WHAT IS A COMMUNICATION DIFFICULTY?

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ABSTRACT - This paper describes, with examples, several types of communication difficulty which arise in telephone information seeking dialogues. These difficulties arise for a variety of reasons, including mishearings and misunderstandings, by either the caller or information giver. Both use their natural communication skills to effect repairs. The analysis of these natural dialogues gives insights into the language processing requirements of future automated speech response systems.

INTRODUCTION

Following the collection of simulated information seeking dialogues over the telephone, we found a large proportion of the interactions were not 'straight forward'. There were situations, for example, when one or the other of the participants had to ask for a clarification or a repetition of material. This often involved the speakers in repairing mishears and misunderstandings. The difficulties were not necessarily perceived as such by the participants, because the speakers were naturally skilled in repairing or avoiding problems. However, it was apparent that a machine would have difficulty tracking much of what a human interactant took for granted. We decided to undertake a pilot study which would investigate communication difficulties in dialogues and how the human participant resolved it. The theoretical approach is that of Functional Systemic Grammar.

A number of questions arise, namely, what is a communication difficulty, what are the identifying criteria, where in a dialogue does it occur, who identifies the difficulty and who initiates the repair, how is it resolved, an what type of repair was used to resolve it? In this paper we look at the question of what is a communication difficulty.

METHOD

We simulated a circumstance where a caller telephoned an operator to find our about a particular service. The callers were given a card with a 'part to act' in these information seeking dialogues. This card described some need on their part to obtain a service for a motor car. Obtaining a service for a car was chosen because this is a familiar activity for most people. This allowed the subjects to be chosen from males, females, and young and old. Different services were allocated to different callers. The operator had a computer program which simulated a database search on a restricted data collection of car services, and the caller was required to request one of these services and 'pay' for it by a 7 or 16 digit account code. The phone calls were then transcribed and coded for various features. Out of all the dialogues collected ten were selected as representative samples of the sort of communication difficulties that had been noted in the full collection. The same female operator was involved in all cases, and the callers were a mixture of males and females. Each dialogue took no longer than a few minutes to conclude. All participants were aware that they were being tape-recorded and that the activity was a simulation. The result was very pleasing because the callers became very involved in the activity and produced very natural sounding data.

Each of the information seeking dialogues was analysed into generic stages. These stages were contact, service request, location nomination, database search, account code specification, service negotiation,

service provision, pre-closure, closure. All of the dialogues had these components. This information was important in identifying possible correlations between types of difficulties and generic stage. Table 1 gives these stages within a sample text.

Speaker	Stage	Text	Function
operator	Contact	"Auto Information Service"	opening the interaction and identifying the service
caller	Contact	"Yes"	acknowledging
caller	Service Req.	"I want information on muffler suppliers, please"	state the goal
operator	Service Req.	"right"	comply with goal
operator	Loc. Nom.	"What s'burb do you want these in?"	request location
caller	Loc. Nom.	"Emu Plains"	provide location
operator	D'base Ser.	"Just a moment"	request cooperation while searching
caller	D'base Ser.	"okay" (or silence)	accept
operator	Acct. Code	"While the computer is searching for that, can I have your account code please?"	request acct. code
caller	Acct. Code	"4444 3333 2222"	comply
operator	Service Neg.	"There's one dealer in Emu Plains"	give information
caller	Service Neg.	"I'll have that one"	accept
operator	Service Pr.	"The name is Quiet's Muffler Service"	give service - name
caller	Service Pr.	"uhuh"	back-channel
operator	Service Pr.	"55 Main Highway, Emu Plains"	give service - address
caller	Service Pr.	"uhuh"	back-channel
operator	Service Pr.	"The telephone no. is 123 4567"	give service - telephone
caller	Service Pr.	"uhuh"	back-channel
operator	Preclosure	"Is that one okay?"	check status
caller	Preclosure	"yes"	confirm
operator	Closure	"okay, good bye"	close & farewell
caller	Closure	"bye"	close & farewell

Table 1. Analysis of a Sample Dialogue.

ANALYSIS

The ten dialogues were examined to establish what features of a human to human interaction would introduce problems for a machine based dialogue manager. Conversation moves were analysed to determine which were essential to achieve operator and caller goals. For the caller, the goal was to gain information about servicing a car and to pay for the service. For the operator, the goal was to provide the information to satisfy the callers request and to charge for the service.

