

Comment on:

*Enlightened Update: A Computational
Architecture for Presupposition and Other
Pragmatic Phenomena*
by Thomason, Stone and DeVault

OSU Workshop on Presupposition Accommodation
October 13, 2006

Staffan Larsson
Dept. of Linguistics
Göteborg University
Sweden
sl@ling.gu.se

Overview

- Brief and selective summary of TSD paper
- Idealizations
- (Mis)coordination and (accidental) accommodation
- Question accommodation in Issue-based Dialogue Management
- Interpretation as intention recognition
- Miscoordination, Common Ground, and AI
- Abbreviations:
 - TSD: Thomason, Stone and DeVault
 - EU: Enlightened Update
 - DP: Dialogue Participant
 - CG: Common Ground
- Additional material
 - Some slides were not used at the workshop presentation; these are marked as **Additional material**

Brief and selective summary of TSD's paper

General claims

- Conversation moves forward through
 - Positive effect of utterances, but also
 - *Retrospective insight* gained about mental states of interlocutors from observing their actions
- Paper argues that pragmatic reasoning is
 - holistic in character
 - continuous with common-sense reasoning about collaborative activities
 - most effectively characterized by associating
 - specific, reliable *interpretative constraints*
 - *grammatical forms*
- Also, aims to illustrate the general place of computation in the cognitive science of language
- Advantage of computational approaches:
 - demand explicit accounts, in terms of
 - algorithms, reflecting real-world problems
 - data structures, reflecting real-world information
 - provide a laboratory for testing theories
- Paper aims to show how computational approach can help in developing a theory of *accommodation*

Interpretation as intention recognition; presupposition as private commitment

- Interpretation is a form of *intention recognition*
- *Intentions* are complex informational structures, which specify commitments to
 - Preconditions - ways that the world is assumed to be, and on which the success of the intention depends
 - a Goal - a state of affairs to be achieved
 - a Plan - a partially specified way of achieving the goal
- *Presuppositions* defined as
 - *private commitments* the speaker makes in using an utterance
 - but expects the listener to recognize based on mutual information
 - presuppositions of speaker / utterance identified with preconditions associated with intentions
- By recognizing the intention, the hearer also recognizes the presuppositions and regards these as commitments made by the speaker

Interpretation by abduction involving accommodation

- COREF interpretations capture the content of the communicative *intention* behind the utterance
- Interpretations are achieved by *abductive proofs*, i.e. inference to the best explanation of the utterance
- Such proofs may also involve *tacit actions*, e.g. that a previous subdialogue has been finished
- The tacit actions are thus part of the representation of the intention underlying the utterance
- In some cases, the tacit actions will include updates which constitute *accommodation* of presupposed material

Accommodation in COREF

- C: It's light brown
- U: You mean like tan?
- C: Yeah
- In interpreting the user's utterance *You mean like tan?*, COREF interprets the user as signaling the following sequence:
 - 1. Downdate the effects of the problematic utterance
 - 2. Initiate clarification.
 - 3. Start collaborative reference task, targeting COREF's intended property associated with *tan*.
 - 4. Start a question-answer task in which COREF is obligated to answer a user question.
 - 5. Ask the question: `ynq(addcr(t1, sandybrown))`.
- Only the last two of these can be seen as directly associated with the semantics of the utterance.
- The others are tacit actions that are recognized abductively as part of COREF's recognition of a communicative intention that makes sense of the user's utterance.

Some major points on which I agree

- Pragmatic reasoning is holistic in character, continuous with common-sense reasoning (and cognition in general) supporting collaborative human activity, and deals with multiple pragmatic (and other linguistic) phenomena at once; abductive reasoning may be useful for modeling this
- Accommodation and presupposition are important phenomena in dialogue and in practical dialogue systems
 - *Question Accommodation* is an important part of theory of Issue-Based Dialogue Management (IBDM, Larsson 2002) implemented in GoDiS dialogue system
- Not only propositions and discourse referents can be accommodated, but also discourse tasks, questions, etc.
- Abductive reasoning could be useful for improving dialogue systems
 - Enables doing interpretation and accommodation in a single step, which allows plausibility of accommodated material to enter into the interpretation process
 - Enables dynamic reasoning to determine when system can generate utterances in need of accommodation, more efficient communication
- The abductive intention/goal/plan-oriented approach to deriving presuppositions and implicatures is appropriate and useful in many cases (though not all)
- Pragmatic rules are essentially social in nature, and a key to understanding accommodation and related phenomena lies in understanding the relation between social norms and cognitive processes

