

## MSFA を用いた文章の深い意味記述

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## Specifying deeper semantics of a text using MSFA

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**Abstract** In this article, we introduce the JCASR Project (in progress at NICT), which aims to develop a relatively small Japanese corpus of texts annotated for “semantic frames” and their “frame elements” (aka “semantic roles”), using *Multilayered/Multidimensional Semantic Frame Analysis* (MSFA) [3]. MSFA is a framework of semantic annotation/analysis compatible with the Berkeley FrameNet project [1], [6] that provides a multidimensional description of “contextualized” meanings of words and phrases. After outlining the project, we provide case studies of two sentences (one from a newspaper article and the other of a discourse).

**Key words** contextualized meanings of words and phrases, FrameNet, the JCASR project, Multilayered/dimensional Semantic Frame Analysis (MSFA), semantic role tagging

### 1. Introduction

The past 20 years have seen the maturation of surface-true, distributionally and statistically based knowledge acquisition techniques. The development has offered us a parse with a good coverage, free from inconsistencies immanent in manual analysis. It was like a new age of NLP. It turns out, however, that such methods clearly have limitations. One of the critical problems is that these techniques do not always meet our need for processing “deeper” semantics (or “shallow pragmatics”) in and of the language people use everyday. What we mean by “deeper semantics” is a class of semantic specifications that goes beyond simple “word senses/meanings” including the so-called “inferences” (yet applying this term would be no help here, because nobody knows exactly what “inferences” are, after all). This is the classical problem of Knowledge Representation (KR). Suppose that the KR problem is resolved totally after we have finished building all the relevant ontologies and inference engines running over them. Did we get to our ultimate goal at last? We suspect the answer is no, because we still need to find out how pieces of knowledge are linked to pieces of language. This is what Kuroda and Isahara (2005) called the problem of Knowledge-Language (K-L) Linking.

If our suspicion is true, we then need to construct a wide-coverage database that specifies what kind of linguistic units are linked to what pieces of world knowledge, or “ontologies” without (too simplistically) assuming that words denote “concepts” (i.e., building blocks of ontologies). This assumption is far from true, however: virtually every word of a given language is ambiguous, and it is far from well-understood how ambiguity comes into play, although there are good theories of word sense disambiguation/creation like Generative Lexicon (Pustejovsky [?]). This reality makes it very ineffective to state that words “denote” concepts. In fact, this situation demands us to build lexical resources dedicated to the identification and specification of “units” of the K-L Linking.

#### 1.1 The JCASR project

Development of a *Japanese Corpus Annotated for Semantic Roles* (JCASR) is being attempted as one of the research projects at the National Institute of Information and Communications Technology (NICT), Japan. The project is proceeded with a crucial assumption that “units” of the K-L linking are “idealized/(stereo)typical situations” which can be identified as (semantic) frames in the same sense as the Berkeley FrameNet (BFN) project (Baker et al. [1]; Fillmore et al. [2]). The goal of the JCASR project is to construct a (relatively small) corpus of Japanese texts annotated for (seman-

tic) frames and their frame elements (aka “(situationally-defined) semantic roles”). The goal is to establish a set of (ontological) links from “pieces of world knowledge” to text segments in terms of semantic role tagging.

### 1.2 What we mean by “semantic role tagging”

In our approach, a strong emphasis is given to the identification and specification of finer-grained, situation-specific roles at concrete levels (e.g., ⟨Robbers⟩, ⟨Victim⟩, ⟨Valuables⟩; hereafter, ⟨R⟩ represents a role) rather than those of coarse-grained, general-purpose roles at abstract levels (e.g., ⟨Agent⟩, ⟨Patient⟩, ⟨Theme⟩). Section 3 is devoted to illustration of this approach. Our approach is theoretically motivated by the hypothesis we assume that deeper, and “better,” understandings are achieved at more concrete levels, rather than at more abstract levels. This hypothesis is one of the points that differentiate MSFA from other (usually more “formally oriented”) approaches to semantic annotation/analysis which tend to assume that the deepest semantic analysis is the most abstract semantic analysis. More formally, we posit the following:

Concreteness bias on semantic interpretation:

the more specific and concrete your understanding is, the better it is (as long as it is not obviously wrong).

