Accommodation through tacit dialogue acts

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Abstract

In this paper we present our approach to the study of accommodation in dialogue through tacit dialogue acts. Our experimental setup (a text-based adventure game) is characterized by *asymmetric dialogues* and by dialogue acts that can be directly mapped into *physical actions*. Given this framework, we motivate the importance of not assuming that dialogue participants share exactly the same dialogue act taxonomies, as existing models do.

If we take a dialogue perspective on Lewis' notion of accommodation [10] and assume that the state of a dialogue is changed by the acts performed by the dialogue participants, it is natural to study Lewis' broad notion of accommodation as *tacit dialogue acts* (or implicit dialogue acts). This is the approach adopted in [8] where the authors formalize the treatment of tacit dialogue acts in the information state update framework. According to them, accommodation is ruled by the following principle:

Context Accommodation (CA): For any move m *that ocurrs in a given scenario* sc_i*: if assignment of a context-dependent interpretation to* m *in* sc_i *fails, try to accommodate* sc_i *to a new context* sc_{i+1} *in an appropriate way by assuming implicit dialogue acts performed in* m*, and start interpretation of* m *again in* sc_{i+1}*.*

They claim that this principle governs not only implicit grounding acts (which they study in detail) but also subsumes the process of question accommodation (described in [9]). In fact, the authors suggest that CA can be seen as a general means of interpretation that explains the fact that dialogue participants produce concise expressions, leaving out inessential information. And indeed, in [11] a unified and symmetric architecture in which tacit actions are of central importance, is presented for both interpretation and generation. However, what can be left tacit when applying the CA principle is too loosely defined and deserves further attention. In our view, speakers leave tacit private commitments, about the state of the world and how the world works, that can be inferred by the interlocutor given the shared information. We believe this to be a crucial aspect that defines what can and what cannot be accommodated. Therefore, our approach will focus on the notion of inferable tacit actions and study it in a way that explains the following two observations.

First, we wish to clarify why it has been possible to formalize accommodation through tacit acts in several different ways: using abduction [11], using information state updates [8], using classical artificial intelligence planning [3], etc. A comparison of the ground covered by these approaches, their feasibility and their computational complexity is essential if we want to gain a better understanding of the area. We believe that each approach has to learn from the others and also from implementations of accommodation theories such as [4, 2]. To start with, the theories presented in [8] and [11] have been studied in the context of *egalitarian* [5] activities, where the participants have roughly the same roles. In contrast, we focus on *asymmetric* activities where the participants involved have different roles and have access to different information (only one of the dialogue participants is an expert in the activity). We believe that investigating this setup, where the act taxonomies routinely start in an uncoordinated state and only become

coordinated during the dialogue (in one direction, from the expert to the apprentice), is a first step in the study of more realistic dialogue phenomena.

Second, current implementations of accommodation of tacit dialogue acts [8, 11] rely on a classical dialogue act taxonomy (including the typical dialogue acts such as *inform*, *request*, *ground*, *clarify*, etc.), that represents linguistic acts in a coarse-grained fashion. Such taxonomies simply reflect established linguistic conventions. We want to study how such conventions are acquired in order to avoid unmotivated design decisions such as splitting the taxonomy arbitrarily between acts that are tacit and acts that must be public, as current implementations do. Our proposal is to study coordination of dialogue acts in a concrete setup (the text adventure game), where dialogue acts can be mapped into *physical actions* with real preconditions and effects. We adhere to the view that some of the basic principles of language use are really general principles of interaction, and to understand language use we must look at the broader principles [5].

A first implementation that starts to capture these two observations is presented in [3]. The two following examples were extracted from this implementation. The aim of the examples is to show how closely general principles of the theory of accommodation explain the behavior of the system. We consider this a motivation to continue working in a setup that tries to handle linguistic acts and physical actions uniformly. Let us analyze a principle that addresses the question of *where do we accommodate* [2]:

Explicit Addition (EA): Accommodation is only possible in contexts where the explicit addition of the accommodated material would produce a felicitous discourse and result in a text which lacked the original presupposition.

Now, consider commands (1) and (2) which both require the tacit action "take the key". The tacit action is required because the commands cannot be executed directly in the given scenarios, the precondition that the key has to be held by the speaker before unlocking the door is not met. The question now is where to add this tacit action, i.e., in which of the contexts $\boxed{1}$ or $\boxed{2}$ offered by each command.