Idealizations

The utility of idealizations

- Idealization and making simplifying assumptions are usually required when formalizing and implementing theories
- TSD are aware of the problems of idealizations and regard their account as provisional, to be extended later to account for more complex cases
 - The notion of *checkpoints* and *objective conversational state* may be regarded as one of these
- I want to explore TSD's account in light of "accidental accommodation"

Checkpoints

- "After performing a sequence of tacit actions, S chooses an observable action. This action will advance the joint activity, but crucially, it also has to coordinate S and H by resulting in a checkpoint."
- "... we imagine that the collaboration intersperses stages of uncertainty with *checkpoints* – states where both agents have full, mutual knowledge of the domain state."
- TSD thus seem to assume the simplifying assumption that checkpoints are "foolproof" in that mutuality is actually *achieved* (not just assumed)
- TSD introduce some uncertainty into their model, but checkpoints guarantee that uncertainty is always temporary and is completely resolved every time an utterance is made

Objective context

- The assumption of foolproof checkpoints is closely related to the notion of "objective context"
- "To model collaborative conversation ... we take each state to specify an abstract, objective body of information that constitutes the conversational situation – the information state (IS) of the conversation" (p. 19)
- Exemplified by "those are heirlooms" example
- By contrast, in GoDiS (Larsson 2002), the shared part of the IS is regarded as a DP's subjective view of what is shared

Coordination principle

- DPs formulate and infer an interpretation for each utterance which is uniquely recognizable from the form of the utterance, using mutual information
- Simplifying assumptions:
 - DPs are perfect rational agents who don't forget, don't make mistakes and are never sloppy
 - DPs have the same internal processing
 - DPs conceptualise domain and discourse state in exactly the same way
 - DPs utilize the objective IS which is, by definition, the same for all DPs after each checkpoint

Checkpoints and uncertainty

- In COREF, it is assumed that “any time any action of this type [public] is performed, its occurrence becomes mutual knowledge among all agents”
- This amounts to making the idealization that DPs always perceive and understand each other correctly

Principle of coordination maintenance

- Presupposing that
 - Interlocutors share the background knowledge that fixes their communicative resources, their updates, and their horizons.
 - DPs share access to the initial conversational state
 - DPs observe actions accurately
 - The coordination principle is satisfied
- Then
 - For any fixed perspective, any utterance is understood as its speaker intends it
 - DPs will agree on each checkpoint

Clarifications and non-foolproof checkpoints

- Nevertheless, COREF includes clarification mechanisms for dealing with miscoordination
 - *Downdate* triggers a clarification subtask by marking an utterance as incompletely understood,
 - *Reinstate* reinstates the effect of an utterance once its meaning has been agreed through clarification
 - These moves allow COREF to handle clarification, grounding, and other kinds of implicit task progress
 - If we assume foolproof checkpoints and objective context, how do we account for clarifications?
- Also, TSD seem open to the possibility of miscoordination
 - “...the dialogue returns regularly to checkpoints, where mutuality is achieved *or at least assumed*” (footnote p. 6)
 - If checkpoints are merely assumed, DPs may have different views of public information over several turns of dialogue
 - How does this square with the notions of objective context and the principle of coordination maintenance?

(Mis)coordination and (accidental) accommodation

Miscoordination

- Let's explore what happens if we lift the assumption that checkpoints guarantee coordination with regard to public information
 - Mutuality is *assumed* by DPs, but no longer guaranteed
- We no longer assume that DPs always
 - Perceive utterances correctly
 - Understand utterances correctly
 - Conceive of the domain in identical ways
 - Remember correctly
 - Take the time to adapt their utterance perfectly to the conversational situation; sometimes they may instead perform some simpler routinized reasoning

- If we lift these assumptions, *miscoordination* becomes a possibility
 - DPs may have different subjective views of what is public information
 - Not just between utterances, but over arbitrary sequences of utterances (and indeed conversations)
- This means we cannot assume that the strong principle of coordination maintenance holds
- What are the consequences for interpretation and accommodation?

