

Refining the Categories of Miscommunication

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Introduction

In studying data that we have collected concerning collaborative dialogues¹, we have identified instances of miscommunications that require us to refine the notion of a miscommunication and we have identified a general strategy for detecting these instances. In this paper we will characterize these category refinements and the detection strategy based on our preliminary analysis of the data.

Some of the miscommunications we found are due neither to flaws with what is mutually believed nor to the hearer's failure to arrive at the right interpretation. Our data collection method disclosed instances of two types of errors that may be related to cognitive load. With the first type, a hearer either forgets the interpretation of an utterance, or ignores the utterance because of attentional shifts. These attentional shifts may be due to topic shift, or to parallel domain problem solving efforts, or to simple neglect and inattention. The second type of error, performance errors, included domain problem solving errors, and generation and production errors. Although these errors can look like misinterpretations, they may be better handled with different prevention and repair strategies.

The instances of the error detection strategy that we found in our data, rely on redundancy. Walker discusses the role of redundancy in discourse (Walker 1993) and shows that the utility of redundancy depends on the task and the definition of task success (Walker 1994). Given a memory dependent domain problem solving task and a strict definition of success, she uses memory limitations to explain why redundant conversational strategies produce better solutions than nonredundant strategies. Since our data was produced during a task that was not memory dependent, the redundancy we observed in our data seems to be motivated by quite different considerations.

For example, agent A repeats information that was previously established—that four red chairs were intended for the dining room—and also explicitly men-

¹This data concerns task-oriented communication in which the participants are all non-experts at the task. See the section on the corpus for more information regarding the communication task and corpus.

tions the total cost of the furniture that he and his partner have decided on². Our data exhibits many such instances, in which the information that has been agreed on will be reviewed on finishing a domain task. Walker calls this type of redundancy a `CLOSE CONSEQUENCE` discourse strategy (Walker 1994). Memory limitations do not provide a satisfactory explanation of this phenomenon in our data, since for our task it will have little or no effect on the final performance if a player forgets the details of a decision once it has already been made. We believe that the redundancy in this case is best explained by its utility in detecting miscommunication. There are several cases in our corpus where misunderstandings were found by means of this technique and successfully repaired. (See Section 5, Dialogue 5 for an example.)³

Types of misalignments

Computational linguists tend to think of communication as an ideally rational process, even when dealing with communicative errors. When the interpreter has chosen the wrong reading of an ambiguous utterance the error can be seen as a misalignment of two rational processes—the generator and the interpreter—that are somehow not attuned to one another.

But some misalignments (that is, some divergences in the participants' views of what has been established in a conversation) are not really *miscommunications*, in this sense. Failures of communication can occur in real life because the hearer's attention has somehow wandered and the utterance is ignored; it is not interpreted at all. And even when the hearer attends to the utterance and interprets it correctly, misalignments can occur later in the conversation because of failures of *conversation maintenance*; one participant may forget a point that the other participant remembers. Such memory-induced misalignments are likely to happen in any very long conversation; but we believe that in some

²See the section on the corpus task for a description of the furniture purchasing domain and Section 5, Dialogue 4 for the complete example and discussion.

³We also have one instance in which the strategy could have discovered a miscommunication, but the players failed to notice the discrepancy; see the discussion of Figure 1 and 2, below.

cases, an utterance that is correctly interpreted may be forgotten almost immediately. This can happen when a hearer’s attention is somehow distracted.

Non-communications and communication maintenance failures

The data that we have collected does not provide a clear way to distinguish cases in which an utterance was interpreted and immediately forgotten from those in which it was not interpreted at all. We have found cases that can be construed in either way, and we believe that both phenomena—non-communications and communications that are almost immediately forgotten by the hearer—do occur⁴. In some cases, these lapses may not cause misalignments, because the speaker’s attention is distracted as well as the hearer’s. But when such misalignments do occur, they are often undetected. In cases where a topic shift is the cause, the speaker’s attention will have shifted too, and she is not likely to expect feedback from the hearer on the old topic. And we have some cases in which the speaker apparently does not notice the misalignment even when she is given evidence that the utterance was not understood.⁵

The speaker may be responsible for a non-communication by misjudging the hearer’s attentional capacity and shifting attention away from the utterance without realizing that this distraction prevented the hearer from noticing the utterance. The risk of such non-communication could be reduced by generating shorter turns or by managing topic more carefully. For instance, if a speaker prompts for an acknowledgment from the hearer before shifting to a new topic, there will be much less danger that the old information will be lost. There is a tradeoff here; it may be difficult to convey complex points using shorter turns, and constant prompts for confirmation can be distracting or annoying. They could even be self-defeating, if the response becomes automatic because of overprompting.