A lot of phenomena suggest that “deep enough” semantic analysis of a text demands effective specifications of what guesses people make, as well as of semantic types of text segments. What is suggested is that it does not really matter whether people’s understandings are semantically based or pragmatically based as far as our goal is to illustrate people’s text understanding: to specify what people understand is the point at issue, while how they do so is not. The semantics/pragmatics distinction would make sense if the issue is how people understand (after we have clarified what they understand). This reasoning would be both good news and bad news, depending on your perspective. It is good news if you feel that routes to deeper semantics are promised. It can also be considered bad news if you feel that you cannot be so optimistic as to say “Leave it all to pragmatics” any more, because what is at issue now is what pragmatics does and how it works: you need to specify it.

## 2. Development Scheme

### 2.1 Status of the project

The JCASR project officially began two years ago. It is (still) at a preliminary, “exploratory” stage. At the moment, we are trying to find out what kinds of frames/situations are found at what granularity levels without assuming a pre-existing, “ready-to-use” database of semantic frames and their frame elements. Some preliminary results have been reported in Kuroda et al. (2006), for instance. We have not started serious development of a semantically tagged corpus yet, but annotation samples are available freely or privately at the web sites (contact us for more details). It should probably be noted that we are currently working independently of the Japanese FrameNet (JFN) project (Ohara et al. 2003). But we are also negotiating with the BFN staff to make the MSFA-based annotation scheme shared with BFN.

### 2.2 Overview

Currently, we are following the “incremental” development scheme as per the following: (1) select a Japanese text  $T$  from a text

database; (2) have each sentence of  $T$  segmented into text segments by the staff at NICT (each result of segmentation always needs to be checked manually, because the standard outputs of the so-called “morphological analyzers” like KNP and ChaSen are sometimes inappropriate for our purposes; this issue to be mentioned again later below); (3) ask “external” annotators to annotate the segmented texts by making reference to databases  $D_1$  and  $D_2$  of “sample annotations” hosted at the web sites (available both publicly and privately); (4) collect the annotations conducted by annotators as “drafts,” and check and edit the results if necessary, which is very often the case (this is conducted by the staff of the project group at NICT); (5) add the edited results to the databases  $D_1$  and  $D_2$ , and “sanitize” the databases when needed.

$T$  is always chosen from Japanese texts which are aligned with English texts. This is because we expect that future comparisons against other annotations (using the BFN database, for example) can be facilitated. So far, all texts have been taken from the following text bases:

$D_1$ : Sample annotations for texts from a collection of English-Japanese alignments of copyright-free texts like Aesop’s Fables are hosted at [<http://www.kotonoba.net/~mutiyama/cgi-bin/hiki/hiki.cgi?FrontPage>]. No access restriction applies.

$D_2$ : Samples for texts from *Kyoto University Corpus* are hosted at [<http://www.kotonoba.net/~mutiyama/cgi-bin/hiki2/hiki.cgi?FrontPage>]. Access restriction applies.

The original texts for  $D_1$  are provided at [<http://www2.nict.go.jp/x/x161/members/~mutiyama/align/index.html>]. Tentatively, we separate the procedures to identify (a) frames for event conceptualizations (e.g., ⟨Robbery⟩, ⟨Predation⟩) and (b) frames for social interactions (e.g., speech acts like ⟨Claiming⟩, ⟨Criticizing⟩, ⟨Doubting⟩, ⟨Protesting⟩, ⟨Warning⟩). This is because the second type of frames are more complex, more data selective, and harder to specify. Currently, only Hajime Nozawa is working on the second type (see §3.3). Nozawa’s work has not yet been integrated into the results of the first type worked on by Kuroda, Lee and Shibuya.

