Contracts in the Common Ground

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Abstract

The paper explores the introduction of contracts in the common ground by means of requests, promises and questions. Various modal operators are introduced to achieve the modelling of these new additions to the conversational record. The paper extends the treatment of Zeevat 97 and introduces the beginnings of a theory of action.

1 Introduction

In my Mundial paper, I gave the outlines of a framework for formal pragmatics. I take it to be the case that an important parameter in the explanation of linguistic behaviour is the estimate of the language user of the common ground that obtains between himself and his audience. This parameter controls the use of anaphoric and presuppositional devices, the choice of words in general and the communication plan of the speaker in general. It also controls the interpretation process, when the hearer tries to make sense of the utterances and the communicative behaviour of the speaker. The framework proposed is a special version of update semantics: update semantics in which the information state that gets changed is (the user's pictures of) the common ground. The model is intended as a further elaboration of Stalnaker's model for pragmatics as developed in Assertion.

Unlike others, I take it to be essential that the common ground is not taken to be something that really exists —a byproduct of the speaker and his audience having certain beliefs— but an object that is constructed independently of the actual beliefs of the commmunication partners. Common grounds also typically contain the beliefs of the communication partners, thus allowing the modelling of conflict. This leads to a treatment of speech acts that is more fine-grained than the traditional treatments.

I take it that update semantics combines traditional logic with a set of pragmatic operations. Logical operations are distinguished by the following characteristics. They can be characterised modeltheoretically by a Tarskian truth-definition, they do not allow truthvalue gaps and they are fully recursive. In contrast, pragmatic operators are not normally fully recursive, they fall outside the scope of model theoretic semantics and they tend to be defined only in certain circumstances. Typical pragmatic operators are assertion and other speech acts, presupposition and the operation that turns an information state into a common ground.

A shortcoming of the earlier work was that the whole dimension of the common ground was epistemic and that therefore there was no way of expressing very common speech acts such as questions, promises and requests into the framework. The current paper tries to give a first attempt at coming to grips with incorporating these notions into the framework and giving some tentative analyses of the speech acts involved. My hope is that these analyses contribute to the analysis of the relation that holds between a question and an information state and that expresses that the information state answers the question. This relation is crucial for the understanding of topic/focus articulation and for understanding communicative behaviour. Even on such a sophisticated theory of questions as the provided by Stokhof & Groenendijk, the relation is problematic for *why*- and *how*-questions (and for certain normal *wh*-questions such as *who is John*?). I have elsewhere tried to show that the problems fully extend to *wh*-questions in an epistemic framework, where the partition approach does not work anymore. Getting more grip on the concepts involved in a pragmatic analysis of these questions therefore seems crucial.

2 Goals, Schedules and What Must Be

A goal is something that one wants to achieve. Having a goal is not necessarily the same as having decided to act on that goal. It may be the case that the goal is not immediately achievable and that certain subgoals have to be reached first. It is also not given that goals are mutually compatible: think of various ways of getting dinner tonight.

Goals lend themselves for a preference semantics. We can leave outside consideration those goals of which the subject recognises that they are unattainable. Together that then gives a preference preorder over the belief alternatives of a subject. $W_x p$ will be true iff x prefers those of his belief alternatives in which p is true over the ones in which p is false. We will assume that the relation is irreflexive, transitive and asymmetric. The state of no goals is the empty relation. The occurrence of symmetry makes the set of goals inconsistent.

Goals can be updated by refining the order, as long as asymmetry can be maintained.

We will make the assumption that goals are false, mainly because it is a clean way to get rid of goals that are satisfied.

On the common ground as a whole, we can have agreed goals. Consider the the common ground of a speaker S and a hearer H. If it is the case that $W_s p$ and $W_h p$ both hold in the common ground, then it is a common goal. The common goals inherit their consistency from the goals in the participants' belief states represented in the common ground. $W\varphi$ abbreviates $W_s\varphi \wedge W_h\varphi$, if S and H are the two participants of the common ground.

