Causality and Point of View in Japanese Complex Sentences

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1. Introduction

The target of this research is semantics of a certain type of discourse including complex sentences that express causality relations. Roughly speaking, general schema of causality is that one event E1 causes another event E2. But looking more closely, in cases that E2 describes a human activity, there has to be a certain person who is so influenced by E1 that s/he acts as described by E2. We show an example.

(1)	[ϕ_{experi}	atama ga	itai]	node,
		head-NOM	feel pain]	because,
	ϕ_{agent}	kusuri o	nom-da.	
		medicine-ACC	drink-PAST	

'ϕ_{agent} took a medicine because ϕ_{experi} had a headache.'

Henceforth ϕ_{agent}, ϕ_{experi}, and $\phi_{patient}$ mean zero agent, zero experiencer, and zero patient, respectively.

In (1) our intuitive reading is that ϕ_{experi} had so influenced by her headache that she took a medicine. As a result the main subject ϕ_{agent} corefers with ϕ_{experi}. By the interpretation of this example, to identify a person who is heavily influenced by the event described by the subordinate clause helps identify the referent of the agent of main clause. In sum, the most important part of semantics of causality is to identify this influenced person. In the rest of this draft we mainly analyze Japanese complex sentences to know who comes to be this influenced person by what kind of mechanism.

2. Examples and Observers

Let's look at a clause which has only a proposition part like the following.

(2)	ϕ_{experi}	atama ga	itai.
		head-NOM	feel pain

'ϕ_{experi} have a headache.'

It is well known that in (2) ϕ_{experi} only refers to the first person, namely the speaker when (2) is assertive. The reason of this lies on the semantics of Japanese adjective *itai*(feel pain). Basically in Japanese language this kind of internal feeling is to be known only by the experiencer herself. This gives us the reason why we have the intuitive reading of (1). In (1) whole the sentence is described from the viewpoint of subject of main clause, who is usually the speaker of (1). Then the referent of the subject of main clause is the only person who can say about her internal feeling like having a headache. As a result ϕ_{agent} corefers with ϕ_{experi}.

On the other hand, we have many Japanese predicates that does not comply with this restriction. For example in

(3)	ϕ_{agent}	hasir-ta.
		run-PAST

'ϕ_{agent} ran.'

ϕ_{agent} can be any person including third person. This contrast comes from *observability* of event described by the predicate. *Hasir*(run) is for physical action of running which is easily observable by outsiders. In contrast, *itai* used in (2) does not have observability as you know from example (1) and (2).

Of course there are many predicates located inbetween *hasir* and *itai* according to their observabilities. For example, *odorku*(be surprised) means an experiencer's internal mental state, but it also has a certain degree of observability from outside. Look at the following sentence.

(4)	[Itumo	kuuruna	Taroo ga	odoroi-ta]	node,
	[usually	cool	Taroo-NOM	be surprised-PAST]	because
	ϕ_{experi}	bikkuri	-sita.		
		be astonished	-PAST		

'ϕ_{experi} was astonished because Taroo who is usually cool was surprised.'

The zero subject of main clause, ϕ_{experi}, intuitively, does not refer to Taroo. Therefore ϕ_{experi} should observe Taroo's surprising. This is the evidence that *odorku* (be surprised) certainly has some degree of observability.

Teramura classifies Japanese predicates including both verbs and adjectives into several classes according to their observability. Since there are many works for observabilities other than Teramura's work, we know much about it, but they are yet to be formalized.

Now we know the clue to identify the person who is enough influenced by the event of subordinate clause to be a player of event of main clause. If a predicate of subordinate clause does not have any observability, the influenced person is an experiencer of that predicate. If a predicate of subordinate clause does have a certain degree of observability, the influenced person can be not only a semantic role posed by the predicate, like an agent, experiencer and so forth, but also an observer. This results in ambiguity about the referent of the enough influenced person.

3. Multi-Layer Structures

Another factor which contributes to identify an influenced person in an event described by subordinate clause is the structure of clause. A clause generally has a multi-layer structure. For instance, a proposition part is embedded by a modality part. As for a modality part, a speaker's attitude towards the proposition is embedded by a speaker's attitude towards hearers. This kind of multi-layer structure is formally treated by JPSG, HPSG, and so on. Each layer may introduce a new semantic role like *affectee* in intransitive passivization, or a discourse role like *observer* whose definitionis given below.

(5) Definition: The role *observer* of the event or state refers to a person who observes that event or state from outside.

