COMMUNICATIVE TRIAD
AS A STRUCTURAL ELEMENT OF LANGUAGE INTERACTION

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ABSTRACT

Researches on dialogue natural-language inter-
action with intellectual "human-computer" systems
are based on models of language "human-to-human"
interaction, these models representing descriptions
of communication laws. An aspect of developing lan-
guage interaction models is an investigation of
dialogue structure. In the paper a notion of elemen-
tary communicative triad (SR-triad) is introduced to
model the "stimulus-reaction" relation between
utterances in the dialogue. The use of the SR-triad
apparatus allows us to represent a scheme of any
dialogue as a triad structure. SR-triad structure
being inherent both to natural and programming
language dialogues, SR-system is claimed to be
necessary while developing dialogue processors.

1. INTRODUCTION

In earlier papers devoted to interpersonal
interaction [Frank,1981; Levinson,1981] much atten-
tion is paid to studying the role of speech act (SA)
in dialogue structure. Considering SA as a principal
functional element of language interaction (LI) is
of special importance for developing natural
language models which are to be practically applied
to human-computer natural-language interaction.

We proceed from the statement that there are
not solitary performed speech acts in real communi-
cation, SAs are interconnected and involved in a
general LI structure [Wunderlich,1980].

Within the framework of our approach to the
formal description of dialogue structure a notion of
SR-triad reflecting the "stimulus-reaction" relation
between utterances in the dialogue is proposed to
construct a more adequate representation of dialogue
structure. Representing any dialogue as a triad
structure (T-structure) in contrast to previous
analysis [Hundsnurscher,1981] is characterized by
distinguishing three phases in the interaction of
the type "stimulus-reaction". First we shall
consider different roles of speech acts in the
dialogue T-structure. Then we shall introduce three
types of relations between SR-triads (intersection,
imbedding and succession) and discuss dialogues with
a complicated structure which is represented by
combinations of these relations and reflects diffe-
rent strategies to attain some goal.

2. SR-TRIAD AND A TYPOLOGY OF SAS

Any dialogue is considered to be a sequence of
SAs distributed in time which is charaterized by: a)
a change of roles of the speaker and the hearer
between communication participants (further desig-
nated as X and Y) and b) certain relations between
SAs.

Each SA is aimed at accomplishing whole complex
of goals/tasks. The discussion of their content is
not relevant to the purposes of this paper. So we
confine our discussion to one goal (g.X) only asso-
ciated with some SA of the author X (SA.X). The very
fact of producing an SA which "initiates" g.X raises

before the addressee Y a communicative task to react
to this goal, i.e. to close g.X positively or nega-
tively. Thus between SA.X and the following SAs of Y
there appear "stimulus- reaction" relations. Between
an initiation and a closure of g.X there may take
place intermediate interactions aimed at accomplis-
hing the communicative task by Y. The intermediate
SAs of Y are associated with goals subordinated to
the communicative task, and the intermediate SAs of
X which are reactions to the corresponding SAs-
stimuli of Y are associated with the initiating SA.X
by the goal g.X and aimed at explanation, support-
ing, correction of the goal or some other components
of the SA.X content.

2.1. In the capacity of the basic structural
element of dialogue interaction, SR-triad is pro-
posed which reflects three following phases of the
interaction these phases being associated with any
goal initiated in the dialogue.
The first phase is a speech act SA1.X by means
of which its author X induces his dialogue partner Y
to realize some communicative goal g.X (initiation
of g.X).
The second phase is represented by a positive
or negative reaction SA1.Y of Y to this goal (clo-
sure of g.X).
The third phase is a reaction SA2.X of X to
SA1.Y which may be positive (acceptance) or negative
(rejection) as well. Often SA2.X may be absent in
real dialogues that means an acceptance of Y's reac-
tion by default (as it follows from the completion
of the interaction or from the transition to the
initiation of a new goal). Irrespective of the
explicit/implicit form of expression, this phase is
considered as a regular organizing component of the
interaction process.

2.2. Let us enumerate principal types of speech
acts reflecting the roles of the SA in the dialogue
T-structure and introduce symbols to designate them
in schemes.
(1) An initiating SA is a primary initiation of
the goal (see the designation in fig. 1a).*)
(2) An initiative-reactive SA is an initiation
of an intermediate goal without trying to close the
principal goal, for example, the author of the given
SA has not sufficient information for generating a
reaction to the principal goal, or the information
at the author's disposal is considered by the
author as non-authentic, gives rise to doubt, needs
correction etc. Such an SA is aimed at some
component of the content of the previous SA
(the connection with this component is designated by
a dotted line (see fig.1b)).
(3) A reactive SA is a positive or negative
reaction (to the goal) reflecting the second phase
of an SR-triad (fig.1c). This reaction may be

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*)Here and further (in schemes) a horizontal line
represents a goal with which the role of the given
SA is connected in an SR-triad; a line representing
a subordinated goal is shown lower than that repre-
senting the principal goal.

recognized by X as final: an SA of type (4) follows and the goal is closed, otherwise the reaction is not final: an SA of type (5) follows.