All the essential elements of the conversation are obligatory and predictable. However, even with this consideration, we still found that there were features in the essential elements that produced communication difficulties. For example, certain ways of indicating turn-taking could be difficult for a machine dialogue manager. Conversational elements that did not fulfil the essential function were classified as non-essential. Precisely because these elements are not essential they are not predictable, and therefore a potential source of communication difficulty. This gave a number of types of difficulties which are listed below.

DIFFICULTIES RELATING TO THE NON-ESSENTIAL UTTERANCES

1. Out of sequence utterances - introducing a future concept early.

> ca.   *"ah, do you want the account number"*
>
> This utterance occurred after the greeting in a dialogue, whereas it usually occurred after the database search in the main generic structure.

2. Appropriate but unexpected.

> (a)   ca.   *"Can you just hold on one moment, I'll put the radio down."*
>
> Introducing an anaphoric element.

> (b)   op.   *"The first one is Gordon Smash Repairs"*
> ca.   *"right, and do you have their number?"*
>
> This preempts of the operator, who would give this information later.

3. Inappropriate and unexpected

> (a)   ca.   *"I have a question for you."*

> (b)   ca.   *"I don't know FitzSimmon's Lane"*

4. Appropriate for human-human interaction but unnecessary. Difficult or impossible for a machine.

> ca.   *"Yes. That sounds a good idea"*
>
> Double checking - the first affirmation is sufficient.

5. Repeating or recycling information

> op.   *"and they're Alto Ford"*
> ca.   *"Alto Ford, yep."*

6. Descriptions of the problem rather than a request for a specific purpose.

> ca.   *"I scraped the rear side panel of the car trying to park it."*
>
> This requires the semantic interpretation that scraping the car leads to the need for panel beating repairs.

DIFFICULTIES RELATING TO ESSENTIAL UTTERANCES

These were primarily problems that could arise because of the inadequate knowledge source on the part of either the caller or the operator, and the speakers would often introduce other information to deal with this when it was recognised as a potential difficulty.

1. Unknown word.

(a) dealt with by preemptive spelling;

> op.   *"and the name of the garage is Hahn" "h-a-h-n"*
>
> The operator pre-empts callers lack of familiarity with the word.

(b) dealt with by checking;

> ca.   *"and Gibbes, was it?"*
> op.   *"Gibbes."*
> ca.   *"right."*
> op.   *"g-i-double-b-e-s street."*
> ca.   *"gotcha."*

(c) dealt with by requesting a spelling;

    ca.   *"sorry, could you spell that for me?"*
    op.   *"b-o-w-t-e-double-l"*

2. Mismatching of caller and operator key words.

    ca.   *"resprayed"*
    op.   *"yes, spray painted."*

3. Input unknown to the operator.

    op.   *"Killara, is that double 'l'?"*

DIFFICULTIES INTERNAL TO THE UTTERANCE

1. Break in the utterance flow

    (a) self corrected mispronunciation

        ca.   *"ifor.... information on..."*

    (b) self corrected mis-stress

        ca.   *"RO ah roZELLE"*

    (c) self corrected grammar error

        ca.   *"he is... he was"*

    (d) self corrected semantic error

        ca.   *"Coogee or Maroubra... Coogee only, sorry"*

    (e) incomplete utterance

        ca.   *"good morning my pl-...would you please be able to tell me where um I....."*

    (f) rephrase

        ca./op.   *"could I have a... can I have your."*

    (g) thinking break (usually a non-lexical vocalisation like 'um', or an unfilled pause)

        op.   *"What was your um preferred time?"*
        ca./op.   *"Would that be [pause] this Friday?"*

2. Talking over each other.

    op.   *"okay ==bye=="*
    ca.   *"==bye=="*

    (== indicates the words talked over)

PROBLEMS INHERENT IN THE COMMUNICATION MECHANISM

1. Because of the noise on the line.

    ca.   *"sorry I've got a bad line"*

2. Because of the unusualness of the word

    op.   *"Aaron Tuning"*
    ca.   *"Air tuning?"*
    op.   *"Aaron, a-a-r-o-n"*

3. Because of difficulties with certain sounds over the phone.

> op.   *"the third one is A.S.K. Style Sheets"*
> ca.   *"sorry A.N.K?"*
> op.   *"A.S.K."*

