HAL
open science

Goal-oriented Dialog as a Collaborative Subordinated Activity involving Collective Acceptance

Sylvie Saget, Marc Guyomard

To cite this version:

Sylvie Saget, Marc Guyomard. Goal-oriented Dialog as a Collaborative Subordinated Activity involving Collective Acceptance. 10th Workshop on the Semantics and the Pragmatics of Dialogue (Brandial 2006), 2006, Potsdam, Germany. pp.131-138. hal-00282131

HAL Id: hal-00282131

https://hal.science/hal-00282131

Submitted on 26 May 2008

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Goal-oriented Dialog as a Collaborative Subordinated Activity involving Collective Acceptance

Sylvie Saget
IRISA - Projet CORDIAL
6, rue de Kérampont - BP 80518
22305 Lannion
Sylvie.Saget@enssat.fr

Marc Guyomard
IRISA - Projet CORDIAL
6, rue de Kérampont - BP 80518
22305 Lannion
Marc.Guyomard@enssat.fr

hal-00282131, version 1 - 26 May 2008

Abstract

Modeling dialog as a collaborative activity consists notably in specifying the content of the Conversational Common Ground and the kind of social mental state involved. In previous work (Saget, 2006), we claim that Collective Acceptance is the proper social attitude for modeling Conversational Common Ground in the particular case of goal-oriented dialog. We provide a formalization of Collective Acceptance, besides elements in order to integrate this attitude in a rational model of dialog are provided; and finally, a model of referential acts as being part of a collaborative activity is provided. The particular case of reference has been chosen in order to exemplify our claims.

1 Introduction

Considering dialog as a collaborative activity is commonly admitted (Clark, 1996; Garrod and Pickering, 2004; Cohen and Levesque, 1991; Cohen and Levesque, 1994). Generally speaking, modeling a particular collaborative activity requires the specification of the collective intention helds by the agents concerned and requires the specification of the Common Ground linked to this activity. Common Ground refers to pertinent knowledge, beliefs and assumptions that are shared among team members (Clark, 1996). Thus, Common Ground is a collection of social mental attitudes.

The Common Ground linked to the dialogue itself (the Conversational Common Ground, CCG) ensures the mutual understanding of dialog partners. The CCG enables dialog partners to use abbreviated forms of communication and enables them to be confident that potentially ambiguous messages will be correctly understood (Klein et al., 2005). Dialogue partners become aligned at several linguistics aspects (Garrod and Pickering, 2004). There is an alignment, for example, of the situation model, of the lexical and the syntactic levels, even of clarity of articulation, of accent and of speech rate. Interactive alignment, of team members' situation model and of social representations, facilitates language processing during conversation and facilitates social interaction.

In the particular case of referent treatment, even for daily task, which use well-known objects with common known proper names to refer to, there is a wide range of possible manners to describe this object by words. To ensure mutual understanding, humans *"associate objects with expressions (and the perspectives they encode), or else from achieving conceptual pacts, or temporary, flexible agreements to view an object in a particular way"* (Brennan and Clark, 1996).

Thus, the Conversational Common Ground, since dialog is a mediated activity, contains all grounded elements linked to the way to communicate (as the necessary level of clarity of articulation or speech rate) as well as elements of dialog's history such as association between modes of presentation (linguistic objects) and mental representations: associations as conceptual pacts.

In previous work (Saget, 2006), we claim that Collective Acceptance is the proper social attitude for modeling Conversational Common Ground in the particular case of goal-oriented dialog. In the first part of this paper, we show

that such a modelization fits better than stronger mental attitudes (such as shared beliefs or weaker epistemic states based on nested beliefs). We also show that this modelization may be considered as partly due to the subordinated nature of goal-oriented dialog. Then, in the last part of the paper, a formalization of Collective Acceptance and elements are given in order to integrate this attitude in a rational model of dialog. Finally a model of referential acts as being part of a collaborative activity is provided. The particular case of reference has been chosen in order to exemplify our claims.

2 Collective Acceptance: the proper social attitude for modeling CCG

2.1 General claims on reference

In order to model dialog as a collaboration, reference resolution has to be considered as the *"act identifying what the speaker intends to be picked out by a noun phrase"* (Cohen and Levesque, 1994). Moreover, the collaborative nature of reference have been brought to the forefront (Clark and Wilkes-Gibbs, 1986). More precisely, reference is not the simple sum of the individual acts of generating and understanding, but is a collaborative activity involving dialog partners. Thus, according to H.H. Clark et al. in (Clark and Bangerter, 2004), these individual acts are motivated by two interrelated goals:

- Identification: Speakers are trying to get their addressees to identify a particular referent under a particular description.
- Grounding: Speakers and their addresses are trying to establish that the addressees have identified the referent as well enough for current purpose.