Presuppositions and beliefs

- "... interpretation may highlight speaker **beliefs about the conversational situation** of which the listener was previously unaware." (p.5)
- Note that "beliefs about the conversational situation" here does *not* mean "beliefs about what propositions are public information / common ground"
- TSD do allow for cases where "the grammar might require a speaker to commit to certain information ... *without* thereby requiring the speaker to somehow treat it as public, prior information"
- Presuppositions of utterances are not *generally* believed by the speaker to be public prior information
- However, it is also likely that some cases of accommodation are *accidental* consequences of "oversight" on the speaker's side, resulting from miscoordination
 - For example, the speaker may believe that P is in CG, even though it isn't (since it's not in the hearer's CG)
 - Presupposition mistakenly assumed to be public, prior information

Accidental accommodation

- "... someone says something at *t* which requires *X* to be in the conversational scoreboard, and *X* is not in the scoreboard at *t*..." (Lewis)
- This may be used as a strategy for conveying implicit information (Grice), *but may also indicate a case of lack of coordination w.r.t public information*
 - Miscoordination resulting from mishearing, misunderstanding, misremembering, etc.
 - More complicated cases:
 - The speaker may not even have a clear idea as to whether *X* is in the scoreboard, and "chance it" that the hearer will be able to accommodate if necessary
 - The speaker may not be clear about all the presuppositions of her utterance
- We refer to this as *accidental accommodation*
 - The speaker "accidentally" (unintentionally) creates a situation where the hearer accommodates
 - (N.B.: the act of accommodation by the speaker is not accidental)
- In any case (whether accommodation is accidental or intended), accommodation can be used by the hearer to adjust to some presupposition
 - This does not necessarily imply that the speaker intended the hearer to accommodate

Example

- Suppose that A has told B that A has a cat, but B has forgotten this, or B misheard A as saying "I have a bat", or misunderstood B as saying A was considering getting a cat eventually
 - "A has a cat" will be part of A's CG, but not of B's CG
 - This is a case of miscoordination w. r. t. CG / public information
- Suppose A says to B, "My cat is sick"
- In interpreting A's utterance, B would need to accommodate by adding a referent for A's cat to her CG
- However, this tacit action was not *intended* by A since A assumed that there was already a referent for the cat in CG

Interpretation as intention recognition meets accidental accommodation

- On TSD's account, the intention includes presuppositions (preconditions) and tacit actions (effects; IS updates)
- However, if some tacit actions which need to be performed in order to understand an utterance and integrate it into IS are not intended, what is their status?
- Accidental accommodation is problematic under the assumption that interpretation is (purely) intention recognition
 - Some updates are not intended

Question accommodation in Issue-based Dialogue Management

Issue-based Dialogue Management

- (Larsson, Ginzburg)
- Dialogue is seen as, essentially, a matter of raising and addressing questions (issues)
- IS includes a stack of Questions Under Discussion (QUD)
- Answers presuppose a matching question on QUD before they can be accepted and integrated

```

RULE: integrateAnswer
PRE:  in( $SHARED/LU/MOVES, answer(A) )
      fst( $SHARED/QUD, Q )
      $DOMAIN :: relevant( A, Q )
EFF:  ! $DOMAIN: combine( Q, A, P )
      add( /SHARED/COM, P )
    
```

Sample human-human dialogue

S(alesman), C(ustomer)

S: hi

C: flight to paris

S: when do you want to travel?

C: april, as cheap as possible

Sample human-human dialogue

S(alesman), C(ustomer)

S: hi

How do you want to travel?

Where do you want to travel?

C: flight to paris

S: when do you want to travel?

What price range?

