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ABSTRACT

We suggest a model of perlocutionary acts in order to explain how an actor plans speech acts to obtain a response from a partner. We introduce two knowledge structures, namely games and contracts, which are used together with themes by the mental processes underlying perlocutionary acts. We present our model through the discussion of a paradigmatic example; in particular we focus on the problem of shifting from the wants of the actor to the wants of the partner. Our analysis is developed at different levels of detail through the identification of CAUSE-TO-WANT, CONVINCENCE and REQUEST actions. Eventually, we discuss some theoretical implications of our approach to perlocution.

I THEORETICAL FRAMEWORK

Recent AI research in the field of communication shows interest for speech act theory and its basic concepts of illocution and perlocution, as developed by Searle (1969). Cohen and Perrault (1979) and Perrault and Allen (1980) propose a formal model of illocutionary acts, both direct and indirect. Such a model has been introduced for the implementation of an artificial system which participates in a natural language conversation. Given such a target, the treatment of perlocutionary acts is simplified. On the contrary, a deeper analysis of perlocutionary acts is a fundamental component for a theory of human communication which accounts for the response of interacting subjects.

Starting from the results achieved by Allen, Cohen and Perrault, we suggest a model of perlocutionary acts in order to explain how an actor plans speech acts to obtain a specific response from a partner. To explain the usual felicitous outcome of communication, we assume that the actor is able to handle a model of the partner. This assumption is consistent with the general hypothesis that the actor and the partner share the same pragmatic competence.

II CAUSING TO WANT

Let us assume that an actor A has a goal and forms a plan to achieve it. If the plan is interpersonal, i.e. it involves the cooperation of a partner P, A has to induce P to perform his role. In particular, we are interested in the most standard way

of achieving such a result, namely communication.

Following Cohen and Perrault (1979), we assume that:

- A performs an illocutionary act, the effect of which is P's recognition of A's want that P performs a specific action TT;
 - a process called CAUSE-TO-WANT is triggered by the illocutionary effect and generates the perlocutionary effect that P wants to perform T.
- The main point here is that the process CAUSE-TO-WANT actuates the transition from A's wants to P's wants. When both A and P are human systems, this transition deserves further investigation.

We claim that within a cognitive system a want can only be generated:

- by a knowledge structure of the kind of Schank and Abelson's life themes (1977);
 - as a subwant of a previously existing want.
- In the following we shall introduce two knowledge structures, namely games and contracts, which generate subwants and, together with themes, are used in our model of perlocution.

111 THE USE OF CONTRACTS IN PERLOCUTION

Our standpoint is that human interactions are regulated by games and contracts. A game is a knowledge structure which describes the interactions of two actors (the players), as regulated by scripts within a specific context (Airenti, Bara and Colombetti, 1983). The actions described in the scripts are not only performed for their effects, but also as moves of a relational game (think for instance of games like wife-husband or guest-host). Contracts differ from games in that the two actors mutually assume the obligation of performing certain actions. The concept of obligation presupposes a third entity in charge of sanctioning it. We distinguish between the stipulation of a new contract and the application of a pre-existing one, assumed as shared knowledge by the two actors.

We shall now focus on the process of application of pre-existing contracts by illustrating a paradigmatic example, in which the process of plan formation of an actor is reconstructed. Let us suppose that actor A wants to reach a location LC (see Figure 1, in which a slot-filler formalism is adopted). A applies the strategy of using somebody else's vehicle. This requires that the driver P of the vehicle wants to execute the action of driving

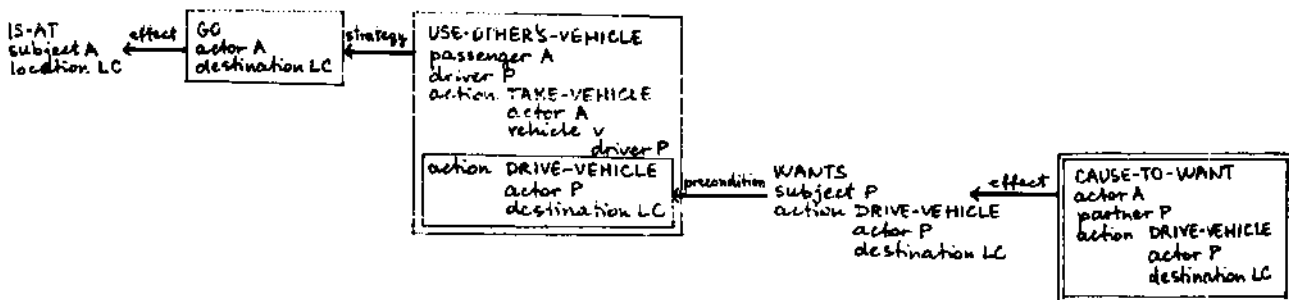


Figure 1 The plan for reaching a destination: first level of detail

his vehicle to LC. Therefore, A has to plan a CAUSE-TO-WANT action (detailed in Figure 2) with respect to P. We reduce the CAUSE-TO-WANT action to: (i) two inferences, made possible by a theme and a contract; (ii) a CONVINCe action.

