

Other-Initiated Self-Repairs in Estonian Information Dialogues: Solving Communication Problems in Cooperation

Olga Gerassimenko
Department of
Estonian
University of Tartu
50409 Tartu, Estonia
gerro@ut.ee

Tiit Hennoste
Department of
Estonian
University of Tartu
50409 Tartu, Estonia
hennoste@ut.ee

Mare Koit
Institute of Computer
Science
University of Tartu
50409 Tartu, Estonia
koit@ut.ee

Andriela Rääbis
Department of
Estonian
University of Tartu
50409 Tartu, Estonia
andriela@ut.ee

Abstract

The paper gives an overview of repair sequences used in Estonian spoken information dialogues. 62 calls for information, travel bureaus, shops or outpatients' departments are analysed. Several repair types are considered. Our further aim is to develop a dialogue system which can interact with the user in Estonian following the norms and rules of human-human communication

1 Introduction

Our goal is to build a dialogue system that would be able to interact with humans in Estonian using norms and rules of human-human communication. Human-human communication is not fluent, problems that must be solved arise continuously. Similar problems occur in human-computer interaction.

Several branches of linguistics study how to solve communication problems: discourse analysis, psycholinguistics, foreign language learning, conversation analysis, dialogue modelling on the computer and determining dialogue acts (Allen, Core, 1997; Linell, 1998; Bunt, 1999; Traum, 1999; Allwood *et al.* 2001; O'Brien, 2002). Similar phenomena are called differently: structure shifts, feedback, grounding, repair, communication strategies. There are at least the following difficulties with these treatments:

1) repair is considered together with other dialogue management acts and not as a separate phenomenon as it is in natural conversation

2) different means of repair are considered instead of repair as a process and sequence

3) non-natural utterances are used in dialogue systems for repairs (*To Paris, is that correct? / I don't quite understand*)

To overcome these problems, we analyse repair using the methods of the conversation analysis (Schegloff *et al* 1977). There are 4 kinds of repairs differentiated in CA: self-initiated self-repair, other-initiated self-repair, self-initiated other-repair, other-initiated other-repair. All the repairs analyzed in this paper are other-initiated self-repairs. We differentiate three subtypes here: clarification (45 cases), non-understanding (7), and reformulation (27).

We have analyzed calls for information (asking phone numbers, addresses etc.), and calls to travel bureaus, shops and outpatients' departments. The analysed sub-corpus consists of 62 dialogues; 2472 dialogue act tags were used in our sub-corpus, among them 79 repair initiations (about dialogue acts see Hennoste *et al* 2003).

2 Other-Initiated Self-Repair

In the case of clarification and non-understanding the hearer initiates the repair and the partner solves the problem. Non-understanding means that hearer didn't hear or didn't understand something in speaker's previous utterance. There are two main possibilities to initiate repair: general question which only indicates that there was a problem (e.g. *mida/what, kuidas/pardon*), or *wh*-questions to localise the problem exactly. The problem is solved by repeating, elaborating or explicating the problematic information.

In our dialogues, the non-understanding is initiated mostly to indicate non-hearing (6 examples from 7) by using general questions *kuidas/ pardon* or utterance *ei kuule/I don't hear*. The problem is solved by repeating the problematic information, either exactly or with modifications.¹

¹ In examples, the participants are C (client) and O (information officer). Simplified transcription is used (see Ap-

C: aga kallis see tööloba on. (0.5)
 how much does this work permit cost
 >O: kuidas |PPE: NON-UNDERSTANDING|
 pardon
 >C: kallis tööloba on. |PPJ: RE-
 PAIR|
 how much does the work permit cost
 O: ei, töö- tööloba ei ole vaja.
 no work permit is needed

Clarification means that hearer is not sure whether she has understood some partner's utterance correctly. Repeating of the problematic part of utterance + tag-question particle (e.g. *jah/yes*) are used to initiate the repair. The problem is solved by agreeing with it or rejecting it.

Clarification is initiated in two ways in our data:
 - a phrase or declarative sentence that repeats the problematic part (70%)
 - the same + a question-particle *jah/yes*, *vä/or*, *iühesõnaga / in short* (23%).