How the identification goal is achieved ? First at all, when speaker has the intention to refer to a particular object, he has to choose a description of this object. Traditionally, this choice is viewed as depending on the beliefs of dialog participants and as depending on availability. In other words, speaker can refer with a definite description $\imath x.\phi(x)$ to an object o iff it is in the unique available object for which $\phi(o)$ holds. Moreover, H.H. Clark and C.R. Marshall (Clark and Marshall, 1981) claimed that mutual knowledge of $\phi(o)$ is necessary, if a description should refer successfully to an object o.

For example, let's imagine that two persons, Tom and Laura, who have been to the same school. Tom suggests to Laura: "Shall we meet in front of our ex-school's basketball court". The choice of the description of the intented place should be explained by the fact that Tom thinks that the following mutual belief is part of their common ground:

- $MBel_{Tom,Laura}(frontOf(l,h)$
  $\wedge\, basketballCourt(h)$
  $\wedge\, partOf(h,g)$
  $\wedge\, studentAt(Tom,g)$
  $\wedge\, studentAt(Laura,g))$,
  where:
  - $MB_{i,j}(\phi)$[1] stands for "ϕ is a shared belief between agents i and j, on i's point of view",
  - $frontOf(x,y)$ stands for "x is located in front of y",
  - $basketballCourt(x)$ stands for "x is a basketball court",
  - $partOf(x,y)$ stands for "x is part of y",
  - $studentAt(x,y)$ stands for "y goes or has been at school y".
- Tom's choice should also be explained by the following weaker belief state:
  $Bel_{Tom}(MBel_{Laura,Tom}(frontOf(l,h)$
  $\wedge\, basketballCourt(h)$
  $\wedge\, partOf(h,g)$
  $\wedge\, studentAt(Tom,g)$
  $\wedge\, studentAt(Laura,g))$
  where $B_i(p)$ stands for "i believes (that) p".

The main assumption behind this kind of approach is the rationality and the cooperativeness of dialogue participants. In addition, to infer from the fact that someone utters that p that she must also believe that p is commonly assumed as a general rule (Lee, 1997). Nonetheless, this assumption is difficult to handle in practice, as J.A. Taylor et al. have shown (Taylor et al., 1996), mainly because of the computational complexity involved. Furthermore, they proved that, in most cases, nested beliefs are not necessary beyond the second level of nesting (ie. what an agent thinks another agent thinks a third agent (possibly

[1] See mutual belief's definition in section 3.1

the first one) thinks), as long as deception is not involved. In the particular case of reference, deception may be involved, as the following situation exemplify, and then may require the handling of deeply nested belief.

Tom and Laura live both in Berlin. They lunched at a restaurant called "Chez Dominique". Following this meal, one may reasonably assume that:

- $Bel_{Laura}(name(l) =$" Chez Dominique "),
- $Bel_{Tom}(name(l) =$ " Chez Dominique "),
- And $MBel_{Tom,Laura}(name(l) =$ " Chez Dominique ".
  We only treat the particular case of definite reference, which counts as an indication to access a mental representation of the intended referent that is supposed to be uniquely identifiable for the hearer. So, it can be viewed as a result of a function.

Then, Laura left Berlin for two years. During this period, the restaurant changed name. Its new name is "Restaurant la Petite Maison". Tom knows it, but Laura does not know it. Thus, the following situation holds:

- $Bel_{Tom}(name(l) =$ " Restaurant la Petite Maison "),
- $Bel_{Laura}(name(l) =$ " Chez Dominique ").

The return-day Laura and Tom (who did not leave Berlin) must lunch together. They speak by phone in order to agree upon a time and a restaurant. Let's consider the following exchange between them:

...

(U1) Laura: " Will we lunch at the restaurant where we have been yet ? "

(U2) Tom: " Which one ? "

(U3) Laura: " *Chez Dominique.* "

(U4) Tom: " Ok. "

...