Misconclusions, misindications, and miscues

Misalignments can also be caused by flaws in domain reasoning or by performance errors in generation and production.

For instance, the hearer may make a mistake in domain problem solving that has nothing to do with communication. Since the speaker and hearer often take the obvious consequences of shared information to be common ground, these errors can lead to misalignments.

⁴See section 5 for supporting evidence

⁵It is difficult in our corpus to distinguish cases in which the speaker of the ignored utterance remembers making it from those in which she has forgotten it. She may just assume that it was correctly understood by the hearer until a problem arises. And when she is presented with evidence that it was not correctly understood, it might be a better conversational strategy to simply pretend that the utterance didn’t occur than to initiate an explicit repair dialogue.

Such errors are not easily distinguishable from conversationally induced misalignments. For example, a speaker may report a total cost for some items the two conversational participants have agreed to buy and the hearer may not agree with this total. In this case, there may be a misalignment about what items have been agreed on or on what they cost. But it is also possible that the speaker simply made an arithmetical error or used the wrong cost for an item.

Misindications can occur because a speaker may intend to say one thing while mistakenly saying another. For example, the speaker mistakenly calls a sofa a chair when she intended to refer to a mutually known sofa. When such an error occurs, the hearer may be aware that something is wrong, without any clear idea of what it is.

Similarly, miscues can occur because the hearer mistakenly hears ‘sofa’ when the speaker actually said ‘chair’. (We have no good examples of this, probably because our corpus involved written communication.)

We assume that many of these errors are due to cognitive load as well. To some extent, redundancy and prompting for confirmation may help to identify errors of this kind. In some very special cases, explicit conventions that reduce the likelihood of misindications and miscues (repeating numbers, spelling out some words, avoiding words that are likely to be misheard) may be desirable.

Discovering and repairing misalignments

Our data shows that misalignments often remain undetected. But in some cases they may be detected and repaired. We believe that our speakers avoided many possible misalignments by pursuing a highly redundant conversational strategy. For instance, our speakers would often review the problem solving context before making a contribution to the problem solution.

A strategy of repeating what is taken to be mutually established can serve as a way of discovering misalignments. As Walker points out in (Walker 1993), such repetitions can serve to confirm a participant’s understanding of what has been established. This redundancy can increase reliability in communication by providing positive evidence that a particular utterance was correctly interpreted (Clark & Schaefer 1992). Or it can indicate the level of understanding of the evolving conversation (Heritage & Watson 1979). To these roles, we wish to add the important role of probing for possible misalignments. Here, redundancy plays a role similar to increasing reliability, the second of these; but it is used to *maintain* mutual understanding rather than merely to *exercise* it.

The Corpus Domain

We have been collecting and studying computer-mediated conversations between pairs of subjects who are collaboratively solving a problem. The participants are of equal status: they have been briefed together

