Functions and Patterns of Speaker and Addressee Identifications in Distributed Complex Organizational Tasks Over Radio*

Bilyana Martinovski, David Traum, Susan Robinson, Saurabh Garg
Institute for Creative Technologies, University of Southern California
13274 Fiji Way, Marina del Rey, CA 90292 USA

1 Introduction

In multiparty dialogue speakers must identify who they are addressing (at least to the addressee, and perhaps to overhearers as well). In non face-to-face situations, even the speaker's identity can be unclear. For talk within organizational teams working on critical tasks, such miscommunication must be avoided, and so organizational conventions have been adopted to signal addressee and speaker, (e.g., military radio communications). However, explicit guidelines, such as provided by the military are not always exactly followed (see also (Churcher et al., 1996)). Moreover, even simple actions like identifications of speaker and hearer can be performed in a variety of ways, for a variety of purposes. The purpose of this paper is to contribute to the understanding and predictability of identifications of speaker and addressee in radio mediated organization of work.

2 Corpus and Annotation

The data set used in this study consists of a 1/2hr fragment of a 1hr40min simulation exercise involving trainees in helicopter flight simulators, involved in a coordinated mission with a command post and semi-automated simulated forces. A small excerpt is shown in Figure 1. There are over 30 speaking participants communicating over multiple radio frequencies; simultaneous speech is not necessarily interrupting.

N	Freq	Spkr	Addr	Said
1	45	R06	STW	STEEL tower .
2	45	R06	STW	rogue 0 6 ,
3	42	STW	R06	0 6 ,
4	42	STW	R06	tower ?
5	45	R06	STW	tower .
6	45	R06	STW	this is rogue 0 6 ,
7	42	STW	R06	0 6 taxi for departure ?
8	45	R06	STW	rogue 0 6 .
9	42	R06	R07	rogue 0 6 ,
10	42	R06	R07	0 7 ,
11	42	R06	R07	0 6 is up at this time
12	8, 43	R7-B	DO	a:nd dragonops ,
13	8, 43	R7-B	DO	rogue 0 6 and rogue 0 7 are alpha at this time ,

Figure 1: Example of Radio Talk (IDs are underlined, IDAs in italics).

We segment the data into several levels of interaction structure. A **transmission** is a communication unit delivered over the radio. At a finer-grained level, we segment communication units into **utterance units** (Gross et al., 1993). Sequences of utterance units by multiple speakers are clustered into **episodes** of sub-activities, each taking place within a contiguous block of time and centered on a single purpose. Episodes typically have three chronologically organized phases: *beginning*, *action*, and *closure*. They include on average 10-20 utterance units and between 4 and 15 transmissions. In addition to segmentation and physical communication factors such as time and frequency of transmission, we also annotated several dialogue functions, including the addressee of each utterance unit, any indications of call signs identifying the speaker **(ID)** or the addressee **(IDA)**, see Figure 1.

*The work described in this paper was supported by the Department of the Army under contract number DAAD 19-99-D-0046.

3 Analysis

We analyze several types of factors that play a role in the interpretation of the data, including **Linguistic:** location of ID/IDA in the episode and the transmission; other speech acts or military expressions in the same transmission as IDA/ID; and **Social:** the role of the speaker; the relationship (including military rank) between participants; the episode.

We grouped transmissions into seven patterns with respect to occurrence of ID, IDA and other acts: (1) Basic IDA-ID pair (2) Reversed ID-IDA pair (3) Single ID or IDA (4) Correction of ID or IDA (5) ID or IDA as 3rd person reference in a core act (6) ID or IDA with other core acts or military expressions (7) no ID or IDA.

There are three types of sequences of transaction patterns: *standard truncated*, and *extended*. The standard pattern (e.g., 1-7 in Figure 1) follows the exact instructions in the call sign protocols for the Army, involving at least three transmissions, each of which contains pattern (1): IDA ID. However, the standard sequence is very rare, only 4 sequences are of this type and they are all initiations of contact between an entity and a command site, i.e. an inter-team call. An Example of the truncated sequence pattern is lines 12-13 in Figure 1 where the pattern is: `a:nd` IDA, ID as subject in 3rd person. The truncation is expressed in several ways: the initial conjunction indicates the existence of previous contact, call sign of the addressee is the short name of the entity, not the full name, Dragon Operations (compare to the full name used in the initial contact with Steel Tower on line 1), and finally the self-identification, although full, is used as the subject of a statement informing the coordinating center of the activities of both helicopters. In this sense the identification function of the ID on line 13 is assumed. The extended sequences involve searching for an entity with multiple calls, achieving a response only after subsequent calls, if at all.

The call signs are pervasive in radio talk: 42.3% of all utterance units (from a corpus of 977 utterance units, total) consist of ID or IDA, of which 20.1% are IDs and 22.2% IDAs. The position in the episode is the most significant factor influencing the frequency of the IDA/ID: 75.3% of all ID/IDAs are in beginning phase of an episode, regardless of their initiating or responding function.

67.9% of all IDs and 71.9% of all IDAs occur in communication units which initiate a speech act. That means that both IDs and IDAs are used mostly for initiation, both on utterance function level and on episode level. In addition, the prescribed format for use of call signs demands the first mention of IDA and second mention of ID, which is the dominating pattern in the data. The cases in which the call sign contact follows the most explicit 3-step pattern are all in the first time establishment of a contact at the beginning of an episode, thus function as activity or topic management as found for other kinds of information dialogues (Rats, 1996).

The roles, ranks, and relationships between speakers and entities are a strong influencing factor. As expected, exchanges between entities representing different task teams, i.e. "inter-team" exchanges are typically much more formal and use more IDA/IDs whereas exchanges between members of the same unit are typically less explicit. 75% of inter-team transmissions include an ID or IDA, while this is true of only 50% of intra-team transmissions.

The activity type also influences the use of IDA/IDs. Most of the IDA/IDs are used in achieving a task, information gathering, and status report activities. Communication checks and single calls consist mainly of IDA/IDs. It is expected that activities which require more changes of addresses and speakers, such as gathering information from different entities may be, will have higher number of call signs, simply because they will be also different call signs and different contacts.

References

C. Churcher, D. Souter, and E. Atwell. 1996. Dialogues in air traffic control. In *Proceedings of the Twente Workshop on Langauge Technology: Dialogue Management in Natural Language Systems (TWLT 11)*.

Derek Gross, James Allen, and David Traum. 1993. The TRAINS 91 dialogues. TRAINS Technical Note 92-1, Department of Computer Science, University of Rochester, July.

M Rats. 1996. *Topic Management in Information Dialogues*. Ph.D. thesis, Katholieke Universiteit Brabant.