At the end of this talk, a conceptual pact of conceptualizing the restaurant as "the place called *Chez Dominique*" is established. If we consider that the Conversational Common Ground has to be modelled in terms of mutual belief, the following mutual belief has been formed, at least on Laura's point of view: $MBel_{Laura,Tom}(name(l) =$ "Chez Dominique"). Tom's choice of the referring expression can not be based on Tom's point of view on the beliefs shared with Laura, because from $MBel_{Tom,Laura}(name(l) =$ "Chez Dominique"), one may infer, following mutual belief's definition (ie. 3.1) that $Bel_{Tom}(name(l) =$ "Chez Dominique ") which is incoherent with $Bel_{Tom}(name(l) =$ "Restaurant la Petite Maison"). In fact, Tom's choice should be explained in terms of his nested belief: $Bel_{Tom}(MBel_{Laura,Tom}(name(l) =$ "Chez Dominique")) and this is a case of deception.

According to previous work (Saget, 2006), we claim that such a treatment of reference, depending on beliefs of dialogue participants at the first place, which may lead to computational representation and treatment with high complexity, are neither necessary, nor proper. The proper social attitude is Collective Acceptance.

2.2 Collective Acceptance, reference and subordinated activity

Modeling conceptual pacts in terms of belief states implies that the literal description has to be true, or, more precisely, consistent with dialog partners' beliefs (at least with shared beliefs between dialog partners on addressee's point of view), in order to ensure their rationality. But the goal of Tom and Laura, in our preceding examples, is to determine a place in such manner that each one identifies it correctly; then, they will be able to meet at the correct meeting-place. Their goal is not to establish the truth with respect to the place in question. Actually, the establishment of conceptual pacts is governed by the " grounding criterion " (Clark and Schaefer, 1989): " *The contributor and the partners mutually believe that the partners have understood what the contributor meant to a criterion sufficient for the current purpose.*" Thereby, one can establish a conceptual pact in conflict with ones own beliefs, if this pact enables each group member concerned to achieve the current common goal. In the first example, one can imagine that the basketball-court does not exists any more, and that both Tom and Laura know this fact. Tom's utterance and Laura's

agreement are still realistic.

Collective acceptance of a group of agents, in contrast with belief, may be inconsistent with their beliefs (individual or shared beliefs). In fact, a description is accepted by the addressee if it allows him to identify the intented referent and if an inconsistent description is not an obstacle to the realization of current goals. For example, if Tom have to send a letter to Laura (having two postal addresses) and say: ”Must I send you the letter at 16 Collingham Road, London”. Even if Laura identifies the correct place, the address has to be correct to receive Tom’s letter. Finally, conceptual pact is a temporary and flexible concept, this property does not match with the ideal of integration or agglomeration of beliefs.

How explaining the use of Collective Acceptance ? Generally, this may be partly due to a particular aspect of goal-oriented dialog as a subordinated sub-activity. Goal-oriented dialogues are implied by two interdependent collaborative activities, as explained by A. Bangerter et al.: *”Dialogues, therefore, divide into two planes of activity (Clark, 1996). On one plane, people create dialogue* ***in service of*** *the basic joint activities they are engaged in-making dinner, dealing with the emergency, operating the ship. On a second plane, they manage the dialogue itself-deciding who speaks when, establishing that an utterance has been understood, etc. These two planes are not independent, for problems in the dialogue may have their source in the joint activity the dialogue is in service of, and vice versa. Still, in this view, basic joint activities are primary, and dialogue is created to manage them.”*[2] (Bangerter and Clark, 2003). One of team members’goals is to understand each other, in other words to reach a certain degree of intelligibility, sufficient for the current purpose.

One may distinguish between two kinds of sub-activities: sub-activities which are subparts of another activity (thus, which transcripts the compositionality of basic activities) and sub-activities *in service of* another activity, ie. subordinated (sub-)activities, such as planning, problem solving, interaction with other agents (goal-oriented dialog) and so on. On the logical point of view, the rationality of the involved agents is rendered by a coherent mental state and by the notion of rational action (Cohen and Levesque, 1990; Sadek, 1994). For example, the beliefs and intentions of an agent form a consistent set and agent’s actions are also consistent with his beliefs and intentions. At the first glance, the coherence of action with beliefs seems to be irrefutable. However, to the extend that the success of a subordinated activity is governed by the generalization of the sufficient criterion and on the basis of preceding arguments, one may reasonably assume that agents’ rationality does not strictly imply the coherence between the actions being parts of a subordinated activity and the beliefs states of the involved agents. For these reasons, conceptual pact match better with acceptance and modeling conceptual pacts by collective acceptance insure the rationality of team members. However, agent’s rationality is contingent on the motivational context and on the context of mental states of dialog partners.

