

# Detection of Assessment Patterns in Ordinary Triadic Conversation

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**Abstract.** Recent interests in conversation in the field of artificial intelligence have expanded beyond the development of particular task-oriented dialogue systems toward technologies for supporting human-human communication in various circumstances. Within such communication supportive approaches, the importance of the analysis of multi-party conversation has increasingly been recognized. In accordance with these orientations, this article outlines a three-party conversation corpus built by the National Institute of Information and Communications Technology, and introduces three preliminary analyses of it that will contribute to the development of Conversational Informatics: The characteristics of turn-taking procedure in three-person conversation; assessment sequential patterns that appeared in the data; and shared knowledge and interpersonal relationships between participants observable from the assessment sequences in triadic conversation.

## 1 Communication-Supportive Approach

There are at least two main concerns of artificial intelligence regarding conversation <sup>1</sup>.

**a) Dialogue-Systemic Approach.** In most cases, since the knowledge concerned is restricted to certain domains and tasks performed through dialogues are well defined with reference to their goal states, finite state- or frame-based approaches are dominant [16]. Further, in the field of information search, since the type of user utterance is prescribed to ‘question’, the trend is toward a stochastic QA approach [24]. Unlike the task-oriented dialogue system, the target of this approach is a large amount of open domain knowledge, though the concern is not the dynamic process of conversation.

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<sup>1</sup> This classification, and the shift of emphasis from the former to the latter, is based on a classical proposal of Winograd [25].

**b) Communication-Supportive Approach.** The main target is not the interaction between human-machine, but human-human conversation. This approach subsumes computer supported co-operative work (CSCW), agent-mediated communication and so forth. In addition, several off-line uses are also included, such as meeting record creation, visualization and information recycling, which are major research topics in information design [22]. This article primarily pursues the communication-supportive approach.

The communication-supportive approach differs from the dialogue-systemic approach in that the target interaction is that between humans; therefore, systems do not necessarily participate in the real-time process of interaction. This means that if the system participates in interaction, such interaction generally involves more than three participants. This situation is contrastive to that of the dialogue-systemic approach most of which involves only two participants: a user and a system.

## 2 Significance of Triadic Conversation Analysis

### 2.1 Multi-participant Interaction

Multiple (more than three) -participant interaction is complex in comparison with a dialogue of two participants. Goffman points out the diversity of ‘hearers’ and divides them into such participation roles as addressee, side-participant and overhearer [7]. Clark and Carlson characterize the complexity of participation roles in terms of ‘audience design’[3]. Audience design comprises linguistic and nonverbal devices by which 1) each participant is assigned a certain participatory role, while at the same time 2) the utterance can be understood by all participants. The most apparent issue in 1) is the determination of the proper next speaker <sup>2</sup> in turn-taking [20]. In a conversation including three or more participants, there is no security or obligation for a current non-speaker to become the next speaker; determination of the next speaker therefore becomes an indispensable concern for participants. As for 2), though understanding by side-participants cannot be directly examined in this article, it should at least be noted that side-participants must be able to recognize themselves as not selected as the addressee and therefore the next speaker. Thus, multi-participant interaction is very complex, so it is crucial to observe what happens when the participant number increases from two to three.

### 2.2 Triadic Conversation Analysis in Japan

The importance of triadic conversation analysis has begun to be recognized in various research disciplines in Japan in recent years. Here are the following attempts of corpus construction, analysis and implementation:

<sup>2</sup> This article simply assumes that addressee normally becomes the next speaker, though this is not the case as lateral indirect speech acts where an intended next speaker is side-participant [3].

1. Social psychological analysis of “social skills” in triadic conversation [4] [10]: Clarifying the perceived relationships between nonverbal behaviors and expressive dimensions or impressions and raptports.
2. Social agents mediating network communication between two users and the analysis of their social influence power [9] [17].
3. Multimodal humanoid robots coping with “who to whom” problem in human-human conversation [15].
4. Building interaction corpus [23] and capturing the dynamics of participation framework [12] from ubiquitous or wearable sensor information in poster presentation environment.
5. Systematics of turn-taking and participation roles in triadic conversation [5] [6]: Fine-grained video analysis of nonverbal behaviors like gaze, gesture and body posture.