C: april, as cheap as possible

Question accommodation in GoDiS

- If questions are part of CG, they too can be accommodated
 - If the latest move was an answer,
 - and there is a matching question which is *relevant in the activity at hand*,
 - then put that question on QUD
- Semi-formally
 - If
 - LM=answer(A)
 - A is a short answer
 - no Q in QUD s.t. **relevant(A,Q)**
 - then
 - find Q such that **relevant(A,Q)**
 - push Q on QUD
- Accommodating the question allows the answer integration rule to trigger and integrate the answer by combining it with the question now on QUD

- In IBDM, (re)accommodation is handled by update rules triggered by dialogue moves and current IS
- In the case of U4, the central update for reaccommodation is
 - **push(QUD, ?x.color(x))**
- ... corresponding to COREFS
 - **push(Clarify(C3, S1))**
 - **push(CollabRef(S1))**

Tacit action and IS updates

- In the Information State Update approach, the IS is updated deterministically by *update rules*, consisting of (1) conditions on IS and (2) updates to IS
 - IS' := apply(Rule, IS)
- Corresponds closely to transformations (actions) on current context in COREF
 - $s_{t+1} = do(a, s_t)$
- Interpretations in COREF can arguably be regarded as *dynamically constructed update rules*
 - preconditions bind variables in IS, and tacit actions update the IS

(Re)accommodation in IBDM account for C3-C5

- System has a plan for responding to a number of questions about t1
 - Assume "What colour?" (?x.colour(x)) is on QUD, or at least available in the context
 - Provide answer to question on QUD
- C3: It's light brown
 - MOVE: answer(colour(light_brown))
 - add colour(sandybrown) to SHARED COMMITMENTS
 - downdate ?x.colour(x) since it has been resolved
- U4: You mean like tan?
 - MOVE: ask(?colour(tan))
 - addresses the issue ?x.colour(x), which was assumed resolved
 - this triggers (re)ACCOMMODATION; derives a matching question from a proposition in SHARED COMMITMENTS
 - push ?x.colour(x) on QUD
 - retract colour(light_brown) from SHARED COM
 - Push ?colour(tan) on QUD
 - check if colour(tan) holds for t1; yes
 - respond to question on QUD
- C5: Yeah
 - MOVE: answer(YES)
 - interpreted w.r.t QUD to mean color(tan)
 - add colour(tan) to shared commitments
 - downdate ?colour(tan)
 - downdate ?x.colour(x) since it is resolved by information in SHARED COMMITMENTS

Accommodation in COREF and GoDiS

- In TSD's account, accommodation is done by tacit actions
 - The speaker has already carried out these tacit actions prior to making the utterance
 - e.g. pushing a clarification dialogue game on Task stack
 - The tacit actions are *updates to conversational state which are part of the intention behind the utterance*
- In GoDiS, accommodation is done by update rules triggered by dialogue moves
 - It is not assumed that the user applies the same update rules to her IS
 - The updates to the IS are not regarded as necessarily intended

"Agnostic accommodation" in GoDiS

- In GoDiS, there is no explicit assumption regarding the user's private updates previous to asking "You mean like tan?", or regarding whether accommodation was intended
 - It doesn't matter to the system whether the accommodation is informational (intended) or accidental
- Instead, (re)accommodation is simply regarded as a way for GoDiS to understand the user's utterance in light of its own view of shared IS

Interpretation, presupposition and accommodation in EU and IBDM

- EU/COREF does interpretation and accommodation in a single step, which allows plausibility of accommodated material to enter into the interpretation process
 - Seems like the right way to do it
 - More complex examples needed to prove that it actually works
- In IBDM/GoDiS, interpretation is done first, then implicitly presupposed material is accommodated (computing a presupposition and accommodating it is done in a single process)
 - Doing contextual interpretation and computing presuppositions simultaneously may be an improvement

Additional material

Generating utterances which need accommodation

- To motivate "It's light brown", GoDiS tacitly pushes ?x.colour(x) on QUD (since GoDiS can only address questions which are on QUD)
 - this update could be regarded as a tacit action by GoDiS
 - if we conceptualize the user as having something corresponding to QUD, understanding this utterance will require the user to have a question regarding the color of t1 on QUD
 - If it's already there, user will not need to accommodate
 - If it's not there, user will have to infer it from the context
- This will not be possible in any contexts; imagine e.g. someone walking into a travel agency and saying "It's light brown"
- However, GoDiS does not determine whether utterances will be in need of accommodation of questions, plans or propositions by the user
 - The assumption that the question regarding color can be regarded as "available in context" is hard-coded into the dialogue plan (assume_issue(?x.colour(x)))
- Reasoning to determine when this can be done would be very useful in GoDiS