By this definition *observer* refers neither to the experiencer of state nor to the agent of the event. Taking into account this muti-layer structure, the main question is from which layer a role corresponding to the most strongly influenced person comes. As the answer for this question, we claim that a role introduced by the outermost layer becomes referring to the most strongly influenced person. This person turns out to be the most salient person in the succeeding part that corresponds to the main clause in case of complex sentences. Therefore we call this role "most salient referent" or *msr* in short hereafter. Of course the notion of *msr* corresponds to the strongly influenced person by the event described by the subordinate clause.

(6) Claim: A role introduced by the outermost layer becomes the most salient referent: *msr*.

This claim couldn't be proven logically, however the outermost layer is regarded as the head of clause at least syntactically and at most linguistically. If we take the outermost layer as a semantic head, the role introduced by that layer is to refer to the most salient referent. Therefore Claim (6) naturally follows. We will show several examples to ensure Claim (6).

(7)	[ϕ_{experi}	kowakat-ta]	node,
		feel danger -PAST	because
	ϕ_{agent}	mou	ika-nai.
		any more	go-NEG

'ϕ_{agent} will never go there because ϕ_{experi} felt danger there.'

In (7) *msr* of subordinate clause corresponds to ϕ_{experi} because *kowai*(feel danger) has no observability. Then the zero subject ϕ_{agent} of the main clause corefers with ϕ_{experi} who corresponds to *msr*. This reading coincides with natives' intuition. But in the following (8) things are different.

(8)	[[ϕ_{experi}	kowa]	-gat-ta]	node,
		be scared	gar-PAST	because
	ϕ_{agent}	mou	ika-nai.	
		any more	go-NEG	

'ϕ_{agent} will never go there because ϕ_{experi} behaved like feeling danger there.'
[1]

In the intuitive reading of (8) ϕ_{agent} does not corefer with ϕ_{experi}. This is because *gat* which is a past form of *gar* is used as verbal suffix of *kowai*. *Gar* means "behave like ..ing" and introduces an observer of that behavior. By the above mentioned intuitive reading, the *msr* comes to be the observer introduced by *gat* which is the outermost layer of subordinate clause, because there is no other explicit role other than ϕ_{experi} and *observer* in the subordinate clause.

[1]Henceforth, in example sentences [ ] shows a multi-layer structure. For instance, [[A]B] means A is embedded by B.

Especially in Japanese language Claim (6) always holds. On the contrary, in English this claim is a good default rule to interpret complex sentences, but, of course, it has some exceptions. An example for Claim (6) is the following.

(9) ? Bill took a medicine because he looked like to have a headache.

Since "look like" introduces an observer, the subject of main clause can only be interpreted as the observer. Then "he" of the subordinate clause should not refer to Bill. However the commonsense that a person taking a medicine must be the person who has a headache, contradicts the expected reading of the previous lines. Thus the awkwardness of (9) is accounted for.

Auxiliary verbs make mulitiple embedded structure like "might have been" or "-rare-ta-rasii"(passive-past-seem). In this multiple embedded structure, at least in Japanese, still Claim (6) holds. Look at the following example.

(10)

[[[[ϕ_{experi}	kane	o	hosi]$_1$	-gar]$_2$	-are-ta]$_3$	rasii]$_4$
	money	ACC	want		-PASS-PAST	seem
node,	ϕ_{agent}	ϕ_{goal}	yar-ta.			
because			give-PAST			

'ϕ_{agent} gave ϕ_{goal} money because ϕ_{goal} looked like to be asked money by ϕ_{experi}.'

The situation described by this Japanese sentence is this. 1) ϕ_{experi} showed a sign that ϕ_{experi} needs some money. This is expressed by [...]$_2$ part. 2) This sign is intensionally intended to a certain person corresponding to ϕ_{goal}. This is expressed by $-are-ta]_3$. 3) Then ϕ_{agent} somehow came to know the situation of 2) by *rasii*(seem)]$_4$. Note that the referent of ϕ_{agent} has not been introduced till [...]$_3$ finished. Actually the referent of ϕ_{agent} is introduced by the auxiliary verb *rasii*. Then ϕ_{agent} gave ϕ_{goal} money. The referent of ϕ_{agent} is to be *msr* of subordinate clause. As you know from the intuitive reading of (10), *msr* is the referent introduced by the outermost layer of subordinate clause in this case, too. This is exactly what (6) expects.

4. Implementation

We implemented the Japanese language understanding system based on the theory we developed in this research. Our system consists of 1) morphological analyzer JUMAN, 2) parser where syntax rules are basically Gunji's JPSG, and 3) constraint solver which we developed. Our observations described so far are formalized as constraints in forms of logic programs and used by the constraint solver. By this system a fairly big portion of Japanese complex sentences conjoined with "node" are automatically understood.

Keywords: Japanese, complex sentences, point of view, causality