Certain goals have been decided to act upon and change their status. In the first place, if a goal has been decided upon, it will be carried out. Not that we have infallibility in carrying out our actions, we sometimes fail. But scheduling an action is believing in its success. So it seems a reasonable approximation to assume that an actor believes that the scheduling of an action leads to its realisation. The principle is not entirely accurate since we may decide for actions whose failure brings only little trouble to schedule them even if we assume a fairly high risk of failure. But we will adopt it since we do not plan to deal here with sophisticated decision making.

The principle can be stated as:

$B_x(P_xp \to \Box p)$

Here P_xp expresses that x has decided to carry out p. This requires that p is an action of which x is the agent.

The second principle that we adopt about courses of action that have been decided upon is that they continue to be goals:

$P_xp \to W_xp$

We further assume about P_x and W_x that they are transparant to belief: $P_x\varphi \leftrightarrow B_xP_x\varphi$
$W_x\varphi \leftrightarrow B_xW_x\varphi$
$B_x\varphi \leftrightarrow B_xB_x\varphi$

This leads to the principle that on a common ground with S and H we have that

$P_s\varphi \wedge B_h\Box\varphi \to \Box\varphi$
$P_h\varphi \wedge B_s\Box\varphi \to \Box\varphi$

This allows an abbreviation: we can say that the common ground schedules the action φ iff one of the participants has made it common ground that he has scheduled it and the others trust him. Trust of x in y with respect to a scheduled action p is the principle:

$B_x(P_yp \to \Box p)$

The last modal operator that we have to consider is that of causal necessity: in our model we consider a unique set of times forming a linear order and a set of possibilities such that each pair (t, i), with t a time and i a possibility is an atemporal possibility. The future of a possibility (t, i) is defined by a function from (t, i) to a set of possibilities that coincide up to t with i.

Updates can so eliminate possible futures as well as possibilities.

3 Speech Acts

A request by S for H to carry out A can be analysed as involving the proposition p, that is the predication of A to H.

The speech act of the request can be treated as follows:

The preconditions are:

$CG \not\models p$ (p has not happened yet)

$CG \not\models P_hp$ (the hearer is not yet planning p)

$CG \not\models \neg\Box p$ (p is not impossible)

$CG \not\models \neg W_sp$ (the speaker does not want p to happen)

and perhaps:

$CG \not\models \neg W_h p$ (the hearer is not disposed against p)

All these conditions are part of the action presuppositions of the speech act. If p has already been done the speech act of requesting for p is void. We could strengthen this to condition to

$CG \models \neg p$

But then we do not allow any more for the situation that p is the case but S does not know so. Here we want to part of the common ground.

The fact that the minimal contribution is $W_s p$ entails that S does

has the entailment that S believes p is not the case.

Also if the plan is already to carry out p there is no point in carrying out the request: it cannot lead to a change. It is less than necessary to ask for p iff it is already known that H is going to do A, in fact one would expect it to be already CG that S prefers p to happen. It is important that it is not CG that p is impossible: in that case the request for p cannot be granted. If the speaker is not self-correcting, it cannot be CG that he does not want p to happen. If it has already been established that H does not want p, H's acceptance of the the request would be a self-correction. Perhaps proper commands are a case where the preferences of the hearer are not supposed to be important.

The minimal contribution of the request is that S wants p to be carried out. So the request always changes the common ground to:

$CG1 \models W_s p$

In addition, the speaker also makes it clear that he trusts the hearer. This can be modelled as his public belief:

$CG1 \models B_s(P_h p \rightarrow \Box p)$

The intended reaction to a request is the acceptance of the request. This can be equated to a promise to carry out the action or the immediate execution of the action. We can then represent the first reaction by $P_h p$ which leads to the new CG2 such that

$CG2 \models Pp$

The second reaction can be formalised as

$CG2 \models p$

and it will no longer hold that

$W_s p$.

Negative reactions to the request are first of all the refusal: $\neg W_h p$ or $\neg P_h p$.

The second speech act is the promise: a promise has the preconditions.