Additional material

STD's criticism of alternative accounts of informative presuppositions

- TSD criticize the idea of accommodation as sequential updates where presuppositions are added before the primary assertion (Von Stechow) for being ad-hoc solutions to save account of speaker presuppositions as concerning contents of common ground
- But the idea of sequential updates is not necessarily motivated by preservation of account of presuppositions as part of CG
- In GoDiS, sequential updates are motivated by the fact that this allows a single update rule for integrating "primary content"
- Yet the underlying theory is neutral as to whether the accommodation was intentional (presupposed material not assumed to be in CG prior to utterance) or accidental

Additional material

Interpretation as intention recognition

The scope of intention recognition strategies

- TSD argue that pragmatic reasoning is an outgrowth of DP's collaborative efforts to coordinate on *communicative intentions*
- Granted, intention recognition can provide plausible accounts of
 - processing and generation of novel utterances, e.g. those involving novel (non-routinized) conversational implicatures
 - cases where understanding becomes problematic and DP's need to reason about what went wrong

Routinization

- However, simpler kinds of reasoning are often sufficient
 - In routinized behavior, it can be argued that intention recognition is bypassed in favor of simpler reasoning (or even reflex-like action)
 - There are several dialogue systems in operation which do not use intention recognition
- (If simpler strategies often work, it can be expected that humans are adapted to exploit this)
- "If the mechanisms of intention recognition are mutual, public action can create new mutual information"
 - But the mechanisms *need* not be mutual; they may be quite different, as when a human talks to a simple dialogue system or one DP acts on routines
- "Accidental accommodation" may sometimes be a consequence of routinized behavior, where full planning is not done ("sloppiness")

What are intentions, anyway?

- TSD: "a complex mental attitude that summarizes an agent's reason to act"
- Dennet's *Intentional Stance* (related to the "Knowledge level")
 - Intentions are part of a complex of related concepts (action, deliberation, planning etc) which form a way of speaking about (explaining, justifying) and thinking about behaviour of complex organisms
 - We may perhaps call it "the language game of rational agency"
 - Explaining and justifying behaviour are important social functions, and they are carried out using terms from this language game
 - Intention is a central concept in this language game
- Intentions are typically ascribed to individuals, but need not be *physically instantiated* in the organism in the form of explicit representations (though they *can* be, as e.g. in dialogue systems based on representation of intentions)
- We can build dialogue systems which (in limited domains) act rationally and can be ascribed intentions, but which do not implement the intentions on the "knowledge level"

TSD: "Input" vs. "substrate"

- "... in contrast to many approaches to formal pragmatics, we do not view our formalism as describing the *input* to higher-level processes of reasoning about intentions and collaboration. It spells out a *substrate* for this pragmatic reasoning and must itself be narrated in high-level common-sense terms."
 - This sounds similar to taking the intentional stance towards the system
- TSD do not *represent* intentions as such, only the common-sense information required "in them"
- This opens up the possibility of
 - (1) Implementing intention recognition using other substrates (?)
 - (2) Narrating COREF's substrate in slightly different terms
- Given the idealizing assumptions behind EU, how come COREF works in a dialogue with a human user where communication and coordination is not perfect?
- Because the implementation itself is not strictly dependent on the ideas of interpretation as (purely) intention recognition, or objective context, or checkpoints
 - The same substrate can be given an alternative high-level narration

Reconceptualising COREF

- We can regard the IS maintained by COREF as a subjective view of CG
- We can regard the preconditions (tacit actions) of interpreted utterances not as necessarily intended by the speaker, but simply as instructions for how to adjust hearer's subjective CG to what was said
- We need not regard the aim of conversation as being to coordinate on intentions; it will still be able to coordinate on *actions*
- Interpretation as abduction is still equally useful, since it is usually not important whether the accommodations were intended, or were caused by miscoordination
- Similarly, an account of generation-as-abduction of utterances in need of accommodation will be useful; the system will just work with what it has and hope that the user is able to understand, or else ask for clarification

Understanding and explaining

- An alternative route is to not give up on intention recognition, but to *supplement* the abductive framework with explanations of utterances not derived from intentions but from explanations of user behaviour in terms of "mistakes", resulting e.g. from miscoordination of CG
- This would probably mean that in addition to the tacit actions forming part of the inferred intention, interpretations would include other updates to adjust for miscoordination
- One advantage of this approach would be that if COREF could detect miscoordinations of CG, it could engage in more efficient repair strategies
- (However, in many cases the system does not need to know whether accommodation was intended or accidental; and in many practical situations it may be very difficult to distinguish them)