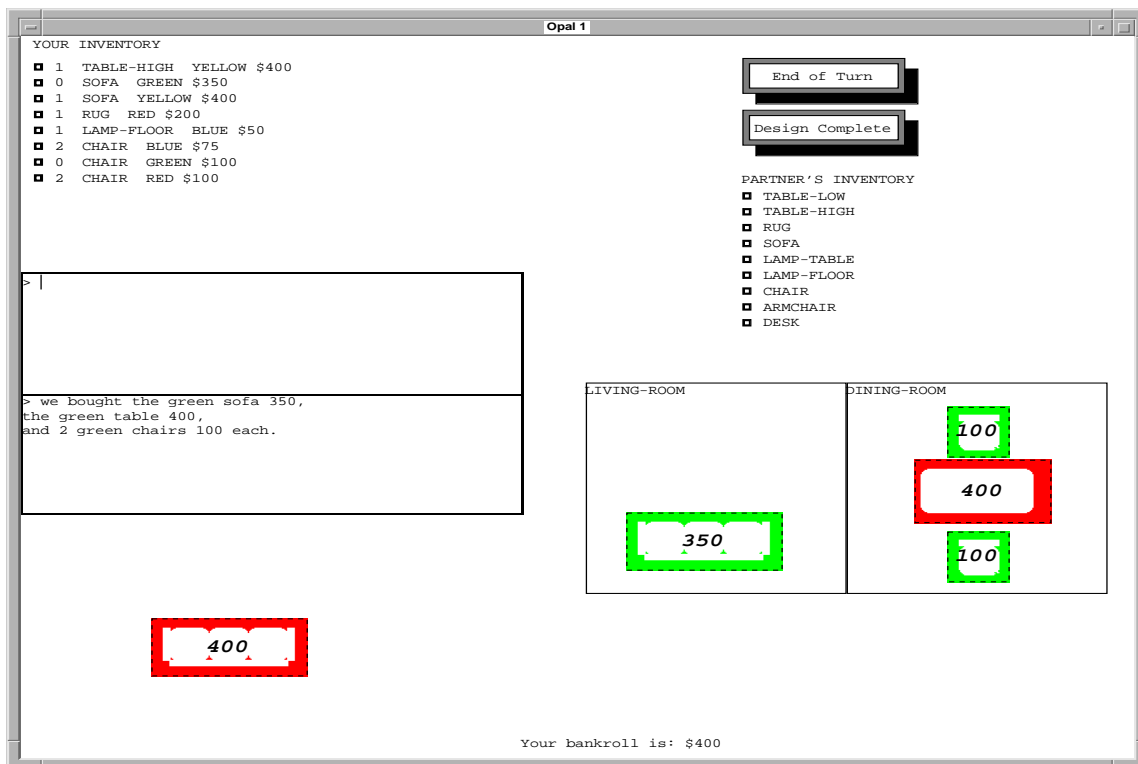


Figure 1: M's View Just After Receiving a Message from D

on the domain knowledge that is needed to solve the problem and neither is an expert in solving this type of problem.

By focusing on computer-mediated conversations, we were able to collect conversational data that does not depend on an analysis of prosodic and facial cues, and in which turn control is simplified. A computer-mediated environment also allows us the flexibility to study many questions. We can modify the design task to study the effect of giving the subjects different information distributions as well as the effect of giving them different goals. In our case, we have set up the design task to focus on the issue of coordination; the subjects have similar information distributions and the same goals.

The Task

The problem solving task requires the subjects to buy furniture for the living room and dining room of a house. (This design is based on tasks used in (Walker 1993; Whittaker, Geelhoed, & Robinson 1993)). Each subject is given a separate budget and inventory of furniture that lists the quantities, colors, and prices for each available item. Although each subject's budget and inventory are private information, the subjects can share this information during their conversation. By sharing this information, the subjects can combine their budgets and can select furniture from each other's inventories.

While the subjects' main goal is to negotiate the design of a two room house, the subjects also have specific secondary goals which further complicate the problem solving task. Subjects are instructed to try to meet as many of these goals as possible. The secondary goals are: 1) Match colors within a room, 2) Buy as much furniture as you can, 3) Spend all your money. The items of highest priority are a sofa for the living room and a table and 4 chairs for the dining room.

In addition to collaboratively solving the problem, the conversational participants maintain private graphical representations of their incremental agreements in the form of iconic floor plans. We use this additional information as partial evidence of what a speaker meant by an utterance and what was understood by the hearer.

The Computer-Mediated Environment

The subjects are in separate rooms and can communicate via the computer interface only. They share dialogue windows but the inventories, budgets and updated floor plans are private and show up only on the owner's color display. Figure 1 shows the interface as it looks in the middle of a design session. First, we will give an overall description of the display as a particular subject sees it and then we will show how the conversation progresses. Looking at figure 1, in the upper left-hand corner is the private inventory that was

