

Sarah-wa	jibun-no	ie-wo	ut-ta-shi,
<i>Sarah-topic</i>	<i>self-postp</i>	<i>house-postp</i>	<i>sell-past-advcl</i>
David-mo	PRO	ut-ta.	
<i>David-focus</i>	<i>PRO</i>	<i>sell-past</i>	

“Sarah sold her own house, and David also sold his own.”

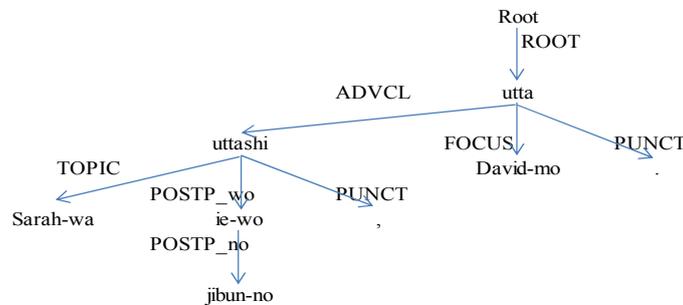


Figure 11: The typed-dependency tree for “Sarahwa jibunno iewo uttashi, Davidmo utta.” (“Sarah sold her own house, and David also sold his own.”)

The typed-dependency tree above is equivalent to the functional structure below. Notice that the index “i” is assigned to the subject zero pronoun of the verb “utta” ‘sold’ in the first clause, and the topic “Sarah” in the first clause. In contrast, the index “j” is assigned to the local functional structure that is the value of the attribute POSTP\_wo (“jibun-no ie”, not just “ie”), and the object zero pronoun of the verb “utta” in the second clause.

Notice that the reflexive pronoun “jibun,” which is the value of the attribute POSTP\_no, cannot be assigned a unique index. This reflexive pronoun refers to ‘Sarah’ in the first clause; hence, it should be indexed “i”. On the other hand, the local functional structure containing this reflexive pronoun is referred to by the object zero pronoun in the second clause. Then, the reflexive pronoun comes to refer to the subject zero pronoun, which refers to ‘David’; hence, it should be indexed “k.” For the binding of reflexive pronouns with respect to the notion of f-structure nucleus, see Bresnan (2001, p.215).

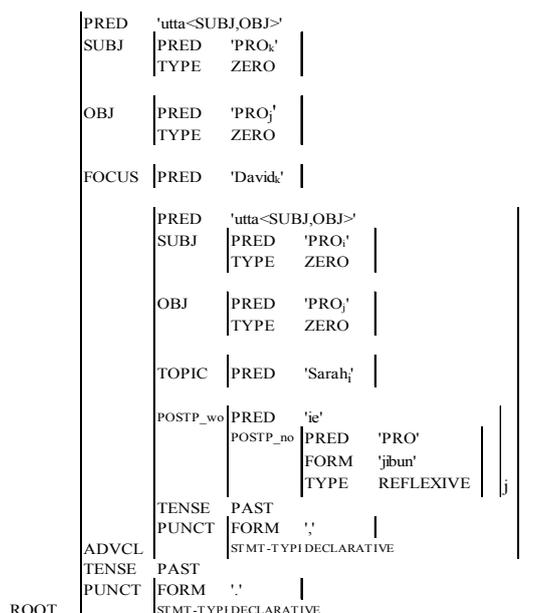


Figure 12: The functional structure for “Sarahwa jibunno iewo uttashi, Davidmo utta.”

#### 4.4 Indefinite pronouns

Example (9) contains a zero pronoun as an indefinite pronoun.

(9)

Sarah-wa kuruma-wo ut-ta-shi, David-mo PRO ut-ta.  
*Sarah-topic car-postp sell-past-advcl David-focus PRO sell-past*

“Sarah sold a car, and David also sold one.”

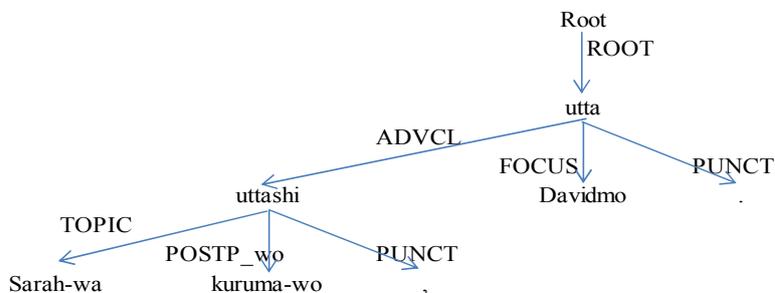


Figure 13: The typed-dependency tree for “Sarahwa kurumawo uttashi, Davidmo utta.” (“Sarah sold a car, and David also sold one.”)

The typed-dependency tree above is equivalent to the functional structure below. Notice that the index for the object zero pronoun in the first instance of “utta” is different from that for the object zero pronoun in the second. This is because the car that Sarah sold cannot be the same car that David sold, and therefore the object zero pronoun of the first sentence refers to something different from the referent of the object zero pronoun in the second sentence. That is, the object zero pronoun refers to something external to the sentence whose identity can be interpreted according to the context.