2.3 The philosophical notion of Collective Acceptance

Studies on dialog modeling as a collaborative activity address the philosophical problem of determining the type of mental states which could be ascribed to team members. Based on the observation that sometimes one may encounter situations where one has to make judgements or has to produce utterances that are contrary to ones privately held beliefs, philosophers, such has (Cohen, 1992), have introduced the notion of (Collective) Acceptance, which is an intentional social mental attitude. (Collective) Acceptances have the following properties, in contrast with beliefs (Wray, 2001):

- They are voluntary (or intentional);
- They holds on utility or success (thus we can accept something we believe false);
- They does not required justifications;
- All or nothing: we decide to accept or not to accept.

In J.L. Cohen’s famous book, ”An essay on belief and acceptance” (Cohen, 1992), the author argue that the conversational implicature ”a person’s saying that p implies that this person believes p”

[2] This claim must be extended to other kind of basic activity such as cooperative or competitive activities.

is not the rule and that speech acts such as concessions, acknowledgements, agreements and admissions that p do not imply the existence of the corresponding belief. In such cases, "I thereby accept that p" means that "I take that proposition as a premiss for any relevant decision or argument" (Cohen, 1992). In previous work (Saget, 2006), we claim that an act of reference using a particular description $\imath x.descr(x)$ of an object o does not imply that the speaker believes that $\imath o.descr(o)$ holds, but implies that the speaker believes that this description enables the addressee to pick out the correct intented referent.

3 Formal part

3.1 The dialog model

Rational models, based on (Cohen and Levesque, 1990), can be considered as a logical reformulation of plan-based models. They integrate, in more, a precise formalization of dialog partners' mental states (their beliefs, choices (or desires) and intentions), of the rational balance which relates mental attitudes between them and relates mental attitudes with agents' acts. Moreover, dialogue acts' preconditions and effects are expressed in terms of dialog partners' mental states. Thus, this is hopeful to model precisely mental attitudes.

The chosen model is based on the rational model proposed by D. Sadek (Sadek, 1994), extending (Cohen and Levesque, 1990), which rests upon a set of principles (axiom schemas) of which dialog acts are branched off. A dialog system is considered as a cognitive agent which is rational and have a cooperative attitude towards other agents (as the dialog system's users) and this agent is able to communicate with other agents.

Mental states (beliefs, intentions,...) and actions are formalized in a first-order modal logic. In the following of the paper, the symbols $\neg, \wedge, \vee, \Rightarrow$ stand for the connectors of the classical logic (respectively negation, conjunction, disjunction and implication); $\forall, \exists$ stand for the universal and existential quantificators; p stands for a closed formula denoting a proposition; i, j denote agents and ϕ is a formula schemata. We only need to introduce here two mental attitudes, belief and intention:

$B_i(p)$ stands for "i (implicitly) believes (that) p",

$I_i(p)$ stands for "i intends to bring about p".

Action expressions can be formed with primitive acts: with $(a_1; a_2)$ which stands for sequential action (where a_1 and a_2 are action expressions) and with $(a_1|a_2)$ which stands for non-deterministic choice.

$Done(a, p)$: "a has just taken place, and p was true before that"
$Done(a) = Done(a, true)$

The model of communicative acts is:

$< i, TypeOfCommunicativeAct(j, \phi) >$

FP: "Feasible Preconditions": the conditions which must be satisfied in order to plan the act;

PE: "Perlocutionary Effect": the reason for which the act is selected.

For example, the communicative model of "i informing j that p" is:

$< i, INFORM(j, \phi) >$

FP: $B_i(\phi) \wedge \neg B_i(B_j(\phi))$

PE: $B_j(\phi)$

In this model, utterance generation and understanding, and thus referential acts are considered as individual acts. Furthermore, the perlocutionary effects are considered as achieved as soon as the communicative act has been performed.

So dialog and reference treatment are not considered as collaborative activities. In order to do so, notably, the set of mental attitudes has to be extended with notions such as collective intention and mutual belief.

There is no consensus on the definition of collaboration. We consider that a group of agents is engaged in a collaborative activity as soon as they share a collective intention.

$CollInt_{i,j}(\phi)$ stands for "i and j collectively intends to bring about p, on i's point of view".