The first inference is based on the TAXI contract (see Figure 1); it leads to assume the driver's want PARTICIPATE-IN-CONTRACT as a condition of the driver's want DRIVE-VEHICLE. The general structure of a contract includes at least slots for the two actors (the client and the contractor), the validity context, and the actions to be performed by the actors. The use of such a structure is that if an actor wants to participate in a contract, then he

wants to perform the actions assigned to him in the contract. In Figure 2 such an inference is made with respect to the contractor P.

The second inference shown in Figure 2 is based on the PROFESSION theme; it leads to assume the want of the client A, PARTICIPATE-IN-CONTRACT, as a condition of the contractor's want to participate in the same contract. The major point in this inference is the shift from the partner's want to the actor's one. The general structure of the theme includes at least slots for: (i) the subject who is supposed to have the theme; (ii) the if-part, i.e. its activation conditions; (iii) the then-part, i.e. the want activated by the theme.

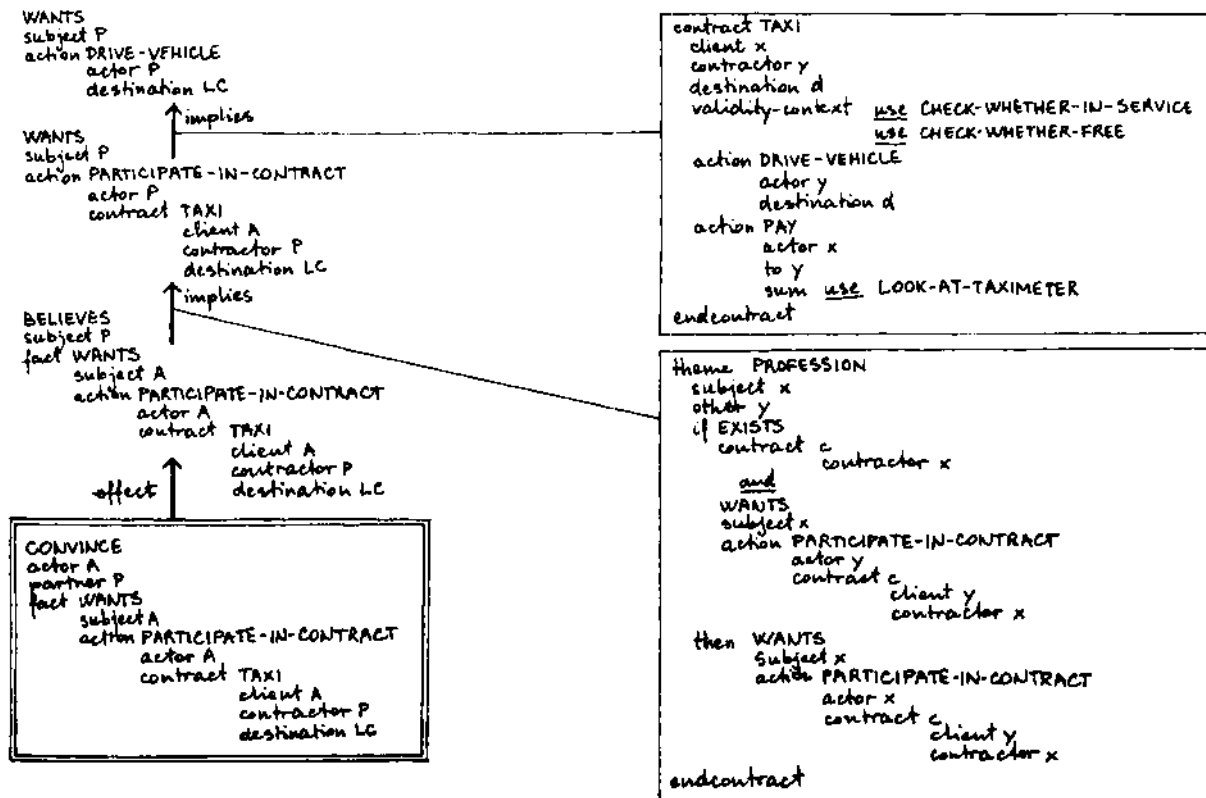


Figure 2 The plan for reaching a destination: second level of detail, showing the analysis of the CAUSE-TO-WANT action