$CG \not\models p$ (p has not happened yet)

$CG \not\models Pp$ (p has not been planned yet)

$CG \not\models P_s p$ (the speaker is not yet planning p)

$CG \not\models \neg\Box p$ (p is not impossible)

$CG \not\models \neg W_s p$ (the speaker does not want p to happen)

$CG \not\models \neg W_h p$ (the hearer does not want p to happen)

The minimal contribution is here not: the speaker wants to carry out p but the stronger: the speaker plans to carry out p. The assent leads to CG1 in which it is planned to carry out p. In addition, the speaker must believe in the hearer's trust:

$B_s B_h(P_s p \rightarrow \Box p)$

By making the promise, the speaker also expresses his belief in the hearer's trust.

There is an ethical dimension to promises and requests, which has to do with the goal of these speech acts. The speech acts have to do with making our actions transparant to others and to allow the construction of actions that depend on the actions of others. Reliability is helpful here and a prerequisite for collaborative action. A more adventurous connection can be made with some of the formulations of the Categorical Imperative in Kant's Prolegomena. In our current setting, this would entail considering a common ground of all thinking beings and asking that a principle of action can be a principle that can be shared in that common ground. But a full exploration of this connection is not in the scope of this papersave.

4 Questions

A question in this setting is then both the expression of ignorance and the expression of a plan: the plan to get the conversational partner to supply information that meets the question.

The following preconditions can be stated for $yes-no$-questions "whether q"

$CG \not\models q$ (asking the question makes sense)

$CG \not\models \neg q$ (asking the question makes sense)

$CG \not\models B_h q$ (asking the question makes sense)

$CG \not\models B_h \neg q$ (asking the question makes sense)

$CG \not\models B_s q$ (asking the question makes sense)

$CG \not\models B_s \neg q$ (asking the question makes sense)

$CG \not\models \neg W_h(B_s q \vee B_s \neg q)$ (no correction of hearer)

$CG \not\models \neg W_s(B_s q \vee B_s \neg q)$ (no correction of hearer)

The minimal contribution of the question is to communicate to the hearer that $\neg B_s q \wedge \neg B_s \neg q$. But it seems equally essential to inform the hearer that the speaker wants to know the answer:

$W_s(B_s q \vee B_s \neg q)$

Again there is trust implied in asking the question. Here the speaker implies that he will the hearer's word: $B_h q \rightarrow B_s q \wedge B_h \rightarrow B_s \neg q$. The cooperative hearer by choosing to answer the question by saying q or $\neg q$ meets the request and destroys the ignorance. In fact, destroying the ignorance destroys the goal.

The analysis can be extended to any question that can be represented by a disjunction of answers, such that any two disjuncts are incompatible.

$CG \models p1 \vee \ldots \vee p_n$

$CG \models \not(p_i \wedge p_j)$ for any i and j such that $j \neq i$

$CG \not\models \neg p_i$ for any i.

$CG \not\models B_h p_i$ for any i.

$CG \not{models} B_s p_i$ for any i.

And the minimal contribution can be stated as:

$CG \models W_s(\bigvee_i B_s p_i)$

The ignorance of the speaker follows from the definition as above.

It is however not at all a trivial matter to come from an arbitrary question to a disjunctive representation as above. In fact, there are in general a number of ways in which a wh- , a *why*- or *how*-question can be represented as a disjunction and the exact way of doing so is highly influenced by the context. Of course, the partition view of of wh-questions suggests that there is such a way: starting from a fixed domain, the partition is generated by considering each of the subsets as the answer. Here, we have to look at the question as standing in need of further resolution to a disjunctive question.

If the question expresses a goal of the speaker, it is related to other goals. One of the processes that guides the resolution is to infer that the speaker can achieve a further goal once he has achieved this one.

In the following table I give a short overview.

Where can I buy cigarettes? Inferred goal: speaker wants to buy cigarettes.
Directions to the nearest shop.

Who is John?
Inferred goal: The speaker wants to know how to get hold of John's paper.
A guy from Saarbruecken.