## 3. Case Studies

### 3.1 The procedure

In conducting an MSFA, one employs a table  $T$  of  $m+3$  rows and  $n$  columns:  $m$  is the number of text segments (including “null instantiations”), and  $n$  is the number of frames identified as comprising the “understood content” of a sentence  $s$ . The cell at  $(i, j)$  of  $T$  specifies the semantic role  $r$  of the  $j$ th frame  $f_j$ . The value for  $f_j.r$  includes “null,” which means “non-realized role for  $f$ .” As illustrated in the following sections, the MSFA’s analytical scheme includes three header lines: “Frame ID” (row 1), “Frame-to-Frame relations” (row 2), and “Frame Name” (row 3). After the completion of the segmentation task, one turns to fill in the cells rightward, specifying (or identifying) Frame Names (together with the names of Frame Elements) and Frame-to-Frame relations among these frames. Frame IDs are local variables used to specify Frame-to-Frame Relations, whereas Frame Names and Frame-to-Frame Relations are global variables. Each sentence of a text  $T$  is segmented into text segments before one starts annotating them. The sentence segmentation process is conducted by using morphological analyzers such as ChaSen

Frame ID	F1	F2	F3	F11	F8	G1	F4	F5	F6	F7	F9	F10	F12	F13
Frame-to-Frame Relations	elaborates F2	elaborates F3; realizes F1	realizes F2	elaborates F8	constitutes F3; realizes G1		presupposes F5; constitutes F8		presupposes F4,F5; presumes F4	constitutes F5	elaborates F5	elaborates F9,F12; presupposes F5	presupposes F13; realizes F13	
Frame name	報道//News	報告//Report	語り//Narration	~過去の指定 ~//Tense specification[for event]~	~特徴づけ ~//Characterization~	~値の指定[役割の]~ ~//Value specification[for role]~	挑戦//Challenge	勝負//Match	勝利//Victory	優劣 //Advantages/Disadvantages	将棋//Shogi (Japanese chess)	プロ将棋EVO:タイトル//Professional shogi.EVO: title	職(業)をもつ //Occupation	生計立て//Making a living
*	報道者//News reporter	報告者//Reporter	語り手//Narrator	指定者//Specifier	特徴づける者//Characterizant									
*	受報者//News receiver	受報者//Report receiver	聞き手//Listener											
*	報道内容//Content of news	報告内容//Content of report	内容//Content											
*														
昨年//last year				~過去の指定[事象の]~ GOV[1,2]//~Tense specification for EXT	対象.Attr//Object.Attr	役割.Attr//Role.Attr	時間//Time	時点[勝負の]EXT//Time of match.EXT	時間//Time					
米長//Yonemaga				参与者[事象の][1]//Event Participant[1]			相手//Opponent	勝負者[1]//Player[1]	敗(北)者//Loser	優位者//Person with advantage	棋士[1,2]//Shogi player[1,2]	プロ将棋.EVO: 棋士[1,2]//Professional shogi.EVO: player[1,2]	職(業)をもつ者[1]//Person in employment[1]	手段により生計を立てる者[1]//Person using means to make a living[1]
に//to							MARKER//NA							
挑ん//challenge				事象//Event			挑戦.GOV//Challenge.GOV	勝負EVO//Match.EVO	勝利EVO//Victory.EVO	優劣EVO//Advantages/Disadvantages.EVO				
だ//PAST-				~過去の指定[事象の]~ GOV[2,2]//~Tense specification for			EXT							
の//N.A.-					MARKER	役割//Role								
が//NOM-						MARKER								
羽生//Habu				参与者[事象の][2]//Event Participant[2]	特徴//Characteristics	値//Value	挑戦者//Challenger	勝負者[2]//Player[2]	勝(利)者//Winner	劣位者//Person with disadvantage	棋士[2,2]//Shogi player[2,2]	プロ将棋.EVO: 棋士[2,2]//Professional shogi.EVO: player[2,2]	職(業)をもつ者[2]//Person in employment[2]	手段により生計を立てる者[2]//Person using means to make a living[2]
**					~特徴づけ ~GOV[2,2]//~C haracterization~ GOV[2,2]									
//	EXT	EXT	EXT	EXT	EXT	EXT								