4. Because of a low volume response.

> op.   *"and their telephone number is 123 4567"*
> ca.   *"m'm" [very softly]*
> op.   *[no response, because she didn't hear it]*
> ca.   *"yes" [louder, to indicate "go on"]*

5. Misheard closure cues or incorrect closure cues.

> All of the utterances were normal exchanges of information until a particular point where the caller used a very small falling pitch contour (complete indicator) instead of the small rising pitch contours which indicate 'still continuing'. The operator followed with a normal turn pass, there was a pause with no response from the caller so, the operator re-interpreted the low fall as a finishing tone, and she then produced a finishing tone. The caller suddenly rattled off the last 4 numbers. The operator was obliged to ask for clarification.

CALLER INPUT PROBLEMS

1. Incorrect information.

> op.   *"do you have an account code number?"*
> ca.   *"yea, one double five nine"*
> op.   *"yes. Is that it? one double five nine?"*

> The account code provided is only 4 digits long. All account codes should be 7 or 16 digits long.

2. Change in the negotiated stance after agreeing to it.

(a) increase the search output.

> op.   *"thank you"*
> ca.   *"just that one? Can I... have you got any others?"*

(b) change the search

> ca.   *"Actually, make it Beecroft"*

3. caller not giving cues sufficient to sustain interaction

> ca.   *"um" [pause]*
> op.   *"yes" [operator prompts for more details]*
> ca.   *[continues...]*

4. Mishear because of other language influence, e.g. difficulty understanding an accent.

5. Extended challenge. An example was a caller who became irritated with the limits of the simulated 'system' and became very angry over the lack of information about services that she knew were available.

OTHER COMMENTS ON THE DIALOGUES

One particular strategy that was very common was the splitting of information into parts. This does avoid communication difficulties by unpacking and spreading out the important facts to be conveyed. For example, a telephone number was frequently broken into chunks of three or four; or a business address was broken into logical components such as the business name, the street, and then the suburb. This strategy suits the human listener but may not be necessary for the machine. Most of these chunks of

information were produced by the supplier of the information, i.e. the operator, and if the operator is to be supplanted by a machine, then this is not a problem of recognition but becomes a useful strategy for providing information to the human caller.

Both caller and operator used the strategy of repeating what they heard. There are a number of possible reasons for this behaviour:

- As the interaction was taking part over the phone, this is one way to indicate that the listener had heard what was said,
- One participant repeats information to indicate to the other participant that they are finished with that information and are ready for more information,
- Repeating information aloud feeds back that information so that the information giver may check that they have been heard correctly.

All these are cues for human listeners to facilitate the dialogue, but may not be useful for the human-machine interaction. As such they are a potential problem. This brings up the question - do speakers interacting with a machine have to learn not to repeat unless they want clarification?

CONCLUSION

The 10 dialogues were coded for generic stage and for communication difficulties that fell into the types listed above. As the study is based on only a few examples, and because not all of the difficulties were captured in these 10 dialogues, no statistical analysis has been attempted. A few important observations can be made. Many of the types of difficulties described in this paper have a tendency to occur in only a few of the stages in the dialogue. This feature may make management of the difficulties simpler, as the problems were most likely to occur in only 2 of the 9 stages. These 2 are, however, the most important stages, service negotiation and service provision. Further, certain difficulties are more common. Less than one third of the difficulties accounted for 94% of all actual occurrences of difficulties in these 10 samples. Clearly, some difficulties are more important to deal with than others.

Wizard of Oz experiments have been performed elsewhere which have been used to simulate these types of interactions. These experiments have shown that handling communication difficulties is one area where the caller seems to recognise that an operator, which is also a machine, will have difficulty with too much information. As a consequence, the callers in the Wizard of Oz experiments reduced the complications involved in redundancy, ellipsis, and embedding (Fraser & Gilbert 1991).

We now intend to complete a more detailed analysis of the dialogues and their communication difficulties, and look into other aspects including:-

- what are the identifying criteria,
- where in a dialogue does it occur,
- who identifies the difficulty and who initiates the repair,
- how is it resolved, and,
- what type of repair was used to resolve it?

REFERENCES

Fraser N & Gilbert G (1991) *Simulating Speech Systems*, Computer Speech & Language, Vol. 5, pp 81-99.

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