$MB_{i,j}(\phi)$ stands for "ϕ is a shared belief between agents i and j, on i's point of view" and mutual beliefs are formalized as:

$$MB_{i,j}(\phi) \equiv Bel_i(\phi \wedge MBel_{j,i}(\phi))$$

Furthermore, Collective Acceptance have to be included.

3.2 Collective Acceptance

We propose the following formalization of the philosophical notion of Collective Acceptance:

- $CollAcc_{ij}(\phi)$ stands for "ϕ is a collective acceptation between agents i and j, on i's point of view"
- Collective Acceptance is an intentional attitude, ie. it comes from individual acts of involved agents:
  $((\exists \alpha, \beta \in \{i, j\}).$
  $Done(Prop_{\alpha\beta}(\phi)) \wedge Done(Accept_{\beta\alpha}(\phi)))$
  $\Rightarrow CollAcc_{ij}(\phi)$
  where:
  - $Prop_{ij}(\phi)$ stands for "i proposes j to consider ϕ"
  - $Accept_{ji}(\phi)$ stands for "j accepts to consider ϕ (towards i)"
  - $Prop_{ij}(\phi)$ and $Accept_{ji}(\phi)$ are individual actions.
- A proposition involves a social obligation to react:
  $Done(Prop_{i,j}(\phi))$
  $\Rightarrow (I_j(Done(($

$$\begin{array}{l} Accept_{j,i}(\phi) \\ |(Prop_{j,i}(\phi')) \\ |(request_{j,i}(Prop_{i,j}(\phi'')))))) \end{array}$$

$$\wedge((\phi' \neq \phi) \wedge (\phi'' \neq \phi)))$$

Following (Boella et al., 2000), we consider that social obligations as pro-attitudes are not required and that an anticipatory coordination takes place on the speaker's point of view. This phenomenon is govern by a social rule, acquired during preceding social interaction. This social rule is transcribed by repeated use through a reaction to the realization of a particular action (on the speaker's point of view) and through a reaction to the observation of an event which is the occurrence of a particular action (on the addressee's point of view). Since, reaction is a unintentional action, we have to extend the kind of action of the basic model. In fact, this model only considers what we name *intentional actions*. Intentional actions of an agent are those generated by a chain of intention, in our model they are generated by the activation of the rational axiom (Sadek, 1994):

$I_i(p) \Rightarrow I_i(Done(a_1 \vee \cdots \vee a_n))$
The intention of an agent, to achieve a given goal, generates the intention that one of the acts, which satisfies the following conditions, be performed:

1. $(\exists x)B_i(a_k = x) \equiv Bref_i(a_k)$:
   the agent i knows the action a_k,
2. $EP_{a_k} = p$ and
3. $\neg I_i(\neg Possible(Done(a_k)))$

Reactions have to be added. Reactions of an agent are defined as those generated by the activation of such axiom:

$\phi \Rightarrow I_i(Done(a_1 \vee \cdots \vee a_n))$
where ϕ is the result of the perception of an event or an action's occurrence.

4 Model of Reference as a collaborative activity

4.1 Model of Referential Act

In order to model dialog as a collaboration, reference treatment has to be considered at the speech act level (Cohen and Levesque, 1994), as it is done in A. Kronfeld's work (Kronfeld, 1990).[3]

In order to integrate Collective Acceptance in reference, we propose an extension of an existing model of referential acts based on A. Kronfeld's work in the rational model used (Bretier et al., 1995). The act of reference from an agent i to another agent j, using the conceptualization x (which corresponds to the semantics of the referential expression) to refer to the object y is formalized as:

$< i, REFER(j, x, o) >$

FP: $I_i(refer_{i,j}(o)) \wedge Bref_i(o)$;

EP: $B_j((\exists o)I_i(refer_{i,j}(o)))$

$$\begin{array}{l} \wedge\ I_j(Bref_j(o)) \\ \wedge\ RepSameObj(o, o') \\ \wedge\ Done(Prop_{i,j}(referBy(x, o))) \\ \wedge B_j(Done(Prop_{i,j}(referBy(x, o)))) \end{array}$$

where:

- o et o' are object mental representations;

[3] For a computational implementation is provided in (Jorgensen, 2000).

– $I_i(refer_{i,j}(o))$ stands for "a communicative intention of i to refer to o, the addressee is j";
– $RepSameObj(o, o')$ stands for "the mental representations o and o' represent the same object";
– $referedBy(D, R)$ stands for "the description D refers to the referent R".