図1 An MSFA of (1)

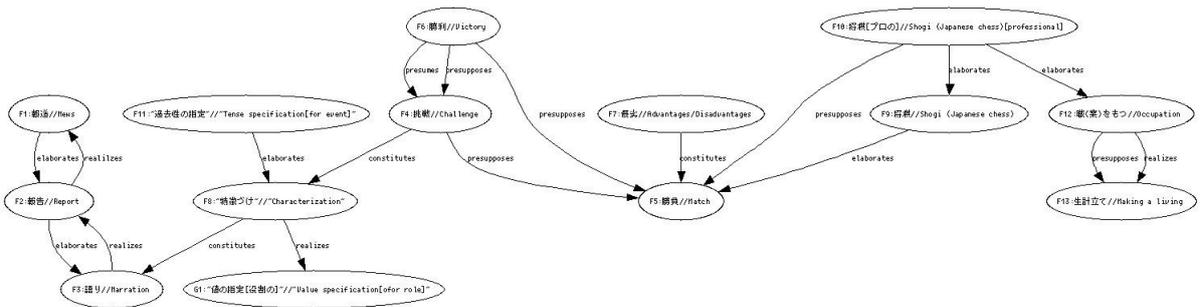


図2 An SFNA of (1)

(<http://chasen.naist.jp/hiki/ChaSen>) and KNP (<http://nlp.kuee.kyoto-u.ac.jp/nl-resource/knp.html>). It is important to note that the segmentation is also conducted manually by the annotators of the project group. This is because for our purposes it is often the case that the outputs of the morphological analyzers leave something to be modified at times (recall §2.1). Another reason is that in an MSFA one tries to specify as many links as possible between knowledge pieces to often discontinuous, multiword units like idioms and proverbs. In general, MSFA does not assume the principle of compositionality, in that for the phrase  $p$  of  $w_1 + \dots + w_i + \dots + w_n$ , the meaning of  $p$  is strategically regarded as independent of  $w_i$ . This is true not only of opaque units like idiom chunks but also of virtually any units which are usually considered to have “regular” semantics. This decision is necessary to avoid the *petitio principii* in semantic specification, even if it seems redundant.

### 3.2 Sample 1: A segment of a newspaper article

Consider the sentence in (1) taken from *Kyoto University Corpus* (Kurohashi and Nagao [5]). (2) gives the English translation. Table 1 provides an MSFA of (1):

- (1) XXXXXXXXXXXXXXXXXXXX [S-ID:950101075-033]  
 (2) Last year, Habu challenged Yonenaga for the title.

In Table 1, the annotations have been converted from Japanese to English (the frame names are given tentatively in English; for the original MSFA in Japanese, see <http://www.kotonoba.net/~mutiyama/cgi-bin/hiki2/hiki.cgi?c=view&p=msfa-round2-s33>). All but the first column represent the frames identified, or “discovered” in the analysis. As shown in the table, 14 frames were identified in (1) (but note that the number is subject to further modifications; see the later discussion). Each of the frames consists of some semantic roles. The ⟨Match⟩ frame (=⟨XX⟩ in the original Japanese analysis; the URL given above), for example, includes the roles such as ⟨Player⟩ (=⟨XXXX⟩), ⟨Place for match⟩ (=⟨XX[XXXX]⟩), ⟨Time of match⟩ (=⟨XX[XXXX]⟩). The colored cells indicate the semantic roles that are considered to be realizing their values in the relevant frames. The uncolored (or “empty”) ones, on the other hand, represent those that do not seem to have any specific roles in the frames. In conducting an MSFA, it is the semantic roles not the semantic types that are annotated in analyzing a text. Semantic types are roughly equated with natural kinds. In contrast, semantic roles are “situation-specific concepts” which are considered highly culture-particular and hence are taken to play a more crucially important role than semantic types in one’s understanding of a text (Kuroda et al. [4] [revised]; for a related discussion, see also Kuroda and Isahara [3]). The table contains \*-symbol, which represents elements that are not lexically realized in a text. For example, the ⟨News⟩ frame (=⟨XX⟩) and the ⟨Report⟩ frame (=⟨XX⟩) contain some semantic roles in the rows with \*-symbol. This is because given these frames such semantic roles must be specified as well. Having outlined the MSFA table for (1), one might address an important question: How deep should one go in describing the meaning of a sentence? In the current MSFA scheme, a sentence is typically given over 20 frames, and each of which comes with some semantic roles as illustrated above. To compare the MSFA scheme to another semantic-annotation framework, the BFN, for example, customar-