The problems are solved mostly by using
 - *jah, jaa /yes, mhmh* (60%)
 - the same + repeating or adjusting the previous turn (12%).

O: nii on pakkuda (0.5) kümme kaks-
 kümend. (.)
 I can propose (0.5) ten twenty
 >C: kümme kakskümend. |PPE: CLARI-
 FICATION|
 ten twenty
 >O: jah. |PPJ: REPAIR|
 yes

In reformulation the hearer initiates the repair and suggests her own interpretation of the problematic issue. The partner agrees with it or rejects this interpretation. The most frequent ways for repair initiation are:

- word, phrase, sentence (22% of cases)
 - the same + a questioning particle *siis/then, jah/ yes, eks/eh, vä/or* (30%)
 - *et/that, tähendab/it means that* + word, phrase, sentence (33%).

The problem is solved by
 - *jah, jaa / yes, mhmh / yes* (41%)
 - *jah, jaa / yes* + repeat or explanation (33%)
 - explanation (22%).

O: ja m praegu no ütleme keskmine
 hind on oleneb nüüd hotellist ekso-

pendix). Only repair acts are marked. Repair initiations are marked by PPE: NON-UNDERSTANDING / CLARIFICATION / REFORMULATION, problem solving acts are marked by PPJ: REPAIR.

le see on kuskil õheksa (.) tuhat
 (.) keskmine hind.
 and now let's say the average price
 is it depends of hotel it is about
 nine (.) thousand (.) average price
 >C: nädal. |PPE: REFORMULATION|
 [for] a week
 >O: jaa. |PPJ: REPAIR|
 yes

3 The Structure of Repair Sequence

3.1 Prototypical Repair Sequences

In the prototype case, the client asks and the officer answers in information dialogues (the roles can be reversed in some cases, e.g. when the officer asks client's personal data). There are two prototypical locations of repair sequence: after client's question/request and officer's answer. They give us two prototypical repair sequences.

A. Problem in question/request
 MAIN LINE: question/request of the client
 REPAIR SEQUENCE:
 > Repair initiation by officer
 > Problem solving by client
 BACK TO MAIN LINE: officer's answer

B. Problem in answer
 MAIN LINE: officer's answer
 REPAIR SEQUENCE:
 > Repair initiation by client
 > Problem solving by officer
 BACK TO MAIN LINE: client's response (*mhmh/ ahah / jah*) + (new) question / request / finishing conversation

69% of repairs that concern question/request belong to prototype A. This forms 14% from all repairs. 44% of repairs regarding answer belong to prototype B. This makes up 27% of all the repairs (75% of them are clarifications). In sum, 71% of non-understandings, 40% clarifications and 33% reformulations are prototypical.

3.2 Untypical Repair Sequences

First, there exist peripheral variants of prototypical repair structures. The remaining examples in group A do not constitute clear sub-groups. In group B there are some more clearly deviating repair sub-groups.

1. A participant initiates repair regarding information in some earlier turn.

Repairs are initiated regarding the immediately previous turn in 90% of cases, but there are some examples, where client clarifies information which

(s)he got earlier in the conversation and breaks the process of giving information by consultant, as in the following example. After repair C gives response by continuer *mhmh*. Only after this O continues to give information.

O: kolmkümmend viis ruutmeetrit
dushsh on seal olemas, (.) mõõturid
on seal olemas (1.0) [korras]
it has got thirty five square me-
ters, a shower, it has got water
meters [in order]
>C: [ja tuhat kolmsada.] |PPE: CLA-
RIFICATION|
[and one thousand three hundred]
>O: jah. (.) |PPJ: REPAIR|
yes
C: mhmh
mhmh
O: elektri boiler on seal olemas,
(0.5) ja ta on tühi.
it has got a boiler (0.5) and it's
empty

The structure is as follows:

O giving information
>C repair initiation regarding earlier information
>O problem solving
C continuer *mhmh*
O continues giving information

2. The answerer/consultant returns to the main line, not the client, as it is in prototypical B type repair.

For example, the client initiates a repair regarding the beginning of an e-mail address and breaks the officer's dictation of the address. In this case, the officer (O) must return to the main line, not the client (C). There are two possibilities to do this:

- O carries out a repair and continues giving information in the same turn
- O carries out a repair, C gives back the turn using particle *mhmh* and O continues to give information.