The inference steps just described lead to a formula which is the effect of a CONVINCE perlocutionary act, detailed in Figure 3. We reduce the CONVINCE action to: (i) two inferences, the first one made possible again by the TAXI contract, and the second one by a communicational assumption of sincerity; (ii) a REQUEST action, which models an illocutionary act performed by A. The TAXI contract is used here in a symmetric way with respect to Figure 2. The meaning of the related inference is that a subject is supposed to participate in a contract as the client, if he manifests to a possible contractor his intention that the contractor performs his role in the contract. This assumption is sound if coupled with the condition that the validity context of the contract is satisfied

The sincerity assumption allows the partner to shift from the illocutionary effect of the request to its sincerity condition. Such an assumption can be considered as standard in interactions regulated by contracts. We shall not discuss the REQUEST action here, as it pertains to the domain of illocution, which has been thoroughly analyzed in the literature.

IV DISCUSSION

We show in Figure 4 the overall scheme of the process described in the previous section, for a generic action π and a generic contract π containing TT. Note that the final formula:

(WANTS (subject P) (action (Π (actor P))))

can be immediately derived from the content of the request of A to P:

(WANTS (subject A) (action (Π (actor P))))

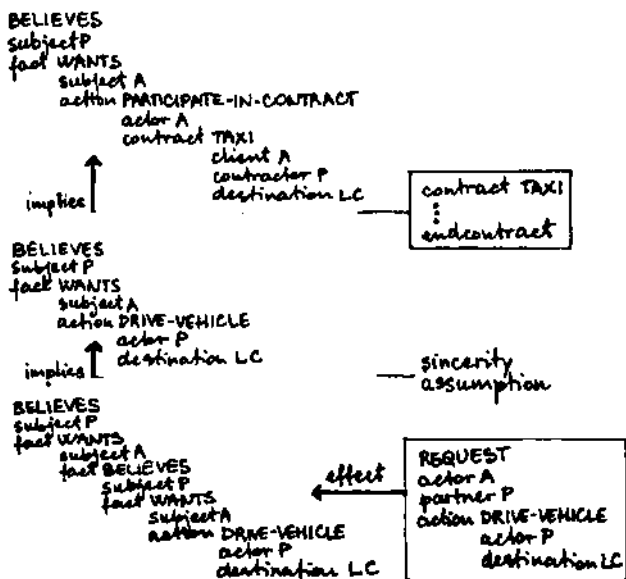


Figure 3 The plan for reaching a destination: third level of detail, showing the analysis of the CONVINCE action

This allows one to reach the same result by the shortcut shown in Figure 4 (dotted arrow). The full process is however necessary to account for:

- failure recovery: when an actor A executes his plan, a failure may occur at any point. The complete plan allows the actor to recover from the failure by partial replanning; e.g., if a client is refused by a suspicious taxi-driver, he can show the money to reassure the taxi-driver about his intention to pay (i.e. to participate in the contract);
- deceit: a deceitful client may exhibit an honest and wealthy look to convince the taxi-driver of his intention to participate in the contract, while having the actual intention of not paying for the ride.

Moreover, while the shortcut is computationally efficient, its correctness is proved only through the complete analysis provided.

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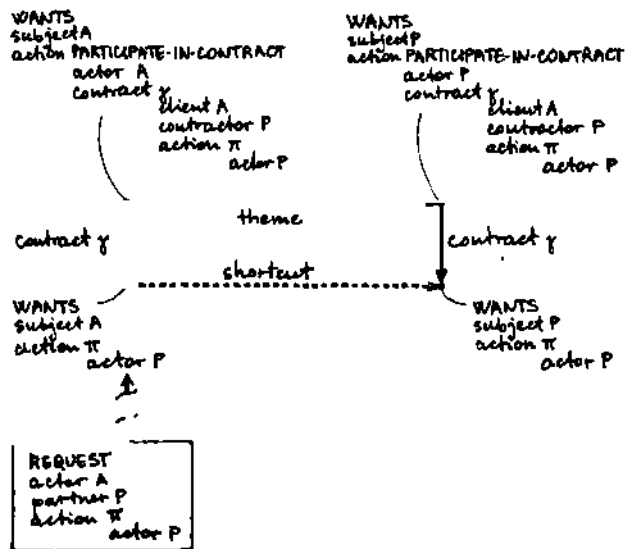


Figure 4 The overall scheme of the process of planning a perlocutionary act