ily limits the number of frames to 2 or 3 frames per sentence. It is remarkable that in an MSFA a sentence as short as (1) is identified with a rather large number of frames compared to the BFN scheme (14 frames in the case of 1; recall Table 1). The deep semantic description as illustrated in Table 1 is the result of meeting one of the fundamental theoretical principles of MSFA: the so-called “Be greedy” principle (Kuroda et al. ?? [revised]), which reads as follows: the analysis/annotation needs to be greedy, in that as many frames as you need can be identified and added to the analysis, as long as they are found necessary for providing deep enough semantic analysis of a text. From the MSFA perspective, sample semantic annotations provided by the BFN framework today are not taken to be deep enough. It is important to note that we do not claim the MSFA illustrated in the table to be as deep a semantic description as we can provide. Rather, it should be taken as exemplifying a “tentatively” suggested version of our MSFA of (1). The position that MSFA maintains as to the so-called “granularity” problem is that it must be worked on inductively. The view we hold is that adequate levels of granularity need to be “discovered” through inductive exploration into real texts. The Frame-to-Frame relations are described in row 2 of Table 1, which is depicted in Figure 1 (called a Semantic Frame Network Analysis [SFNA]). In the figure, each frame identified in the MSFA (Table 1) is represented in a circle and the arrows indicate how these frames are interrelated with one another. The diagram is generated automatically by Graphviz based on the specification given in Table 1 (i.e., the MSFA of (1)). Note that here, as well as in Table 1, all the frame names have been translated from Japanese to English. It should be noted that the Frame-to-Frame relations are not assumed a priori in MSFA. Instead, we hold that the set of such relations too needs to be discovered by inductive processes, rather than in a top-down, theory-driven manner. Enlisted in (3) below are the relationships (the specifications partially omitted for lack of space) that are often found. The list is not exhaustive. Most of the Frame-to-Frame relations in the BFN are analogous to those of the MSFA; but for the discrepancies, see Kuroda et al. [4] [revised]: §??).

- (3) (a) “Elaboration” relation: A frame  $F$  elaborates another frame  $G$ ; i.e.,  $F$  inherits from  $G$ . (b) “Constitution” relation:  $F$  constitutes  $G$ ; i.e.,  $F$  is part of  $G$ . (c) “Presupposition” relation:  $G$  presupposes  $F$ . (d) “Presumption” relation:  $F$  presumes  $G$ . (e) “Realization” relation:  $F$  realizes  $G$ . (f) “Target/Transfer” relation:  $F$  targets  $G$ .

Having provided a brief illustration of how one analyzes a newspaper article sentence of (1) with MSFA, let us now turn to the prospects of this framework for cross-linguistic semantic annotation research. Consider (4), which is the Korean translation of (1) (translation provided by Jae-Ho Lee):

- (4) Jagnyeon -e yonenaga -ege dojeonha n salam -i habu.