### 2.3 Modality Augmentation Approach is Not the Only Way

Most of the researches on triadic conversation mentioned above examine non-verbal aspects of communication and / or influences of conversation on human relationships. This tendency is understandable, given the recent dissemination of computer-mediated communication technology and several related problems in our society. One problem is the paucity of social context information [13] such as nonverbal information, which can be plentifully observed and is actually used by participants in face-to-face interaction. One obvious resolution to this problem therefore is to develop multimodal communication technologies; various methodologies have in fact been advocated in this vein. However, multimodality augmentation is not the only way to improve mediated communication. It is quite apparent that detection of participation roles via nonverbal information, such as gaze and body direction, is only a part of jobs of hearers in different participation roles<sup>3</sup>. Audience design of language use in multiparty conversation should also be reexamined from the perspective of communication-supportive technologies.

Thus, points we especially tried to clarify for the audience design are:

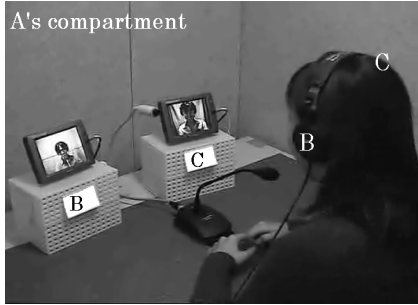
1. What kind of ‘linguistic’ devices enable participants to find who, or what kind of participant, should or can become a recipient or the next speaker, besides nonverbal cues like gazes? (Sect.4)
2. What kind of shared knowledge and interpersonal relationships between participants are detectable from a variety of audience designs and turn-allocation dependent on them? (Sect.5 & 6)

## 3 NICT Three-Party Conversation Corpus

The National Institute of Information and Communications Technology (NICT) has developed and analyzed a three-party conversation corpus. The number of

<sup>3</sup> Of course, problems of language understanding in context are deliberately escaped in most researches, presumably for the similar reasons of what Winograd [25] has negatively pointed out before.

subjects was 45 (15 triads). Each group performed two experiments and 30 sets of dialogue were recorded. The average duration required for each experiment was approximately 20 minutes.



**Fig. 1.** Soundproof compartment



**Fig. 2.** Photo task: these two figures are a) brothers, b) husband and wife for four years, or c) strangers

The speech sound was recorded via DAT and the video image of nonverbal information was via DV. Three DAT decks were utilized: Deck 1 recorded the speech of subjects A+B; D2 recorded that of B+C; and D3 recorded that of C+A on the L & R tracks, respectively. The images of the three subjects were synthesized through the 4-divider and was recorded with one DV deck. The recording by the DV was not for detailed analysis, but for overview of all sounds and images in a dialogue. Each subject entered an individual soundproof compartment to clearly record each speech on an independent track. Therefore, subjects were not placed in a face-to-face situation. We installed two small monitors according to the direction of the input sound so that the members could receive feedback as naturally as possible: A, for example, heard the voices of B and C through the L and R headphones, respectively and could see an image of B in the left monitor and of C in the right (Fig. 1). This environment is like the video telephone conference by three persons, where subjects cannot use eye contact though can obtain speech and nonverbal information. However, the timing of turn-taking seems to be smooth enough.

All subjects were university students. Each group consists of three members of the same sex (besides one group). The following four combinations were prepared: (a) subject A, B and C are friends with each other; (b) A and B are friends + A and C are friends; (c) only A and B are friends; and (d) everyone is a stranger with each other. Each group went through the two tasks consecutively. Experiment 1 was a “photo task” [1], in which subjects are seeking an answer for each of three questions like in Fig.2, on which all of them can agree. Experiment 2 was a “free topic conversation”, in which subjects could use an optional topic list.