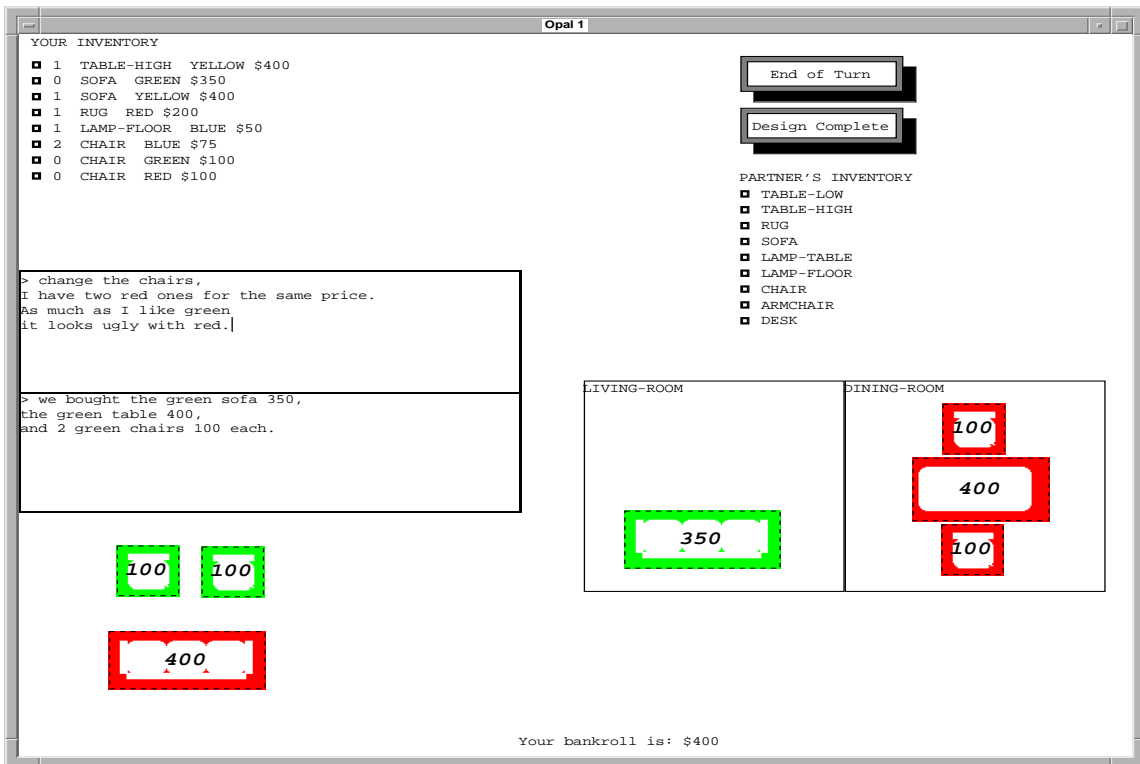


Figure 2: M's View After Responding to a Message from D

allocated to M. The inventory lists the quantity of the item described by the line that is available (e.g. M has 1 high yellow table costing \$400, 2 blue straight chairs costing \$75 each, etc.). M can use items in the inventory by clicking the mouse on the square at the beginning of the line. Each time M clicks the mouse button on a square, the item described by the line is allocated and the number in the inventory is decreased by one. If the quantity is 0, no more items of this description are available and nothing happens as a result of clicking the mouse. When an item is allocated from the inventory, a color graphics icon that represents the furniture item and includes its cost, appears in the lower left-hand area of the screen. The furniture icon can be dragged via the mouse into the living-room and dining-room spaces shown in the lower right-hand area of the screen. Furniture icons can be returned to inventory via mouse clicks as well.

The middle, left-hand side of the display contains two dialogue boxes. The top dialogue box is cleared automatically, anticipating that the subject will type in a new message to send to his partner. The lower dialogue box shows the last message that the subject received from his partner. In this case it shows the message that M (the subject) received from his partner D.

Near the top right-hand side of the display is a menu for creating icons to represent the furniture the sub-

ject's partner is contributing to the design. This menu behaves similarly to the subject's inventory area except that there is no quantity indication and the subject must provide color and price information according to what he understands from the conversation with his partner.

The buttons above the partner's inventory menu, "End of Turn" and "Design Complete", enforce turn-taking and initiate the incremental recording of the conversation and the graphics updates. The subject is unaware of the recording effects and uses the "End of Turn" button merely as a means of transmitting his message in the top dialogue box to his partner. Once the subject hits the "End of Turn" button the subject's screen is frozen until the partner's reply is received.

Finally, the subject's budget allocation is shown at the bottom of the display. This number reflects the initial allocation of money to the subject and does not update during the session.