An MSFA of (4) (here omitted for lack of space) reveals the similarities and differences in Japanese and Korean in terms of the availability of the frames (in 1 and 4). Below is the list of the additional frames that were identified with the Korean sentence (4):

- (5) (i) ⟨~Specification[of being Japanese]~⟩ (=⟨~XX[XXXX]~⟩)  
 (ii) ⟨~Specification[of Time]~⟩ (=⟨~XX[XXXX]~⟩) (iii) ⟨~Specification[of difference in ability]~⟩ (=⟨~XX[XXXXXX]~⟩) (iv) ⟨~Transmission[to person]~⟩ (=⟨~XX[XXXX]~⟩) (v) ⟨~Modification~⟩ (=⟨~XX~⟩)

(vi) (∼Specification[of the fact that it is an interpersonal event]∼)  
 (=∼XX[XXXX]∼)

The involvement of these Korean-specific frames is considered to be due to the syntactic characteristics of the Korean language. It is interesting to see that Korean and Japanese (two typologically close languages) differ in the availability of the frame types in understanding an equivalent sentence. The results of an MSFA of (4) suggest an interesting prospect for cross-linguistic (semantic annotation) research, because it is suggested that a careful semantic analysis using MSFA would make a contribution to clarifying the universals and particulars of languages with respect to how people understand a sentence.

### 3.3 Sample 2: A segment of a prose

Let us briefly discuss how one analyzes a sentence from a discourse with MSFA. Consider the sentence in (6), taken from Aesop's *Fables (The Ass and the Grasshopper)*:

(6) XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

(7) They replied, "The dew." [<http://www2.nict.go.jp/x/x161members/mutiyama/align/htmlPages/aesop-0.htm>]

An MSFA of (6) is given in Table 3 and an SFNA in Figure 2. Similar to Table 1 and Figure 2, all the annotations of Table 3 and Figure 4 have been converted from Japanese to English (for the original analyses, see <http://www.kotonoba.net/~mutiyama/cgi-bin/hiki/hiki.cgi?c=view&p=msfa-aesop01-s03-s04>). A total of 25 frames were identified with (6). A remarkable fact with (6) is the involvement of the frames such as ⟨Narration⟩ (=⟨XX⟩), ⟨Telling a story⟩ (=⟨XX⟩), ⟨Creative work⟩ (=⟨XX⟩), ⟨Allegory creation⟩ (=⟨XXXXX⟩), ⟨Imagination⟩ (=⟨XX⟩), which are identified because of the nature of the text (i.e., a discourse-style fable). Of the frames found in the MSFA of (6), the ⟨Having curiosity⟩ frame (=⟨XXXXXXXX⟩) is perhaps among those that significantly differentiate MSFA from other semantic annotation frameworks for its elaborate semantic specification. In MSFA, one recognizes the ⟨Having curiosity⟩ frame in a reply sentence like (6), because it is a sentence with which the grasshoppers (specified by they) answer the preceding question that was posed by the ass who was "curious" to find out what type of food the grasshoppers live on so that they could possess such beautiful voices (see the preceding context given below; also notice the description given in Table 2 that says "G6 motivates F9"):

(8) XXXXXX XXXXXX X X XXX XXX XXXXXXX

(9) AN ASS having heard some Grasshoppers chirping, was highly enchanted; and, desiring to possess the same charms of melody, demanded what sort of food they lived on to give them such beautiful voices.

In this section, we have briefly introduced how one analyzes a discourse segment, showing that MSFA provides a framework for describing discourse understanding as well. There is, however, a caveat to note before closing this section. The caveat to bear in mind is that the current version of MSFA scheme has not yet been equipped with a descriptive tool to link a reply to the descriptive contents of the preceding sentences effectively (one possible scheme is being developed by H. Nozawa; see his paper in this volume).

## 4. Conclusion

In this article, we introduced the JCASR Project, which aims to develop a relatively small Japanese corpus of texts annotated for semantic frames and their frame elements (aka semantic roles) in the same sense as the Berkeley FrameNet. After outlining the project, including its status, methodological procedures, strategies, and so forth, we provided case studies of two sentences, suggesting that MSFA provides a framework for deep semantic description.