## 4 Characteristics of Turn-Taking in Triadic Conversation

Table 1<sup>4</sup> shows a list of resources for next speaker determination that resulted from our corpus analysis. Unlike explicit devices like vocatives, tacit resources are not specified for speaker selection but have some propositional or modal contents. This means that each of them cannot be used for speaker selection in a context-independent manner, but their functions are implicit triggers for activating shared knowledge or having participants orient to local sequential organization of conversation. Therefore, it is important to clarify their nature of dependency on the context of knowledge or conversational sequences.

**Table 1.** Resources for speaker determination

1. Nonverbal devices: gaze, etc.
2. Linguistic devices:
  - (a) Explicit: vocatives, etc.
  - (b) Tacit: references to participants (personal pronouns or names, their grammatical functions are not vocatives but nominatives, possessives, etc.), choices of addressee honorific/non-honorific particles, selection of specific vocabularies (+ 3), discourse markers (+ 4), etc.
3. Use of shared knowledge: Mention to shared episodes, information requests from or giving to someone who does not know them.
4. Use of sequential organization: Second parts of adjacent pairs, continuous questions to the preceding answerer, etc.

### Excerpt 1<sup>5</sup>

(C questions A and B: ‘Have you decided your seminar yet?’)

- 1 B: *A, mada desu ne.* [→ C] ‘Ah, not yet.’  
*Haitte kara dayo ne.* [→ A] ‘Will it be determined after the new academic year begins?’

### Excerpt 2

- 1 B: *Kataku dou natta?* [→ A] ‘How did Kataku go?’  
 2 A: *Are wa na: ichibu.* [→ B] ‘It was only by some members.’  
 3 B: *Ah.* ‘Oh.’  
 4 A: *Camp de sa: adana ga kettei shiten.* ‘My nickname was determined during the camp.’  
 [→ C]  
 5 C: *Ah.* ‘Oh.’

<sup>4</sup> This list is similar to that of Lerner [10], in which use of “shared knowledge” and “sequential organization” are called use of “social” and “sequential” identities, respectively.

<sup>5</sup> Transcriptional notation: Each line consists of four elements: Turn ID, speaker ID, utterance and English translation. = shows that the line is continuing from the prior line. : shows that the vowels are prolonged. In <sub>xn</sub>/, / shows the starting points of overlapped speech, <sub>a-c</sub> means between whom they are (a: between participants A and B; b: B and C; c: C and A); and <sub>x</sub> are serial numbers in each except for a, b and c, respectively. => and -> at the head of line points [1st Assessment] and [2nd Assessment], respectively, these terms introduced in Sect.5.

In Excerpt 1, the former half of the utterance is an answer to C's question and the latter is a confirmation to A who is B's friend and belongs to the same university and class as B. These selections of addressees are expressed by the distinction between honorific post-verbal particle "desu ne" and non-honorific "dayo ne". In Excerpt 2, the use of the word *Kataku* in 1B implies that it is the one sharing the episode about *Kataku* with B, who is selected as the next speaker. After this exchange, 4A explains this episode to C, who has no knowledge of it yet.

## 5 Assessment Sequences in Free Topical Conversation

From the perspective of 'Conversational Informatics' [2], the flood of information [26] is not the only problem. One of the most important characteristics of information included in conversation is the fusion of objective world knowledge and subjective information. The latter includes such 'meta-information' as distribution of knowledge among participants in regard to things, persons or events referred to in the conversation [8][11], and participants' attitudes or opinions toward them [18]. Any attempts to develop technologies of conversational informatics must struggle with how to utilize such subjective information<sup>6</sup>. This section proposes that sequential analysis of assessment patterns appearing in conversation can be contributory in this regard.