Therefore, there are two structures:

O giving information
>C initiation of repair
>O problem solving + continuation of giving information

O giving information
>C initiation of repair
>O problem solving
C *mhmh*
O continuation of giving information

3. Some turns are added after the repair before returning to the main line (8 cases).

The problem is that officer believes that his/her answer given before repair initiation was finished,

but client does not. So the client does not return to the main line after problem solving but sends the turn back by using *jah/yes* or *mhmh/yes*. Then the officer sends turn back again and only after that the client returns to the main line. The structure is as follows:

O: answer (giving information)
>C: initiation of repair
>O: problem solving
C: *jah / mhmh*
O: *jah / mhmh* / adjusting or repeat
C: (*mhmh* +) new question / finishing conversation / adjusting or justifying the request

Second, there are some repair sequences with reversed roles - the officer asks questions and the client answers.

4. Simple structures with reversed roles

Such repairs occur first of all at the end of conversation where the client and the officer negotiate the next meeting and the officer asks client's address or phone number. Two types occurred.

First, conversation continues with reversed roles after repair, the officer asks a new question:

C giving information
>O initiation of repair
>C problem solving
O repeat + new question

O: ä (.) kes te olete.
what's your name
C: ja nimi on Saabas. (.)
and the name is Saabas
>O: Saabas jah? |PPE: CLARIFICA-
TION|
Saabas yes
>C: jah. (.) |PPJ: REPAIR|
yes
O: Saabas. a ku- kus te asute (0.8)
see on Tartus jah?
Saabas. where do you live (0.8) it
is in Tartu yes?

Second, officer wants to return to normal roles and gives the turn back to client using the particle *mhmh* or repeating earlier information:

C giving information
>O initiation of repair
>C problem solving
O *mhmh* /repeat
C new question / finishing conversation

O: ja nimi on
and the name is
C: Saabas, Arvo. Saabas Arvo
(6.5) ((O writes down the name))
>O: Arvo jah? |PPE: CLARIFICATION|
Arvo yes

>C: jah. |PPJ: REPAIR|
 yes
 O: teeme siis nimodi et kümme kaks-
 kümend. (0.5)|
 let's do so that (let's meet) at
 ten twenty
 C: aitäh?
 thank you

5. The second group are sequences where officer cannot answer the client's question immediately but needs some additional information (6 examples). So he/she uses one or two adjusting questions at first and then initiates repair. Client solves the problem. And then the answer to the client's question follows. The structure is as follows:

C question / request
 (O adjusting conditions of answer)
 (C giving information)
 O adjusting conditions of answer
 C giving information
 >O initiation of repair
 >C problem solving
 (O adjusting conditions of answer)
 (C giving information)
 O answers to the C's question/request

4 Conclusion

We are not able to direct the behaviour of humans who communicate with the computer. Nevertheless, we can design our dialogue system in such a way as to minimize the reasons of repairs by the user. The primary strategy of the computer would be to provide clear and exhaustive information so that the need to clarify or re-formulate would be unnecessary. The computer itself must initiate repairs to clarify what information the user wants. The repair mechanism of the computer that simulates information officer can be prototypical (type A) because this occurs mostly in human-human communication.

Our further work will concentrate on the analysis of a bigger corpus in order to find out and explain more repair structures which could be modelled in a dialogue system.

Appendix. Transcription marks

falling intonation	point
fall not to low	comma
raising intonation	?
short interval (max 0.2 sec)	(.)
timed interval	(2.0)
begin of overlap	[
end of overlap]
latching at end of utterance	word=
latching at beginning	=word
glottal cut off	do-

Acknowledgement

This work was supported in part by Estonian Science Foundation under Grant No. 5685.

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