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Frame ID	F8	F10	G3	G4	G7	F7b	F7a	H3	F9	G5	G6	F13	F12	F11	G2	F6	H1	H2	
Frame-to-Frame Relations	elaborates F5; presupposes F9; elaborates H3; constitutes F1n	constitutes J1; elaborates G3	elaborates G4			constitutes F10; realizes F8,H3; elaborates G7	constitutes F10; realizes F9; elaborates G7	elaborates F7; constitutes G4; presupposes G5	presumes F8; elaborates F7a; constitutes F10; realizes n.c.	constitutes G4	motivates F9; ?motivates G5		constitutes H2; constitutes H3; presupposes G5			constitutes H2	constitutes J1; presupposes F7b	presupposes F4; presumes H2	constitutes H1
Frame Name	返答//Reply	対話//Dialogue	会話//Conversation	共同行為//Joint Action	行為[意図的]//Action[volitional]	発言[2]//Remark[2]	発言[1]//Remark[1]	提供[情報の]//Offer[of information]	質問//Question	要求//Request	好奇心をもつ//Having curiosity	特徴づけ//Characterization	種類[指定]//Specification[for object]	摂取//Intake	引用//Quotation	擬人化//Personification	特指[人間]//Characterization[human]		
*															指定者//Specifier	引用者//Quoter	擬人化者//Personifier	行特指づけ者//Characteristic	
*																		擬人化の先[+human][2]//Target for personification [+human][2]	特指[人間の][2]//Characteristics [of human][2]
*																		擬人化の先[+human][1]//Target for personification [+human][1]	特指[人間の][1]//Characteristics [of human][1]
*	内容[質問の]//Content[ of question]	先行する話題//Preceding topic	先行する話題//Preceding topic				内容[質問の]//Content[ of question]		内容[質問の]//Content[ of question]										
*	返答をもつ人//Person who gets reply	対話者[1]//Interlocutor[1]	会話者[1]//Conversation participant[1]	共同行為者[1]//Joint action participant[1]	行為者[意図的][1]//Agent[volitional][1]	相手[発言の]//Listener[ of remark]	発言者//Remarker	発示者//Offerer	相手[質問の]//Questioner[ of question]	要求者//Requester	好奇心をもつ者//Person with curiosity					相手[発言の]//Listener[ of remark]	擬人化の先[1]//Source of personification [1]		
キリギリス//grasshopper	返答者//Replier	対話者[2]//Interlocutor[2]	会話者[2]//Conversation participant[2]	共同行為者[2]//Joint action participant[2]	行為者[意図的][2]//Agent[volitional][2]	相手[発言の]//Listener[ of remark]	発言者//Remarker	発示者//Offerer	相手[質問の]//Questioner[ of question]	相手[要求の]//Requester[ of request]	相関体[好奇心]の対象//Object of curiosity	特徴づけの対象//Object of characterization	指定者//Specifier	摂取者//Intaker	対象//Object	発言者//Remarker	擬人化の先[1]//Source of personification [1]		
たち//PLURAL-	返答者EXT//Replier.EXT	対話者[2].EXT//Interlocutor[2].EXT	会話者[2].EXT//Conversation participant[2].EXT	共同行為者[2].EXT//Joint action participant[2].EXT	行為者[意図的][2].EXT//Agent[volitional][2].EXT	発言者EXT//Remarker.EXT		発示者EXT//Offerer.EXT	相手[質問の]EXT//Questioner[ of question].EXT	相手[要求の]EXT//Requester[ of request].EXT	相関体[好奇心]の対象EXT//Source of curiosity.EXT	特徴づけの対象EXT//Object of characterization.EXT	指定者EXT//Specifier.EXT	摂取者EXT//Intaker.EXT	GOV	発言者EXT//Remarker.EXT			
は//TOPIC-	MARKER	MARKER	MARKER													MARKER			
答文//reply	質問.GOV//Question.GOV	対話.EVO//Dialogue.EVO	会話.EVO//Conversation.EVO						質問.EVO//Question.EVO	要求.EVO//Request.EVO							EVO?		
た//PAST-	EXT	EXT	EXT						EXT	EXT							EXT		
//																			
//	MARKER[1,2]	MARKER[1,2]	MARKER[1,2]			MARKER[1,2]	MARKER[1,2]										EVOKER[1,2]		
**//It's	内容[返答の]//Content[ of reply]	内容[対話の]//Content[ of dialogue]	内容[会話の]//Content[ of conversation]			内容[発言の]//Content[ of remark]	内容[発言の]//Content[ of remark]	情報//Information	対象[質問の]//Object[ of question]	対象[要求の]//Object[ of request]	対象[好奇心]の対象//Object of curiosity	特徴//Characteristics	役割//Role	値//Value	対象[摂取の]//Object[ of intake]=食料		発言//Remark		
水曜//dew																			
が//the																			
よ//N.A.-								EVOKER[+incomposible]							EVO				
//	MARKER[2,2]	MARKER[2,2]	MARKER[2,2]			MARKER[2,2]	MARKER[2,2]										EVOKER[2,2]		