Though one of the urgent problems for conversational informatics is how to extract subjective information like attitudes or opinions of participants from conversational data in an effective and reliable manner, it is not easy to do this because these kinds of information are mingled tightly with objective propositional information, and often omitted from the surface forms of utterances. For instance, it could be said that "USJ is interesting" is an expression of the speaker's subjective judgment, while "USJ is in Osaka" is objective information. However, as clearly seen from the following excerpts, even "USJ is in Osaka" and "Cockroaches can fly" will not always transmit only objective information but can sometimes imply the subjective judgment or taste of speakers as well.

### Excerpt 3

- 1 A: *USJ tte Osaka shinai desu yone?* 'Is USJ in Osaka?'  
 2 B: *Hai, totemo benri desuyo.* 'Yes, it is very convenient.'

### Excerpt 4

- 1 C: *Gokiburi tte tobu yan na, yappa.* 'Cockroaches can fly, can't they?'  
 2 B: *Iya: kowai kowai.* 'Yeah, it is very very scary.  
       =: *Iya ne.* I hate them.'  
 3 A: *Tobu tobu.* 'They can fly.'  
 4 C: *Mou sore ga kowai nen.* 'That terrifies me.'  
 5 A: *Kowai.* 'Terrible.'

<sup>6</sup> In addition, subjective information is important not only for anonymous users but also for participants themselves of the conversation, as in the case of recycle of information from past meeting records.

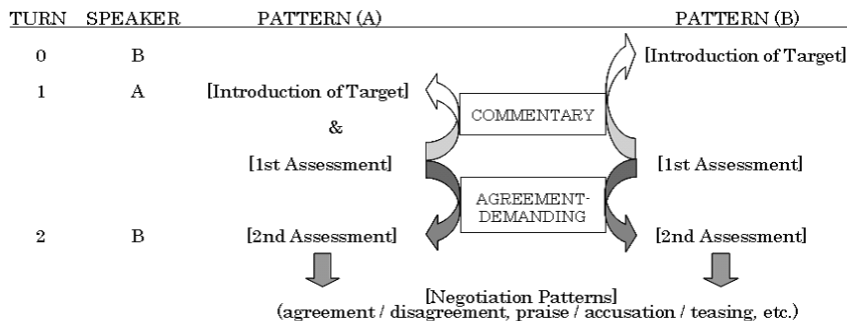


Fig. 3. Assessment sequence schema

In general, some expressions like “The score of the test was 28 points” and “We visited a hot spring after the conference”, in addition to 1A in Excerpt 3 and 1C in Excerpt 4, regularly evoke subjective or emotional responses from the recipients. In other words, it is one of the most important features of conversation data that some implicit aspects of prior utterances become overt by listeners’ responses to them. This nature is properly grasped by the doctrine “responses display how the speakers understand prior utterances” proposed by conversation analysts, called “sequential analysis” [19], which appears most clearly in the formulation of adjacency pairs [21]. From this viewpoint, Pomeranz analyzed assessment sequences in conversation and found that a first assessment makes relevant the occurrence of the second assessment, expressing agreement or disagreement to the first [18]. Based on her formulation, we developed the “assessment sequence schema” (Fig.3).

A typical assessment sequence consists of four elements: [Introduction of Target], [1st Assessment], [2nd Assessment], and [Negotiation Pattern]. The procedures and notices for analysts to identify them are the following:

**Agreement Demanding Relation.** As mentioned above, the targeted parts are only those which include the pairs of [1st Assessment] and [2nd Assessment]. The relations between these elements are called “agreement-demanding” because the most typical relevant response to the [1st Assessment] is agreement/disagreement.

**Commentary Relation.** The [1st Assessment] also has “commentary” relations with things or events taken up in the [Introduction of Target]. There are two kinds of [Introduction of Target] according to where and how they are introduced into the conversation: In pattern A, the Target elements are introduced by the speaker of the [1st Assessment] in the same utterance, and in pattern B, things or events that have already been the topics of conversation are retrospectively recognized as the Target by virtue of the occurrence of a [1st Assessment], where those who introduced these things or events for the first time are not necessarily the speakers of the [1st Assessment]; these introductions can be done

through several utterances of several participants. In either case, the criterion of identification is the occurrence of the [2nd Assessment].