Who is Louis XIV?
Inferred goal:The speaker wants to know whether the candidate has properly studied his history book.
Lengthy descriptions as in the book.

Who ate the cake?
The speaker wants to get the culprit to buy a new one.
Identification knowledge.

Who attended the workshop?
Inferred goal:The speaker wants to know what to write in his report for the funding agency.
Which stars? Which disciplines were represented?

Either the list of stars or the list of represented disciplines.

What does he look like?
Inferred goal: Speaker wants to have the means to recognise him at the drink.
Descriptions of sufficient detail to distinguish him from the others.

The above list of examples suggests that the disjunctive representation is often generated not so much from the domain of objects but from the domain of possible answers.

5 Planning

The resolution of questions to a disjunctive representation makes use of the process of getting what one wants by means of planning. A goal that cannot yet be acted upon or scheduled for action, is defective because the actor cannot yet have sufficient confidence in the course of action. What is still missing is the satisfaction of certain prerequisites of the action. To post a letter one needs to be able to move to a mailbox and in order to do so one must have the capacity of movement and knowledge as to the location of the mailbox or have a strategy (like asking or random movement) that guarantees success.

If one of these factors is missing one lacks the confidence necessary for carrying out the action. The solution is obvious: make it a goal to supply the missing factor. We can capture the principle as the interpretive principle governing the resolution of questions:

If
$CG \models W_s p$ and
$CG \models \Diamond q \rightarrow \Diamond p$ and
$CG \models W_s X$ and
X can be interpreted as q then
interpret X as q.

6 Towards a Model

What we are dealing with in this model are three future oriented operators: want, scheduled and must. The last one is a fairly standard modal operator.

We assume a linear order T and a set of possibilities meeting the following demands for $t \in T$, p a propositional letter and x a subject.

1. $i(t)(p) \in 2$.

2. $i(t)(\Box) \subset POSS$

3. $i(t)(B_x) \subset POSS$

4. $i(t)(W_x) \subset i(t)(B_x) \times i(t)(B_x)$

5. $i(t)(P_x) \subset i(t)(B_x)$

In addition it must hold that if $j \in i(t)(\Box)$ then
$forall t_1 < t \forall Z \in range(i(t)) i(t_1)(Z) = j(t_1)(Z)$

B_x must be euclidean, also with respect to the extra structure supplied by W_x and P_x.

$i(t)(W_x)$ must be an irreflexive, asymmetric and transitive preorder.

$j \in i(t)(P_x)$ must be less than $k \notin i(t)(P_x)$ according to $i(t)(W_x)$

An information state is pair consisting of an element of t and a set of possibilities. A common ground is an information state meeting the common ground conditions: $CG \models B_h\varphi \wedge B_s\varphi \rightarrow \varphi$ and $CG \models \varphi \Rightarrow CG \models B_s\varphi \wedge B_h\varphi$.

We define:

1. $i, t \models p$ iff $i(t)(p) = 1$

2. $i, t \models \neg\varphi$ iff $i, t \not\models \varphi$

3. $i, t \models \varphi \wedge \psi$ iff $i, t \models \varphi$ and $i, t \models \psi$

4. $i, t \models \Box_x\varphi$ iff $\forall j \in i(t)(B_x) \exists t_1 > t\ j, t_1 \models \varphi$

5. $i, t \models B_x\varphi$ iff $\forall j \in i(t)(B_x) j, t \models \varphi$

6. $i, t \models W_x\varphi$ iff $\forall j, k \in i(t)(B_x)(\exists t_1(t \leq t_1 \wedge j, t_1 \models \varphi \wedge \neg\exists t_1(t \leq t_1 \wedge k, t_1 \models \varphi \rightarrow < j, k > \in i(t)(W_x)$

7. $i, t \models P_x\varphi$ iff $\forall j \in i(t)(P_x) \exists t_1(t \leq t_1 \wedge j, t_1 \models \varphi$

All of these are normal pointwise operators and they give only rise to a slightly different interpretation when transported to a specific information state such a common ground.

References

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