(1) *Scenario:* The key is in the chest, the chest is open
Command: $\boxed{1}$ Close the chest and $\boxed{2}$ lock the door with the key
Take the key, close the chest and lock the door with the key *(EA in* $\boxed{1}$*:)*
Close the chest, take the key and lock the door with the key *(EA in* $\boxed{2}$*:)*

(2) *Scenario:* The key is in the chest, the chest is closed
Command: $\boxed{1}$ Open the chest and $\boxed{2}$ lock the door with the key
Take the key, open the chest and unlock the door with the key *(EA in* $\boxed{1}$*:)*
Open the chest, take the key and lock the door with the key *(EA in* $\boxed{2}$*:)*

For command (1), EA in $\boxed{1}$ results in an equivalent sequence of actions which lacks the original failed preconditions and can be directly executed. For command (2) instead, the right context for applying EA is $\boxed{2}$.

But, why? The answer is *common sense*. Common sense about how the simulated world works and common sense that is used in order to find a coherent *explanation*. This might seem a truism, but it is a truism widely ignored. And even in formal models where this is taken into account (such as [11]), the knowledge that is used for constructing common sense explanations is given *a priori*, set by factors that must be known before conversation starts. But we know that the rules and constrains that are applied for interpretation do not stay static during a conversation. Constrains and rules can change their saliency as conversation evolves, just as objects of discourse do. Assuming that common sense is given a priori is a simplification that we need to drop if we want to model more realistic dialogue and to implement more flexible dialogue systems.

The system we have presented can be seen as an instantiation of the Transition Preference Pragmatics (TPP) framework, introduced by Beaver [1]. Beaver presents TPP as a general framework for pragmatics which can be seen as a novel model theory for the tableau method used for reasoning in Optimality Theory. In our system, the transitions are the actions that determine a causal link between the possible states of the world, and the reasoning method used is planning. The ranking (or preference) over transitions required by TPP is achieved in our system by having a dynamic set of action definitions that can change from turn to turn during the dialogue, according to those definitions that are more salient at the moment. Saliency in our system is the same as occurrence; i.e., if an action has been successfully performed then it is salient. This is a starting point that we plan to refine in future work.

It is known that planning is a specialized kind of abductive reasoning [6] (the actions involved in the plan are the hypothesis that are invoked to explain the goal of the plan). This has two interesting consequences. First, abduction has been presented as a general framework for interpretation [7], so our approach could be a link between the work in TPP and the work in interpretation as abduction. Secondly, and more concretely, nowadays there are good off-the-shelf planners, but this is not the case for abductive reasoners. So the theoretical question we would like to put forward is how far can we get using just planning. The challenge then is to characterize more precisely the abductive reasoning tasks that are necessary for interpretation and that it is still possible to find efficient algorithms for them (as has been done with planning). This is the important question to answer in future work.

References

[1] D. Beaver. Pragmatics, and that's an order. In *Logic, Language and Visual Information*. CSLI Publications, 2001.

[2] D. Beaver and H. Zeevat. Accommodation. In *The Oxford Handbook of Linguistic Interfaces*, pages 503–539. Oxford University Press, 2007.

[3] L. Benotti. Incomplete knowledge and tacit action: Enlightened update in a dialogue game. In *The 2007 Workshop on the Semantics and Pragmatics of Dialogue*, pages 17–24, 2007.

[4] J. Bos. Implementing the binding and accommodation theory for anaphora resolution and presupposition projection. *Computational Linguistics*, 29(2):179–210, 2003.

[5] H. Clark. *Using Language*. Cambridge University Press, New York, 1996.

[6] K. Eshghi. Abductive planning with event calculus. In *International Conference in Logic Programming*, pages 562–579, 1988.

[7] J. Hobbs, M. Stickel, D. Appelt, and P. Martin. Interpretation as abduction. *Artificial Intelligence*, 63(1–2):69–142, 1993.

[8] J. Kreutel and C. Matheson. Context-dependent interpretation and implicit dialogue acts. In *Perspectives on Dialogue in the New Millenium*, pages 179–192. John Benjamins, 2003.

[9] S. Larsson, R. Cooper, and E. Engdahl. Question accommodation and information states in dialogue. In *Third Wokshop in Human-Computer Coversation*, pages 93–98, 2000.

[10] D. Lewis. Scorekeeping in a language game. *Journal of Philosophical Logic*, 8:339–359, 1979.

[11] R. Thomason, M. Stone, and D. DeVault. Enlightened update: A computational architecture for presupposition and other pragmatic phenomena. In *Presupposition Accommodation*. Ohio State Pragmatics Initiative, 2006.