**Negotiation Pattern.** There appear various kinds of [Negotiation Pattern], according to whether the [2nd Assessment] is agreement or disagreement, whether the type of attitude in the [1st Assessment] is praise, accusation or teasing, etc., and what kinds of things or events the [Introduction of Target] includes, etc. For instance, when the [2nd Assessment] is disagreement, the speaker of the [1st Assessment] often either tries to justify his or her prior judgment or modifies it in pursuit of agreement [18].

**Excerpt 5:** The number 6 is big

1 A:	<i>Doko koukou?</i>	‘Where is your high school?’
2 C:	<i>Koukou? Koukou wa Edogawa- = Higashi tte iu kore mata kore = c1[mata miner na un.</i>	‘High school? My high school is called Edogawa-Higashi. It is not so famous, either.’
3 A:	<i>c1[A sou nanya:</i>	‘I see.’
4 C:	<i>Kouritsu, Kouritsu b2c2[:</i>	‘Public, public.’
5 B:	<i>b2[He a1[:</i>	‘Oh.’
6 A:	<i>c2a1[He:, = K-dai kita hito otta?</i>	‘Oh:, was there anyone who passed K university?’
7 C:	<i>K-dai kita hito roku nin = kana c3[:</i>	‘There were six students who passed K university.’
=> 8 A:	<i>c3[Roku nin a2[mo orun?</i>	‘Six persons is a lot.’
9 B:	<i>a2[He b3[:</i>	‘Oh:.’
-> 10 C:	<i>b3[Un, roku nin, = ooi n kana c4[:</i>	‘Yeah, six persons, is it big number?’
11 A:	<i>c4[Ooi yo c5[:</i>	‘It is big.’
12 C:	<i>c5[Nanka watashi = sukunai c6[toka omottotta kedo.</i>	‘Well, I was thinking that it was small.’
13 A:	<i>c6[Iya, uchi atashi dake damo:n.</i>	‘No, it was only I who passed from my high school.’

In Excerpt 5, the fact “It was six students who passed K university”, counted as the [Introduction of Target], appears in lines 1-7. 8A is the [1st Assessment], in which A declares a subjective judgment that 6 is a big number. This assessment is not agreed upon by the corresponding [2nd Assessment] in 10C. Thus, the fact that six persons passed K university from a high school can be judged as either a big or small number, depending on the knowledge and experiences possessed by each of the participants. The sequence after 10C, which is engendered by this disagreement, should be regarded as the [Negotiation Pattern], in which, especially, 13A tries to justify her argument.

Of course, all implicit aspects of participants’ attitudes cannot always be identified by this methodology, and it might therefore seem to be too strict to restrain our analytic focus only on the parts where both a [1st Assessment] and [2nd Assessment] do occur. However, as pointed out above, it is difficult for analysts to securely extract subjective information like participants’ attitudes



toward things or events, which are an integrated part of conversational information, and therefore methods to do this must successfully provide a way to identify evidence that some attitude information is really used by participants in the conversation. The sequential analysis of assessment patterns proposed above enables analysts to treat only those subjective information items that become overt (“publicized”) by and for participants themselves in the particular conversational context.

## 6 Shared Knowledge and Interpersonal Relationships Between Participants

The combination of two kinds of analyses introduced above, the analysis of turn-taking in triadic conversation in Sect.4 and of assessment sequence patterns in Sect.5, enables us to discover shared knowledge and interpersonal relationships between participants. The excerpts for detailed analysis are those in which either speaker or recipient of the [1st Assessment] is the one who has not become either speaker or addressee (focal recipient) in the exchange immediately before the [1st Assessment]. Here, they are classified as “from or to side-participant”, correspondingly.

### Excerpt 6: Even though you're in the 4th grade

(C is explaining the advantage of a part-time job in convenience store.)