(4) A completing SA reflects the third phase of an SR-triad and contains the acceptance of the previous positive or negative reaction of the partner (fig.1d).

(5) A re-initiating SA is a re-initiation of the goal which means rejection of the reaction to the given goal and plays a double role in the dialogue T-structure: such an SA simultaneously reflects the third phase of one triad and the first phase of the other triad which follows it immediately (fig.1i).

In any dialogue complex SAs representing the combinations of the enumerated structural types are possible. Let us list some of them:

(6) An initiating complex SA is a primary initiation of the goal with a complication, e.g. with a motivation (fig.1f).

(7) A reactive-initiative complex SA is a closure of the goal with a complication, for example: a) a positive closure with a counter-condition; b) a negative closure with a motivation(fig.1g).
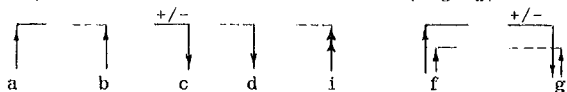

Fig.1

If the interaction phases corresponding to the types (4) and (5) are expressed implicitly and follow by default, then they are designated in the structural schemes by a dotted arrow.

2.3. The elementary SR-triad describes the structure of a minimal interaction (e.g. question – answer, inducement – refusal etc.). The structural schemes given in fig.2 illustrate the positive (a) and negative (b) closures of the goal in a minimal interaction:
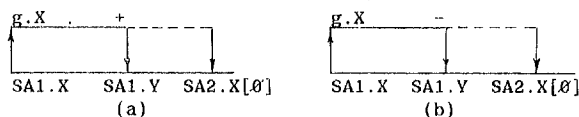

Fig.2

SA1.X is an initiation of a certain goal g.X by X.
SA1.Y is a positive (a) and negative (b) reaction of Y to g.X.
SA2.X is an acceptance of Y's reaction by X (may be expressed implicitly).

In the elementary SR-triad each SA is simple, without a complication. SR-triads describe both the dialogue fragments and simplest dialogues.The latter do not seem to be rare or artificial [cf. Hundsnurscher,1981], they are entirely typical, e.g. in communicative situation with random unknown partners:

    (a) SA1.X: What is the time, please?
        SA1.Y: Twenty minutes past four.
        SA2.X: Thanks.
    (b) SA1.X: Have you a cigarette?
        SA1.Y: Unfortunately not.
        SA2.X: Excuse me!

3. THE TYPES OF RELATIONS BETWEEN SR-TRIADS

In the general case the dialogue T-structure is described by a system of SR-triads which are connected with each other by the relations of intersection, imbedding and succession.

3.1. Let us consider the above types of the

relations on examples of dialogues with a complicated T-structure which consists of two SR-triads.

The intersection of SR-triads represents the T-structure of a dialogue containing a motivated refusal which is a negative reaction to the goal g.X initiated by SA1.X (e.g. to a request). This reaction includes a motive of the refusal satisfying X (see a structural scheme given in fig.3).
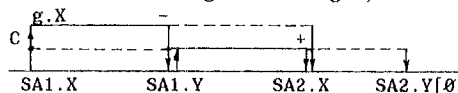

Fig.3

SA1.Y is a negative reaction to g.X with the initiation of a reason aimed at the component C of the SA1.X content.

SA2.X is a positive reaction to the reason with the removal of the goal g.X.

SA2.Y is an acceptance of X's reaction to the reason by Y (possibly by default).

In any real dialogue the refusal may be expressed indirectly, i.e. SA1.Y contains only the reason for non-performing the action to which Y is induced.

The imbedding of SR-triads characterizes the T-structure of the dialogue containing an initiating complex SA, consists of the initiation of g.X with a motivation (e.g. giving an argument for the goal g.X). In this case four kinds of the goal closure are possible (fig.4(a-d)).
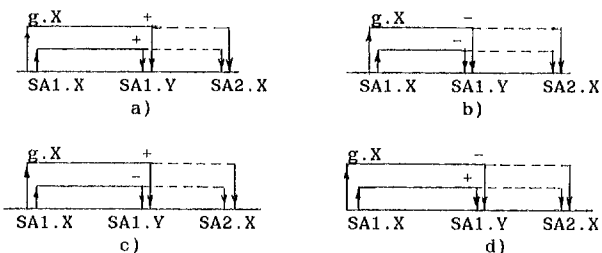

Fig.4

To illustrate these schemes, let us give the following variants of the dialogue:*)

SA1.X:Would you go with me, it is very necessary for me.
    SA1.Y:(a)Agreed,I'm all for it.
         (b)Certainly not and you needn't it.
         (c)I'l go, though I think it unnecessary.
         (d)I know it's necessary for you but I shan't go.
    SA2.X:I see.

The succession of SR-triads describes the following cases:

(a) the dialogue in which goals are initiated and closed in turns; the connection between these goals is not considered in the T-structure (see fig.5).
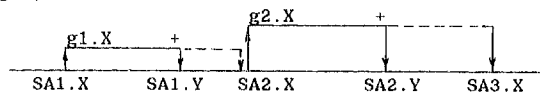

Fig.5

SA1.X: What is the time of Krasnodar flight?