Understanding vs. explaining: Examples

- Situation: B has never heard of Jimbo & does not know A has a cat
- A to B: "Jimbo is sick, so I need to take him to the vet"
- B accommodates "A has an animal called Jimbo"
 - Either this was intended (understanding); could possibly be regarded as impolite (?)
 - or A was sloppy & just assumed B knew; could also request clarification, e.g. "Who's Jimbo?" (explanation)
- Situation: A and B have talked about A's cat Jimbo on several previous occasions
- A to B: "Jimbo, my cat, is sick"
- B assumes either that
 - A has forgotten or was sloppy (explanation), or
 - A is making a point (e.g. that B often forgets things) (understanding)
- Here it matters whether explanation or understanding is assumed

Miscoordination, Common Ground, and AI

Conceptual pacts

- Implemented agent plays a "collaborative reference" task similar to that in Brennan & Clark 1996
- B&C use the notion of a "conceptual pact" to refer to an agreement between DPs to refer to a new object using a certain word or phrase
 - This can be regarded as a coordination of linguistic knowledge
 - The agreed-upon concept is added to the lexicons of both DPs, and is of similar status to other lexical entries
- Relevant dialogue excerpt:
 - C3: It's light brown
 - U4: You mean like tan?
 - C5: Yeah
- How is this modeled by COREF? (p. 22)
 - U4 is interpreted as a proposal to add a constraint on the internal referent "sandybrown" that it is "light" and "brown"
 - "tan" is assumed to predicate something about the color "sandybrown" rather than about the object t1

- Why didn't COREF produce "It's tan" instead of "It's light brown"?
- This can be analysed as a situation where C's and U's vocabularies turn out to be not completely aligned
 - U prefers the term "tan" to describe the color of the object in question
- Since C accepts U's proposed term, this is a plausible candidate for a conceptual pact
 - Possibly, if C were a human (woman?) and chose to *accommodate* this terminology, the next time C needs to refer to this color in conversation with U, C will use "tan" instead of "light brown"

Clark: Common Ground

- Common ground includes *shared expertise*: a shared system of beliefs, practices, nomenclature, conventions, values, skills, and know-how
 - "Human nature", e.g. folk psychology, biology, physics; perceptual & motor systems
 - Communal lexicons: word knowledge
 - Cultural facts, norms, procedures
 - "Ineffable background", including "experiences that others cannot have unless they have had them themselves"
 - "what certain buildings look like, the ability to play the piano or to ski; how a woman feels in a male society; how it feels to be a born-again Christian"

- Language use depends on a sufficient degree of coordination with respect to all aspects of CG
- Also, miscoordination, and thus accommodation, is possible regarding all aspects of CG (including word knowledge)
 - If COREF and the user were completely coordinated w.r.t. their lexicons, COREF would have said “It’s tan”

- In addition, if Clark is right, language use cannot be isolated from “ineffable CG” and the perceptual-motor system of agents
- If a computational pragmatics based on propositional reasoning is to be able to model human linguistic cognition,
 - *this know-how, along with interests, feelings, motivations, social interests, and bodily capacities that go to make a human being, would have to be conveyed to the computer as knowledge in the form of a huge and complex belief system (Dreyfus)*
- Nevertheless, it is possible to build useful practical dialogue systems in limited domains that do not require a complete modeling of human language use

Looking forward

The nature of pragmatic rules

- Pragmatic rules are best regarded as social norms
- Can be routinely exploited without threatening the status of the rule
- Reasoning mechanisms provide ways for agents to
 - act in accordance with pragmatic rules, but also
 - to handle cases where they are exploited
 - to exploit them
 - to deal with cases where rules are violated
- Reasoning mechanisms may or may not rely on actual representations of pragmatic rules; possibly, these rules may work even if they are not represented anywhere at all
- Reasoning does not need to be “deep” reasoning (e.g. intention recognition) to allow an agent adhere to or exploit rules; this is a matter of behaviour and only indirectly one of cognitive mechanisms underlying that behaviour
- (Can all linguistic rules be regarded as social norms?)