Generating a referential expression is considered as the generation of an instance of such plan and the interpretation of a particular referential expression as the recognition of an instance of such plan. And the whole process is governed by two meta-goal, on the speaker's point of view [4]:

$$CollInt_{ij}(MB_{ij}(I_i(refer_{i,j}(o)))) \wedge$$
$$CollInt_{ij}((\exists D)CollAcc_{ij}(referedBy(D, o)))$$

4.2 Return to the example

Let's consider the example shown in 2.1, the task level and the conversational level have to be separated [5]. In uttering (U1), Tom wants to make a necessary choice for the meeting task, such as :

$$I_{Tom}((\exists l)MBel_{Tom,Laura}(meetingPlace = l))$$

Tom makes his choice: his mental representation of the restaurant chosen is o. In order to realize his preceding intention, he has get through to Laura:

$$I_{Tom}(refer_{Tom,Laura}(l))$$

Remaining the goal of referential acts (2.1), the choice of the description of the intented place is guided by its capacity to enable Laura to pick out, *in her mental state*, the mental representation of the correct place. That is, the description enables Laura to isolate the correct mental representation from other possible ones, with sufficient evidence of mutuality. This is a pragmatic (ie. contextual) guideline, which corresponds to the Identification goal.

Thus, Tom produces a description of the intended place: *"the restaurant where we have been yet"*. He thinks that Laura is able to identify the correct place basing on the description, ie. he thinks that she is able to realize the following intention:

Identification task:

$$I_{Laura}(Bref_{Laura}(l') \wedge RepSameObj(o, o'))$$

But, Laura is not able to pick out a single place: there is other restaurants, where they have been together. Moreover, Laura has to answer to Tom's proposition:

$$B_{Laura}(Done(Prop_{Tom,Laura}(referedBy(\imath x.\phi(x), l'))).$$

She is obliged to reply to his proposition by the social rule. Besides, the precondition of accepting a conceptual pact is to have realized the Identification goal; otherwise, the addressee has the choice between other possible reactions. As Laura failed to succeed, she chooses to ask for clarification in (U2):

$$request_{Laura,Tom}$$
$$(Prop_{Tom,Laura}(referedBy(\imath x.\phi'(x), l'))).$$
$$\wedge(\phi' \neq \phi)$$

In order to achieve understanding, by a cooperative attitude, Tom realizes Laura's request in (U3). Laura is now able to pick out a single mental representation of the place. She likes it, so she agrees. The social goal obliges Laura to react to Tom's new proposition. As the precondition of accepting is fulfilled, with uttering (U4), Laura realizes the following intention:

$$Done(Accept_{Laura,Tom}(referedBy(\imath x.\phi'(x), l'))).$$

Finally, following Collective Acceptance's definition, a conceptual pact is created:

$$CollAcc_{Laura,Tom}(referedBy(\imath x.\phi'(x), l').$$

As well as, mutual understanding:

$$MB_{Laura,Tom}(I_{Tom}(refer_{Tom,Laura}(l')),$$

and the coordination on the task level:

$$MBel_{Laura,Tom}(meetingPlace = l')).$$

5 Conclusion

Modeling dialog as a collaborative activity consists notably in specifying the content of the Conversational Common Ground and the kind of social mental state involved. Even if mutual beliefs, or weaker forms of belief states, do not rise to inconsistencies, but, are still sufficiently strong for the participants to have successful cooperation or coordination of actions. Epistemic states involve computational treatments with high complexity.

[4] On the addressee point of view, it is govern by dual goals with existential quantifier.

[5] Further details may be found in(Saget, 2006).

We show that modeling the CCG by an epistemic state is neither necessary, nor proper. Considering only genuine conceptual pacts limits the capacity of interaction and may leads to ”real” communicative errors.

We have proposed a formalization of Collective Acceptance, furthermore, elements haven been given in order to integrate this attitude in a rational model of dialog. Finally, a model of referential acts as being part of a collaborative activity has been provided.

Further studies will hold on the extension of the general principles proposed to the dialog itself. Moreover, collective acceptance is a particularly interesting attitude because it allows to model reference and dialog itself as situated activities in an elegant manner. Finally, this concept may provide symbolic elements in order to form the grounding criterion, which is a notion especially hard to make up, because this criterion is highly context dependant. Grounding criterion differs depending on the people involved, the domain concerned and so on.