- |   |                                  |
|---|----------------------------------|
| 1 C: <i>A, nanka betsumi isshuukan ni nikai</i> | ‘It’s no problem if I can work   |
| =: <i>demo ii shi, shiken kikan toka mo</i>     | only twice a week, and it’s      |
| =: <i>meccha raku nan desu yo.</i>              | flexible too even during exams.’ |
| 2 B: <i>Ah a1[:</i>                             | ‘Oh.’                            |
| 3 A: <i>a1[Sore wa ii desu wa c1[ne.</i>        | ‘That’s good.’                   |
| 4 C: <i>c1[U:n.</i>                             | ‘Yeah.’                          |
| 5 A: <i>Kateikyoushi nante kekkou shiken no</i> | ‘In case of tutors, exam periods |
| =: <i>jiki mo kasanatte kuru n desu c2[yo.</i>  | often come simultaneously.’      |
| 6 C: <i>c2[Hu:n.</i>                            | ‘Oh.’                            |
| 7 A: <i>Demo shiken mae ni wa ma: fudan</i>     | ‘But during exams, because       |
| =: <i>okane moratte irushi, zettai</i>          | I’m ordinarily paid a salary,    |
| =: <i>ika nai to ikkenai tte yuu c3[ka</i>      | I must be sure to go.’           |
| 8 C: <i>c3[U:n</i>                              | ‘Oh.’                            |
| 9 A: <i>Tsugi no hi gogaku ga futatsu arou</i>  | ‘Even if I have two exams of     |
| =: <i>c4[to a2[mo.</i>                          | foreign language classes         |
|   | the next day.’                   |
| 10 C: <i>c4[Ha b1[hahaha.</i>                   | (laughter)                       |
| 11 B: <i>a2b1[Hahaha hahahaha.</i>              | (laughter)                       |
| 12 A: <i>Report ga arou c5[tomo</i>             | ‘Or even if I have a deadline    |
|   | for my report,’                  |
| 13 C: <i>c5[U:</i>                              | ‘mhm:’                           |
| 14 A: <i>ikanai c6[to ikenai</i>                | ‘I have to go.’                  |
| 15 C: <i>c6[u:</i>                              | ‘mhm’                            |

- 16 A: *To iu* <sup>a3</sup>[*no ga arimasu kara ne.* 'I think so.'  
 17 B: <sup>a3</sup>[*Hahaha.* (laughter)  
 18 C: *U:n* 'Oh.'  
 19 A: <sup>a4</sup>[*Kukuku* (laughter)  
 => 20 B: <sup>a4</sup>[*Kimi yon kaisei nanoni mada* 'You're still taking a foreign  
 =: *gogaku totteru kara* language class even though  
 you're in the 4th grade.  
 =: *da* <sup>a5</sup>[*me nan* <sup>b2</sup>[*desu yo,* So, it's your own sake,'  
 -> 21 A: <sup>a5</sup>[*Hu* <sup>c7</sup>[*hu.* <sup>c8a6</sup>[*Kukuku.* (laughter)  
 22 C: <sup>c7b2</sup>[*Hahaha* <sup>c8</sup>[*haha.* (laughter)  
 23 B: <sup>a6</sup>[*hahahahaha.* (laughter)

Excerpt 6 illustrates the “from side-participant” type. As a response to C’s argument about the advantage of the part-time job in a convenience store up to 1C, 3-9A compares it with the case of a tutor, and conversation is going on between A and C. The [1st Assessment] is 20B, noting that 1) B has not become a speaker before it, and 2) B’s assessment resorts to shared knowledge between only A and B that A is taking a foreign language class despite in the 4th grade. Thus, one who issues [1st Assessment] often utilizes an existing interpersonal relationship and shared knowledge between him and the target person.