Now that we have described the layout of the display, we can look at what happens during the interaction. As we said earlier, the subjects M and D are in the middle of a session. We see that M has allocated some of his inventory and that he has a green sofa in the living room and two green chairs in the dining room along with a red high table. He has just received a message from D that summarizes the decisions they have made so far. Note that D's description does not match what

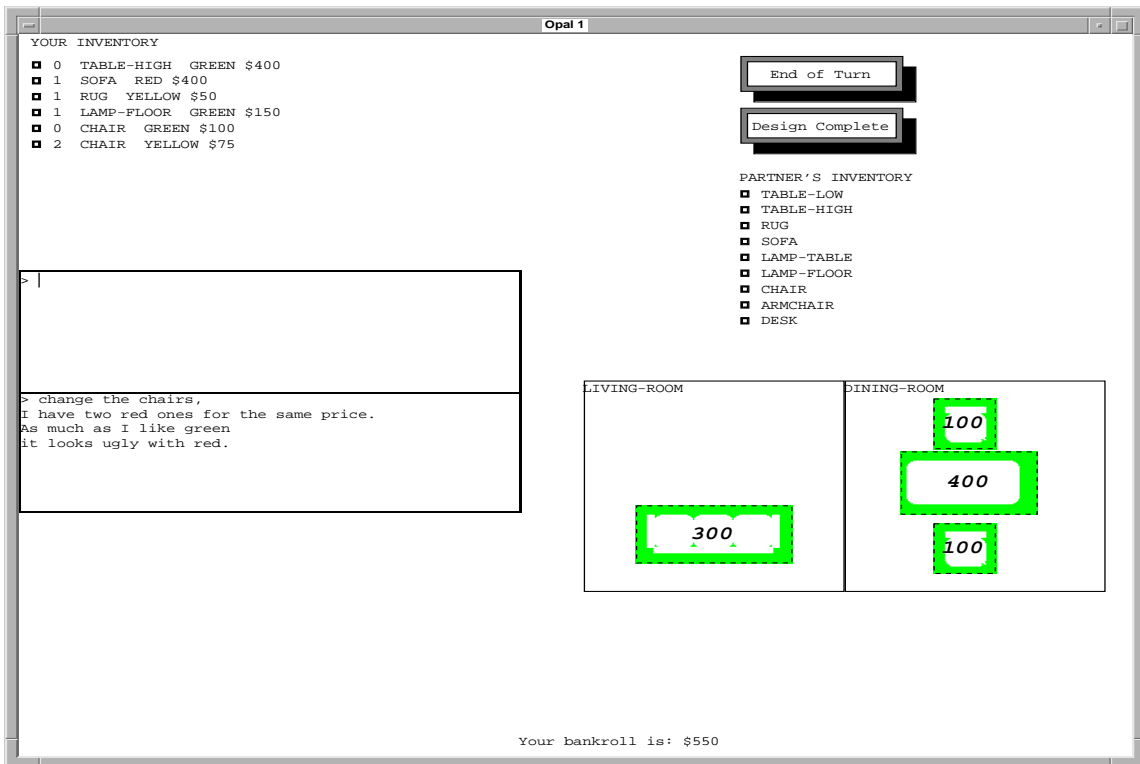


Figure 3: D's View Just After Receiving a Message from M

M has represented in his floor plan. D has a green table while M has a red table. M now makes some updates and types a message to send to D. M's interface just before he sends a message to D is shown in figure 2.

The floor plan shows that M allocated two red chairs from his inventory and has used them to replace the green ones that were in the dining room. Instead of returning the green chairs to the inventory, he moves the two icons back to the lower left corner as a reminder that these are items that have been mentioned before. He then types in a description of the changes he wishes to make "change the chairs, I have two red ones for the same price...". Now when M clicks on the "End of Turn" button his display freezes and D's display is unfrozen so that D may take his turn.

M's message is displayed in D's lower dialogue box as shown in figure 3. The previous message that M had sent was cleared out of the lower dialogue box before the current message was displayed and D's prior message to M is cleared from the top dialogue box in readiness for D's next message.

Task, Environment and Miscommunication Dependencies

We expect that at least two of our interface design choices will affect the character of the communication and the types of miscommunication that occur. First, we prevent interruptions by disabling the interface of

a participant once he relinquishes control by "sending" a transmission to his partner. Conversely, receipt of a transmission unlocks a participant's interface. Second, the hearer is able to view the most recent transmission until it is replaced by a new transmission. Limited exposure to what has been previously said gives the interaction a more conversational character than if the participants were able to review a transcript of the conversation. If a transcript were available we would not have been as likely to observe the inattention effects that we collected.

One question that arises is whether the turn lengths in our corpus are affected by the environment. We expect that a turn length would be influenced by either the inability to interrupt, the lag time between responses as problem solving and graphics maintenance take place, or both. In the first case the speaker can say all that he wants without getting sidetracked by an interruption and in the second case the speaker wants to convey all of the information he thinks may be useful so that his partner's problem solving effort is as successful as possible given that the problem solving activity is time consuming.