Additional material

- What I believe to be central issues in cognitively oriented pragmatics
 - Social norms and conventions in interaction with cognition, reasoning and learning (routinization)
 - Learning and adaptation to novelty and change
 - Interaction between language, mind and the world in the presence of noise and error
- These questions overlap and interact in complex ways and are difficult to isolate from each other
- Computational modeling has some utility since complex interactions can be formalized and kept track of
 - however, it is important to be aware of the limitations of formal and computational modeling when it comes to simulating human cognition

Additional material

Another way of conceiving of the relation between computational models and pragmatics

- Implementations should be developed as practically useful dialogue systems; this will make it necessary to take into account
 - Important facts of dialogue, such as the presence of noise and miscoordination
 - the specific abilities and limitations of computers as language users
- Pragmatic theory (of human communication) and dialogue system implementation are separate projects
 - but interaction between these two disciplines (practical dialogue management and pragmatics) is important and likely to be useful to both
- Implementations are useful “objects of comparison” for understanding
 - general principles of linguistic interactions and
 - their instantiations (or lack thereof) in humans and in practical dialogue systems

Additional material

Summary

- The Enlightened Update approach introduces a novel account of interpretation and accommodation involving abduction
- In doing so, some simplifying assumptions are made
 - foolproof checkpoints
 - objective context
 - interpretation as pure intention recognition
- Extending the EU approach to account for the existence of accidental accommodation requires modifying some of these assumptions
- This points towards an alternative high-level narration involving
 - the possibility of miscoordination
 - a subjective view of CG
 - agnostic accommodation, or interpretation as understanding and explanation
- The notions of accommodation and coordination apply not only to propositional information, but to all aspects of common ground
 - including word knowledge and "ineffable knowledge"
 - This is a challenge for computational approaches to pragmatics insofar as this is taken as the computation modeling of human language use
 - Practical dialogue systems may be built without accounting for the full complexity of human language use, but nevertheless interact usefully with (non-computational) pragmatics

Additional material (not presented at workshop)

Additional material

The primacy of knowledge and objective context

- "We assume that the reference of the demonstration is *determined* by the speaker's intentions"
- "... even quite reasonable intentions can fail if the circumstances don't cooperate."
- Intentions can be *flawed*, as when A points to a covered pot
 - It is flawed because B does not know what's in the pot, and thus public information is insufficient to interpret A's utterance
- Also, it may be that A does not know what's in the pot
 - For example, A believes it's the potatoes but actually it's the beets
 - This is a more peculiar case
- TSD: "(A) has expressed a proposition that he himself cannot identify"
 - presumable something like "The beets in the pot are heirlooms"
 - assumes propositional content is determined by context *unknown to speakers*

Additional material

Alternative analysis based on belief rather than knowledge

- Issues of truth should be separated from issues of meaning and reference; mutual *belief* or *commitment* (intersubjective context) is more central than mutual *knowledge* which involves possibly unknown facts (objective context)
- Each DP interprets utterance based on their view of the context and public information
- Context which is unknown to DPs play only indirect role in communication, although it determines the truth of what is said
- Assume that A and B bought potatoes *p* and beets *b* at the market
 - It is public information that *p* and *b* were bought at the market
- In first problematic example:
 - When A points to a covered pot, he intends to refer to the potatoes *p*,
 - but B may fail to understand because A and B are not coordinated w r t public information
 - A believes it is public information that *p* are in the pot, but B does not believe so (nor that *p* are actually in the pot; she does not know what's in the pot)

Additional material

- In the second case, A intends to refer to the potatoes and believes
 - (1) the potatoes *p* are in the pot and
 - (2) it is public information that (1)
- Some possible outcomes of second case
 - B also believes (1) and (2) and correctly interprets "those" as referring to the potatoes *p*
 - A and B now share information that "The potatoes (*p*) are heirlooms", which is true;
 - they also share "The potatoes (*p*) are in the pot", which is false;
 - both of these propositions have been successfully transmitted
 - One happens to be true, the other false
 - Communication can work even if both DPs have false beliefs about context
 - B thinks that (1') the beets *b* are in the pot and (2') it is public information that (1')
 - B will misunderstand A and they will become miscoordinated
 - B will believe that the beets *b* are heirlooms, and that they are in the pot
 - B does not have any idea what's in the pot, and asks for clarification

Additional material