	PRED	'utta<SUBJ,OBJ>'
SUBJ	PRED	'PRO <sub>k</sub> '
	TYPE	ZERO
OBJ	PRED	'PRO'
	TYPE	ZERO
FOCUS	PRED	'David <sub>k</sub> '
SUBJ	PRED	'utta<SUBJ,OBJ>'
	TYPE	ZERO
OBJ	PRED	'PRO <sub>j</sub> '
	TYPE	ZERO
TOPIC	PRED	'Sarah <sub>i</sub> '
POSTP_wo	PRED	'kuruma <sub>j</sub> '
	TYPE	ZERO
TENSE	PRED	'kuruma <sub>j</sub> '
	TYPE	ZERO
PUNCT	FORM	'.'
	STMT-TYPE	DECLARATIVE
ADVCL		
PUNCT	FORM	'.'
	STMT-TYPE	DECLARATIVE
ROOT		

Figure 14: The functional structure for “Sarahawa kurumawo uttashi, Davidmo utta.”

#### 4.5 Property anaphora

Example (10) contains a zero pronoun as a property anaphor. The construction *~shika V-nai* means ‘do only ~’; *issatsu-shika yoma-nai* means ‘read only one book.’

(10)

Sarah-wa shuu-ni san-satsu hon-wo yomu-ga,  
*Sarah-topic week-postp three-books book-postp read-advcl,*  
 David-wa issatsu-shika yoma-nai.  
*David-topic one.book-focus read-neg*

‘Sarah reads three books a week, but David reads only one book (a week).’

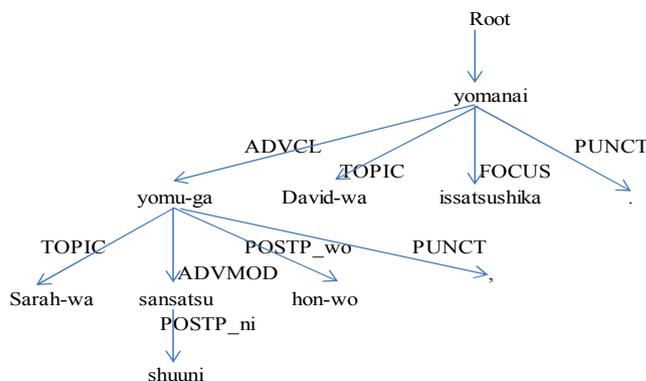


Figure 15: The typed-dependency tree for “Sarahawa shuuni sansatsu honwo yomuga, Davidwa issatsushika yomanai.”

The typed-dependency tree above is equivalent to the functional structure below. The index “j” is assigned to the object zero pronoun of the verb “yomu” in the adverbial clause, and the word “hon,” which is the value of the POSTP\_wo attribute. The index “j,” however, is not assigned to the object zero pronoun of the verb “yomanai.” This is because this sentence does not make explicit whether Sarah and David read the same book.

PRED	'yomanai<SUBJ, DOBJ>'	
SUBJ	PRED 'PROj'	
	FORM ZERO	
DOBJ	PRED 'PROj'	
	FORM ZERO	
ADVCL	PRED 'yomu<SUBJ, OBJ>'	
	SUBJ PRED 'PROj'	
	TYPE ZERO	
	OBJ PRED 'PROj'	
	TYPE ZERO	
	TOPIC PRED 'Sarah'	
	ADVMOD PRED 'sansatsu'	
	POSTP_ni PRED 'shuun'	
	POSTP_wo PRED 'honj'	
	TENSE PRESENT	
TOPIC	PRED 'Davidj'	
FOCUS	PRED 'issatsu'	
TENSE	PAST	
NEG	=	
PUNCT	FORM ''	
ROOT	STMT-TYPE DECLARATIVE	

Figure 16: The functional structure for “Sarahwa shuuni sansatsu honwo yomuga, Davidwa issatsushika yomanai.”

It seems that Japanese zero pronouns of this type refer to numeral classifiers (“issatsu” or “one book” and “sansatsu” or “three books” in the example above) intra-clausally. What is at issue here, however, is the identity of the antecedent of the object zero pronoun of “yomuga” in the first part of this sentence. In principle, this can refer to “sansatsu,” along with “honwo.” However, it is safe to consider that a zero pronoun cannot refer to more than one antecedent. In addition to this, it is natural to consider that a zero pronoun refers to an entity, if any (in this example, “hon(-wo),” meaning “books in general”), rather than a numeral classifier.

## 5 Conclusion

This study presented both a Lexical-Functional Grammar (LFG) treatment and a typed-dependency grammar treatment of zero pronouns in the Japanese language. We showed that the completeness constraint is observed in the functional structures for these “elliptic” sentences, which contain zero pronouns of different semantic types.

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