One could vary this design choice variable to allow interruptions and then measure both the number of interruptions and changes in turn length to determine whether the task or the inability to interrupt encourages longer turns. At the same time, one could see

how the character of miscommunication changes. The results would provide useful guidance for designers of non-spoken human-computer interfaces. For some tasks it may be beneficial to prevent interruptions while for others the reverse may be true. Walker's results on varied attentional capacities and determining when a discourse strategy is beneficial (Walker 1993) is some indication that this is plausible to consider in this case as well.

The second design parameter is the extent to which a transcript of the conversation is made available. In our interface we chose to allow the subject's and the partner's previous messages to be displayed until a new message is received from the partner. The main goal was to avoid having to estimate the time it would take for a subject to read a message.

But since participants frequently must wait a long time for a response from their partners,⁶ this decision may have served to alleviate some possible attention problems. In future collection efforts, it may be useful to record the time between responses, since turn length alone is not an accurate enough measure for attention-related miscommunications.

For non-spoken human-computer interfaces, it is crucial to have an idea of the extent to which the human's picture of the preceding conversation may have been lost during delayed responses. As the data in Section 5 shows, the transcript isn't always fully utilized (see Dialogue 1 in Section 5). So the interface designer cannot rely on a transcript to prevent all attention related miscommunications. As with the interruption parameter, the transcript display parameter could be varied as well to measure its effects on the character of miscommunications.

The Evidence from the Data

Clark & Schaefer (Clark & Schaefer 1992) have characterized coordination in terms of presentation and acceptance pairs. They showed how tightly coordinated speakers are during some types of conversations but their analysis does not consider the effects of longer turns. The characterization does not account for a hearer understanding and forgetting an utterance before it is accepted or a speaker forgetting a presentation. Consider the states of understanding described by Clark & Schaefer, pg 154-155 (Clark & Schaefer 1992) (u' is a sequence of utterances that has just occurred):

State 0. B didn't notice that A uttered any u'

State 1. B noticed that A uttered some u' (but wasn't in State 2)

State 2. B correctly heard u' (but wasn't in State 3)

⁶The response delays arise because the active participant typically has to complete the following steps: 1) read and understand the partner's message 2) update the floor plan 3) do some problem solving 4) update the floor plan 5) generate and send a response message to the partner.

State 3. B understood what A meant by u'

Dialogue (1)

- (1) J-1: I can get a high table in blue for \$250 but I don't have any blue chairs.
- S-1: I don't have any blue chairs either. But I do have 2 \$25 yellow chairs. But I don't have a high yellow table.
- J-2: Yellow is out since I don't have a yellow table either. I have a blue for \$250 and a red for \$300. I can get 3 green chairs (\$50) or 2 red chairs but we can't afford those since they're \$100 each!! So here's hoping you have a green table or, better yet some cheap blue chairs.
- S-2: THERE ARE NO BLUE CHAIRS! I do have a green table for \$400, and 5 green chairs for \$75 each. So the dining room can have my green table for \$400, 1 green chair for \$75, plus 3 green chairs from you for \$50 each. That's $400+75+150=625$. The cheapest of all the sofas is my red one for 300. That's 925. We only have 850. AHHHHHHH!
- J-3: we're in big trouble unless you happen to have some blue chairs. What's the word??
- S-3: Hey, I just found out that we don't HAVE TO match the colors. Well, we should definitely go with the red sofa for 300. My cheapest table is red for 300. My cheapest chairs are 2 yellows for 50. If we add 2 or your green chairs for 50 each that's $300+300+100+100=800$. We have 50 bucks left.

Consider Dialogue (1). At the end of turn J-2, the speaker asks whether S has any blue chairs. This indicates that J was in state 0 for the utterance regarding blue chairs in S-1. In S-2, the speaker indicates that she understood and remembers the utterances about blue chairs made in J-1 and S-1. She is also aware that J was in state 0 since she highlights the repetition in hopes of getting J to notice it. This fails to repair the situation since J is still asking about blue chairs in J-3. We hypothesize that J could have noticed the highlighted utterance in S-2, but because the turn was complex she forgot that S had no blue chairs. S shifted J's attention to the green options for the dining room and the fact the green option was over the budget. J probably engaged in some more problem solving activity, and arrived again at the need to use her cheaper blue table and the need to find matching chairs. S could try to continue the repair but because she finds a solution to the problem solving activity in S-3, either her attention has shifted from J's query for blue chairs or she judges that the repair is not important. Simply repeating the utterance failed to work in this case.