#### Excerpt 7: We are only new acquaintances

- 1 C: *Nande ore shin-san shiri attan darou* 'How did I get acquainted with  
 you, Ms. Shin?'  
 2 A: *E?* 'Pardon?'  
 3 C: *Ma, doko de ore no kao mitakke?* 'Well, where did you meet me?'  
 4 A: *Hu, ichiban saisho ni atta no wa: test* 'The first time was at the Fuyou  
 =: *no saishuubi no fuyou-kan ja nai?* Pavilion on the final day of  
 exams, wasn't it?'  
 5 C: <sup>c1</sup>[*E?* 'Really?'  
 6 A: <sup>c1</sup>[*A, chigau?* 'Oh, that's not right?'  
 7 C: *Sou nano?* 'Surely?'  
 8 A: *Atashi hajimete mita no wa,* 'The first time I saw you was,  
 =: *a test chuu kana test* oh it might have been during  
 =: <sup>c2</sup>[*chuu.* the exam, during the exam.'  
 9 C: <sup>c2</sup>[*Doko nanoka wakaranakute sa.* 'I can't remember.'  
 10 A: *Fuyou-kan, fuyou-* <sup>c3</sup>[*kan* 'Fuyou Pavilion, Fuyou Pavilion.'  
 11 C: <sup>c3</sup>[*Un.* 'I see.'  
 12 C: *De koe kakerarete dare daka jitsuwa* 'But actually, when I was called  
 =: *wakatte nakatta* on at that time, I couldn't  
 find who you were.'  
 => 13 A: *So atashi tachi sugoi: tomodachi reki* 'So, we are only new  
 =: <sup>c4</sup>[*te* acquaintances.'  
 -> 14 C: <sup>c4b1</sup>[*Asai.* 'Recently.'  
 -> 15 B: <sup>b1</sup>[*A, sou na* <sup>a1</sup>[*n?* 'Oh, so.'  
 16 A: <sup>a1</sup>[*shichigatsu no* 'It was at the end of July when  
 =: *owari yone,* <sup>a2</sup>[*shiriatta.* we first met, wasn't it?'  
 17 B: <sup>a2</sup>[*A mada kotoshi nan?* 'Oh, it was this year.'

Excerpt 7 is the “to side-participant” type. Participants A and C are jointly recalling the situation of their first encounter. It does not seem that the conversation between A and C is not co-telling to B though B has not known this episode. Therefore, the [1st Assessment] in 13A turns the conversation to B in the form of resuming it. It is appropriate for A to introduce the relationship between A and C to B, because only A is an acquaintance of both B and C. Both 14C and 15B are two different kinds of [2nd Assessment] responding to 13A. 14C shows agreement from the standpoint of the one who has shared the episode with A while B in 15 shows himself as a person who hears it for the first time.

Thus, shared knowledge and interpersonal relationships between participants appear clearly in the assessment sequences in the “from and to side-participant” types.

## 7 Conclusion

In this article, we have insisted on the significance of analysis of triadic conversation to develop Conversational Informatics, and proposed a method of analysis of turn-taking in triadic conversation, assessment sequence patterns as the exchange and negotiation process of attitudes and opinions of participants, and shared knowledge and interpersonal relationships made explicit through assessment sequences between three participants.

Generalization of typical patterns of characteristic phenomena in conversation from the corpus is a sound phase necessary for developing various conversation supporting technologies, and is considered to consist of at least two aspects: What sort of information should be discovered from conversation data and how such information can be detected efficiently and securely. This article has focused on the significance of the target phenomenon and the fine-grained description of it. Hereafter, the efficiency and objectivity of the method are to be examined through constructing a reliable coding schema for corpus annotation and building a method for automatic extraction and utilization of the information.