図3 An MSFA of (6)

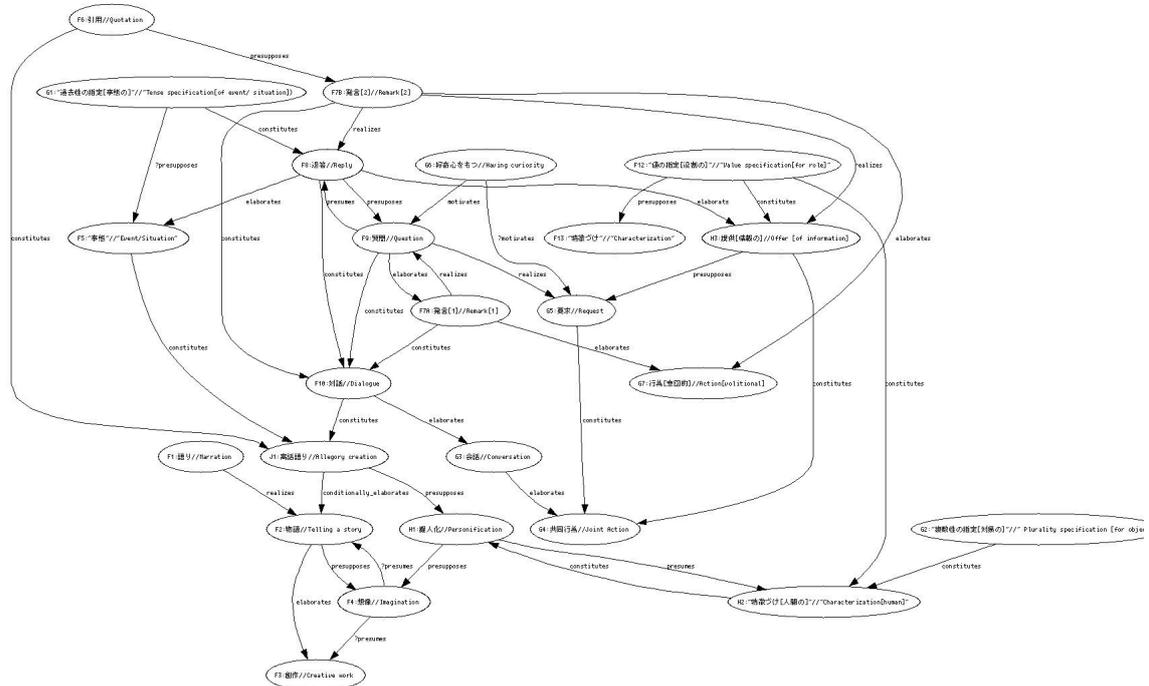


図4 An SFNA of (6)