This dialogue illustrates how a hearer can have a state 0 attitude towards an utterance that we believe she must have understood at some point. The number of repeats and her explicit request for the information increases the likelihood that she understood at least one

of the repetitions. She simply forgot about the proposition later in the turn.

Note too that at the time J-2 was produced, S-1 is still available for J to review. Apparently she did not re-read S-1 before sending J-2 or she would have realized there were no blue chairs.

Dialogue (2)

- (2)V-1: I don't have any blue chairs either! I have a red table for \$300 but the chairs are \$100 each and there is only two. I have four yellow chairs for \$25 if you have the table... also, I have three green chairs for \$50. Let me know what you have.
- S-1: Hmm... well the best deal on a table that I can see is also red \$300. But my red chairs are 2 for \$75 and 2 for \$125/ea. There are 5 greens for \$75/ea but the table is \$400. So, since neither of us has a yellow table, it looks like red table and 4 chairs (my 2 and your 2) = \$650 and green would = \$750, no?
- V-2: Well, it looks like we'll have to go with the red table and chairs for \$650, but we also have a red sofa in the living room and I would like some diversity for the sake of esthetics... however, as it is with the cheapest for the LR and the DR we are over our limit. We only have \$900, right? Can we charge it?!
- S-2: We do only have a total of \$900. I just noticed that I have one green chair for \$50. So, it would be \$400 for the table and \$275 (1 @ 50 and 3 @ 75) for the chairs = \$675. Or do you have any greens for \$50? Or other deals? I mean we would still be over and they don't take visa that I know of! Hope I'm adding right!?
- V-3: So I guess I forgot to mention that I have 3 green chairs for \$50 each, oops! So my 3 green chairs plus yours for \$50 and the green table for \$400 would be \$600. Then we could still afford the red table at \$300. And, we'll have the diversity I've been dreaming of! Kind of a bright green, huh?
- S-3: You mean the red sofa for \$300, right?

In Dialogue (2), although S has added wrong in S-1, it is clear that she didn't use the 2 \$50 green chairs, presented in V-1, when constructing the green option. Interestingly, V seems to have forgotten that she has 2 \$50 green chairs in V-2. S's obvious state 0 attitude for the utterance in V-1 is not noticed in V-2. Since S queries for cheaper green chairs in S-2, V remembers in V-3 that she has the two green chairs but does not remember that she presented them earlier. This is evidence that the speaker forgot about her own utterance. Notice that the turns are again complex, suggesting that attentional shifts may be responsible.

Also in turn V-3 of Dialogue (2), V refers to the red table for \$300 as though it had already been decided upon. However, we know from V's updates to her graphics that she actually removed a red table for \$300 and must have meant the \$300 red sofa that had been agreed upon earlier for the living room. The removal of the red table from her display may have interfered in this case. In S-3, her partner recognizes the

miscommunication and corrects V since this record of their agreement had been requested as part of the task description. Notice that S treats this as a speech error on V's part and not as an alignment problem although a misalignment allowed the problem to be detected.

Dialogue (3)

- (3)R-1: This time I have all of \$550. I have a red high table for \$300 and a blue sofa for \$300. I also have 4 blue chairs for \$100 each, which is kind of expensive. Also 2 red chairs for \$50, which would match the table."
- K-1: I have \$450. I have 2 red chairs \$50, Your table deal is good, we'll have a set 1 table and 4 chairs 4 chairs. I have a blue floor lamp (\$250). For the living room set I have ,in yellow, a sofa (350) and rug 150
- R-2: If I buy the table and chairs, I will have \$150 left. I can't afford a sofa. If you bought the yellow sofa, I could get a matching floor lamp for \$150 and be out of money. You could buy the 2 red chairs with the sofa and you'd be out also, right? How does that sound?
- K-2: The red dining arrangement is good, and so is the yellow sofa and lamp. i still have 50. can we shop from each other's lists.
- R-3: No, I don't think so. How much were your chairs? I thought they were \$50 each.
- K-3: Oh wait , I added them as 25. We are done

In Dialogue (3) we see in turn K-2 the other type of speaker error in which the speaker has used an incorrect value in totaling the agreed to items. The graphics evidence and the prior dialogue indicate that K believes the chairs cost \$50 each, but he indicates in turn K-3 that he used the wrong value for the chairs when adding. It is a problem solving error which was detected because of a misalignment. Notice that in turn R-3 that R treats this as a possible misalignment on the costs of K's contributed chairs due to the amount of the discrepancy. Alternatively, R could have claimed K added wrong but her repair is more helpful since she can point out a possible source for the mistake.