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SA1.Y: It is at six o'clock in the afternoon.
SA2.X: How much does the grown-up ticket cost?
SA2.Y: Sixty five roubles.
SA3.X: Thanks.

(b) the dialogue containing the re-initiating SA2.X. The re-initiating g.X means the rejection of Y's reaction to g.X, initiated in SA1.X (see fig.6).
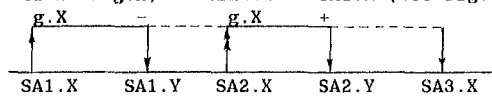
Fig.6

SA1.X: Come here, please.
SA1.Y: No, I shan't.
SA2.X: Now then, be quick!
SA2.Y: Well, I come.
SA3.X: Good for you!

3.2. More complicated dialogue T-structures represent combinations of the above types of the relations between SR-triads. These dialogues include intermediate speech acts: each SA initiating a subordinated goal opens an intermediate SR-triad which complicates the dialogue structure. Thus, for example, in a dialogue the speech acts of X, which are connected with the principal goal initiated by the SA1.X, may be defined as "insisting" or "persuading". This is the case if Y "offers resistance" to X, i.e. Y objects, expresses doubts or advances counter-arguments. Let us mention as an instance a similar dialogue (see the scheme in fig.7).

SA1.X: Let's go to the lecture about Sidorov.
SA1.Y: No, I doubt whether it will be interesting.
SA2.X: Well, to be sure, Ivanov will deliver the lecture himself, there will be slides and tape-records.
SA2.Y: When does it begin?
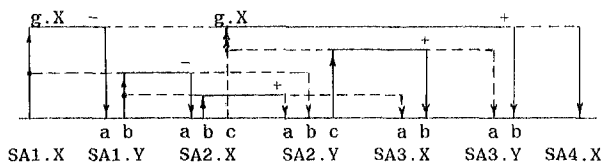SA3.X: In an hour.
SA3.Y: Agreed.
SA4.X: All right!

Fig.7

SA1.X is an initiating g.X (offer).
SA1.Y is:(a) an attempt to close g.X;
        (b) an initiation of the reason (doubt).
SA2.X is:(a) a disagreement with the doubt of Y;
        (b) advancing the counter-argument to SA1.Y(b);
        (c) re-initiating g.X which means rejection of the refusal [by default].
SA2.Y is:(a) an agreement with the counter-argument of X [by default];
        (b) an acceptance of X's disagreement [by default];
        (c) a requirement of supplementary information.
SA3.X is:(a) an acceptance of Y's agreement with the counter-argument [by default];
        (b) an answer to Y's requirement.
SA3.Y is:(a) an acceptance of X's answer [by default];
        (b) a positive reaction to the principal goal g.X (agreement).
SA4.X is a completing SA.

In the above communicative situation the parti-

cipant X may choose another strategy of attaining his principal goal g.X: X may initiate g.X not at once but "to pave the way" for it, for instance, to let Y know of the lecture, to elucidate the degree of his interest and, if necessary, to raise it, i.e. to construct a sequence of auxiliary SAs and then to advance the principal SA.X(offer). The T-structure of a similar dialogue interaction may be represented by the scheme in fig.8.
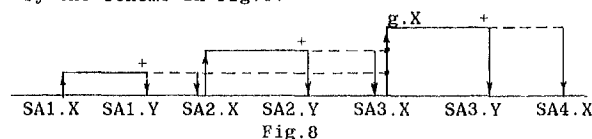
Fig.8

4.CONCLUSION

The above SR-triad, being the basic structural element of language interaction, reflects the interconnection of SAs according to the type of the "stimulus-reaction" relation. It is of special importance for us to distinguish the third phase which means that the positive or negative reaction of a participant to a certain goal initiated by his partner becomes final only after the acceptance (approval) of this reaction by the initiator of the goal. It should be noted that even a positive closure of g.X by Y does not always satisfy X, e.g. a prompt agreement is interpreted by X as thoughtless and insufficiently reasonable.

The acceptance of a reaction by a dialogue participant may happen at different levels of the interaction. Thus if Y gives advice to X's request for an advice (there are no violations at the communicative level) but the content of the advice (so-called extracommunicative information) does not satisfy X, then he looks in the content of the advice for the reason of initiating a further discussion. The above offered apparatus for describing the dialogue T-structure with the use of additional means reflecting the character of a connection between the goals can, apparently, be applied for integral multilevel structural representation of LI.

In the paper we have limited ourselves to the consideration of a dialogue (or a fragment of a dialogue) subordinated to one goal, its development, achievement or removal. However, except the dialogue connectedness with respect to goal, other types of SAs connectedness in a dialogue may be discussed, e.g. a thematic one. The dynamics of the development of the theme does not always correspond to the development of the goal. The introduction of the notion of the theme and the investigation of its relations to the goals will allow us to represent a thematic structure to accompany the T-structure of a dialogue or to be combined with it.

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