Acknowledgment

This work is partially financed by the grant A3CB22 / 2004 96 70 of the regional council of Brittany.

References

[Bangerter and Clark2003] A. Bangerter and H. H. Clark. 2003. Navigating joint projects with dialogue. *Cognitive Science*, (27):195–225.

[Boella et al.2000] G. Boella, R. Damiano, and L. Lesmo. 2000. Social goals in conversational cooperation. In *Proceedings of the First SIGdial Workshop on Discourse and Dialogue*, pages 84–93. Association for Computational Linguistics, Somerset, New Jersey.

[Brennan and Clark1996] S. E. Brennan and H. H. Clark. 1996. Conceptual pacts and lexical choice in conversation. *Journal of Experimental Psychology: Learning, Memory and Cognition*, 22:482–1493.

[Bretier et al.1995] P. Bretier, F. Panaget, and M.D. Sadek. 1995. Integrating linguistic capabilities into the formal model of rational agent : Application to cooperative spoken dialogue. In *AAAI-95, Fall Symposium of Rational Agency*, Stanford, MA.

[Clark and Bangerter2004] H. H. Clark and A. Bangerter. 2004. Changing conceptions of reference. In I. Noveck & D. Sperber, editor, *Experimental pragmatics*, pages 25–49. Palgrave Macmillan, Basingstoke, England.

[Clark and Marshall1981] H. H. Clark and C. R. Marshall. 1981. Definite reference and mutual knowledge. In *Elements of discourse understanding*, pages 10–63. Cambridge University Press, Cambridge.

[Clark and Schaefer1989] H.H. Clark and E.F. Schaefer. 1989. Contributing to discourse. *Cognitive Science*, 13:259–294.

[Clark and Wilkes-Gibbs1986] H.H. Clark and D. Wilkes-Gibbs. 1986. Referring as a collaborative process. In *Cognition*, volume 22, pages 1–39. The MIT Press.

[Clark1996] H. H. Clark. 1996. *Using Language*. Cambridge: Cambridge University Press.

[Cohen and Levesque1990] P.R. Cohen and H.J. Levesque. 1990. Rational interaction as the basis for communication. In *Intentions in Communication*, pages 221–256. MIT Press, Cambridge, MA.

[Cohen and Levesque1991] P.R Cohen and H.J. Levesque. 1991. Confirmations and joint actions. In *Proceedings of the International Joint Conference on Artificial Intelligence (IJCAI-91)*, pages 951–957.

[Cohen and Levesque1994] P.R. Cohen and H.J. Levesque. 1994. Preliminaries to a collaborative model of dialogue. *Speech Communication*, 15:265–274.

[Cohen1992] J. Cohen. 1992. *An Essay on Belief and Acceptance*. Oxford University Press, Oxford.

[Garrod and Pickering2004] S. Garrod and M.J. Pickering. 2004. Why is conversation so easy? *Trends in Cognitive Sciences*, 8:8–11.

[Jorgensen2000] S.W. Jorgensen. 2000. *Computational reference - An investigation, Development and implementation of Kronfeld's Theory of reference*. Ph.D. thesis, Copenhagen Business School.

[Klein et al.2005] G. Klein, P.J. Feltovitch, and D.D. Woods. 2005. Common ground and coordination in joint activity. In *Organizational simulation*. Wiley, New York.

[Kronfeld1990] A. Kronfeld. 1990. *Reference and Computation : An Essay in Applied Philosophy of Language*. Cambridge University Press.

[Lee1997] M. Lee. 1997. Rationality, cooperation and conversational implicature. In *Proceedings of the Ninth Irish Conference on Artificial Intelligence*.

[Sadek1994] M.D. Sadek. 1994. Communication theory = rationality principles + communicative act models. In *AAAI-94, Workshop on Planning for Interagent Communication*, Seattle, Washington, USA.

[Saget2006] S. Saget. 2006. In favour of collective acceptance : Studies on goal-oriented dialogues. In *Proceedings of Collective Intentionality V (to appear)*, Helsinki, Finland.

[Taylor et al.1996] J.A. Taylor, J. Carletta, and C. Mellish. 1996. Requirements for belief models in cooperative dialogue. *User Modeling and User-Adapted Interaction*, 6(1):23–68.

[Wray2001] K.B. Wray. 2001. Collective belief and acceptance. *Synthese*, 129:319–333.