Dialogue (4)

- (4)S-1 my bankroll is 550. i also have 2 red chairs for 50 a piece. Lets buy those definately. I also have a red high table for 400 if u want to spend extra money to match if not let me know
- A-1: i say we stick with your red high table and the 4 red chairs for the dining room. And for the living room I have a 400 yellow sofa. If we buy this that will take care of all of our money, which looks good
- S-2: look at this, we can always but a red tablecloth for the 200 yellow table. if we do that i have 400 blue sofa and a 350 yellow sofa, and i have a 250 blue floor lamp or a 150 yellow rug. I say lets get the 200 yellow table

A-2: ok, so we're set on the yellow table and 4 red chairs for the dining room. which will cost us 400. so now we have 600 left for the living room. if we get your 350 yellow sofa and your 250 blue floor lamp, that sounds good to me because I don't have anything better in my inventory.

In Dialogue (4), we see that subjects review the mutually known solution before modifying it. In S-1, D proposes to buy 4 red chairs for the dining room and introduces a matching table and weakly proposes it. In A-1, A agrees to put the 4 red chairs and the matching table in the dining room. But in S-2, S counterproposes a \$200 yellow table to replace the red table. Finally in A-2, we see that "4 red chairs in the dining room" is presented again although it has already been agreed to and nothing has happened to alter that part of the agreement. Note that the totals in A-2 are also redundant since this is mutual knowledge.

Dialogue (5)

(5)R-1: ok. I have ordered my 4 chairs. We can order more of these if we have \$\$ left over. I have a blue sofa for 200. My other sofa is expensive. So we are blue today. Let's use your blue sofa, can you order that? I have 2 blue floor lamps for 200.

J-1: I'd prefer the living room a different color, but what the heck. I'll get the blue sofa for 175 for the living room, you get the 2 blue floor lamps, one for each room, and I'll get a blue rug for the living room for 75, leaving me broke. Your floor lamps are 100 each, right?

R-2: Right, floor lamps for 100 each. I total your proposal at 850 with everything we have decided on. So if I order 2 more chairs for the dining room we can have bigger parties and are spent out.

J-2: I'd have preferred a chair for the living room, but you give good parties, so I yield. But I don't understand why we are spent out. You've bought 6 chairs = 150, 2 lamps = 200. Total = 350. You have 200 left. ??

R-3: aha, a misunderstanding. I think I misread the display. The lamps are 200 each. If I said 100 each, correct that.

In this last excerpt, shown in Dialogue (5), we see how the redundancy strategy is used to detect a miscommunication. R presents 2 blue floor lamps that cost \$200 each in R-1. Since the presentation as stated is ambiguous, J asks for clarification in J-1 and shows that his interpretation is 2 floor lamps with a total cost of \$200. In R-2, R erroneously agrees with J's interpretation, and communicates the total of J's proposed extension to the agreed to solution in J-1 while also implicitly accepting that extension. R then makes a proposal to further extend the solution. Since R and J are not coordinated on what they have agreed to, J arrives at a different total for the extended proposal. In R-2, R intended to check his level of understanding of the evolving conversation by communicating a total which he believes is mutually known.

Conclusions and Future Work

We have presented evidence from conversational data that shows how complex turns and problem solving efforts can shift attention and result in a non-communication. Strategies that are sensitive to cognitive overloading can help minimize these types of errors when used by the speaker. In contrast, speech errors or problem solving errors cannot be prevented since the speaker is the one who has overloaded himself. An awareness of these self-inflicted overloads suggests that additional repair options should be available. For example, when repairing a misindication, a repair strategy for misattributions (McCoy 1986) as in (6a) may be better than one for misinterpretations as in (6b).

(6) a. We aren't using the red table. Did you mean the red sofa?

b. I thought we were replacing the red table.

Finally we presented data that illustrates the strategy of checking the level of understanding of the evolving conversation where there may be a heightened expectation of misalignments. But the strategy is not guaranteed to work in all cases: attention lapses are always possible.

We plan to collect enough additional data to enable us to perform statistically significant distributional analyses. We plan to determine what factors contribute to a subject's inattention and attentional shifts and what factors influence a subject to probe for a misalignment. We are still considering how to code the data in order to support these projected analyses.

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