## References

1. Archer, D.: *How to Expand Your S.I.Q.* M. Evans and Company, Inc. (1980)
2. International Workshop on Conversational Informatics: <http://www.ii.ist.i.kyoto-u.ac.jp/jsai2005ws/>
3. Clark, H. H., Carlson, T. B.: Hearers and speech acts. *Language*, **58** (1982) 332–373 Also in Clark, H. H.: *Arenas of Language Use*. University of Chicago Press & Center for the Study of Language & Information (1992) 205–247
4. Daibo, I., Goto, M., Miyagi, H.: The perceived relationship between the conversation style and the nonverbal cues in a triadic conversation. *28th International Congress of Psychology (ICP2004)*. (2004)
5. Den, Y.: Towards a Science of Conversation. *Technical Report of the Institute of Electronics, Information and Communication Engineers*. (2004) (in Japanese)

6. Enomoto, M.: An analysis of nonverbal behavior affecting participation-role taking. *JSAI SIG-SLUD-A301-02* (2003) 25–30 (in Japanese)
7. Goffman, E.: *Forms of Talk*. University of Pennsylvania Press (1981)
8. Heritage, J., Raymond, G.: The terms of agreement: Indexing epistemic authority and subordination in assessment sequences. *Social Psychology Quarterly*, **68** (2005) 15–38
9. Isbister, K., Nakanishi, H., Ishida, T., Nass, C.: Helper agent: Designing an assistant for human-human interaction in a virtual meeting space. *International Conference on Human Factors in Computing Systems (CHI2000)*. (2000) 57–64
10. Iso, Y., Kimura, M. Sakuragi, A., Daibo, I.: The effects of nonverbal behaviors on impression formation and rapport in a triadic communication. *28th International Congress of Psychology (ICP2004)*. (2004)
11. Kamio, A.: *Territory of Information*. John Benjamins (1997)
12. Katagiri, Y., Bono, M., Suzuki, N.: Conversational inverse information for context-based retrieval of person experiences. *Proceedings of JSAI 2005 Workshop on Conversational Informatics*. (in conjunction with the 19th Annual conference of the Japanese Society for Artificial intelligence, 2005) (2005) 1–6
13. Kiesler, S., Siegel, J., McGuire, T.: Social psychological aspects of computer-mediated communication. *American Psychologist*, **39** (1984) 1123–1134
14. Lerner, G.H.: Selecting next speaker: The context-sensitive operation of a context-free organization. *Language in Society*, **32** (2003) 177–201
15. Matsusaka, Y., Tojo, T., Kobayashi, T.: Conversation robot participating in group conversation. *IEICE Transaction of Information and System*, E86-D, **1** (2003) 26–36
16. McTear, M. F.: *Spoken Dialogue Technology: Towards the Conversational User Interface*. Springer (2004)
17. Nakanishi, H., Nakazawa, S., Ishida, T., Takanashi, K., Isbister, K.: Can software agents influence human relations?: Balance theory in agent-mediated communities. *International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS2003)* (2003) 717–724
18. Pomeranz, A.: Agreeing and disagreeing with assessments: Some features of preferred / dispreferred turn shapes. In Atkinson, J. M. & Heritage, J. (eds.), *Structures of Social Action: Studies in Conversation Analysis*. Cambridge University Press (1984) 57–101
19. Psathas, G.: *Conversation Analysis: The Study of Talk-in-Interaction*. Sage Publications (1995)
20. Sacks, H., Schegloff, E. A., Jefferson, G.: A simplest systematics for organization of turn-taking for conversation. *Language*, **50(4)** (1974) 696–735
21. Schegloff, E. A.: Sequencing in conversational openings. *American Anthropologist*, **70(6)** (1968) 1075–1095
22. Shedroff, N.: Information interaction design: A unified field theory of design. In Jacobson, R. E. (ed.), *Information Design*. MIT Press (1999)
23. Sumi, Y., Ito, S., Matsuguchi, T., Fels, S., Mase, K.: Collaborative capturing and interpretation of interactions. *Proceedings of Pervasive 2004 Workshop on Memory and Sharing of Experiences*. (2004)
24. TREC-8 QA Track: <http://trec.nist.gov/data/qa.html>
25. Winograd, T., Flores, F.: *Understanding Computers and Cognition: A New Foundation for Design*. Ablex (1986)
26. Wurman, R. S.: *Information Anxiety 2*. Que Corporation (2000)