

# Argumentation in Negotiation Dialogues: Analysis of the Estonian Dialogue Corpus

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**Abstract.** Estonian spoken dialogues have been analysed with the purpose to model natural argumentation. Calls from an educational company to different institutions are studied where a salesclerk argues for taking a training course by a customer. The study demonstrates that salesclerks try to persuade customers stressing the usefulness of a course in most cases. Our further goal is to model natural dialogue where the computer as a dialogue participant (a salesclerk) follows norms and rules of human-human communication.

## 1 INTRODUCTION

How do people argue? To answer this question, one has to study corpora that include human-human conversations. Argumentation is used in the dialogues that deal with cooperative problem solving. Let us list some of the most important corpora [6].

The HCRC Maptask Corpus consists of 128 dialogues where participants are marking a route on a map. The TRAINS corpus includes 98 problem solving dialogues where one participant plays the role of a user and has a certain task to accomplish, and another plays the role of the system by acting as a planning assistant. The Monroe corpus contains 20 human-human mixed-initiative, task-oriented dialogues about disaster-handling tasks. The COCONUT corpus includes computer-mediated human-human dialogues in which two subjects cooperate on buying furniture for a house. The Linköping Dialogue Corpus consists of 60 dialogues collected in Wizard of Oz-experiments using two scenarios: car repair and travel. The VERBMOBIL corpus includes bilingual situational dialogues recorded with a role-playing manner (schedule arrangement, hotel, sight seeing). Switchboard is a collection of about 2430 spontaneous conversations between 543 speakers in which the subjects were allowed to converse freely about a given topic.

Dialogue acts and some other phenomena are annotated in the corpora. Different coding schemes are used for various purposes: for annotation and analysis of units of dialogue, to support the design of a dialogue system, to support machine learning of dialogue acts and sequences, theoretical analysis of the pragmatic meanings of utterances. DAMSL (Dialogue Act Markup in Several Layers) is a well-known system for annotating dialogues [3]. A more elaborate version of the SWBD-DAMSL (Switchboard Shallow-Discourse Function

Annotation), has been used to code the Switchboard corpus [3]. The Maptask coding scheme is used to annotate transactions, dialogue games and moves in dialogues [1]. The VERBMOBIL corpus uses 18 dialogue acts for annotation of topics.

Our current research is done on the Estonian Dialogue Corpus (EDiC) which contains dialogues of two kinds [2]. The main part of EDiC is made up of spoken human-human dialogues – 715 calls and 116 face-to-face conversations. The remaining part of EDiC – 21 written dialogues – is collected in the Wizard of Oz experiments [7]. We have two purposes collecting the corpus – (1) to study human-human conversations and human-computer interactions, and (2) to develop a DS which interacts with a user in Estonian.

Dialogue acts are annotated in EDiC using a DAMSL-like typology which is based on the conversation analysis approach [2]. According our typology, dialogue acts are divided into two groups: (1) acts that form so-called adjacency pairs (AP) like proposal – agreement (A: *Call me later.* – B: *OK*), and (2) non-AP acts like acknowledgement. The number of the dialogue acts is about 120.

In this paper, we will investigate the conversations where the goal of one partner, A, is to get another partner, B, to carry out a certain action D. Such communication process can be considered as exchange of arguments (and counter-arguments) pro and con of doing D. This type of dialogue forms one kind of so-called agreement negotiation dialogues [8].

Because of this, we have modelled the reasoning processes that people supposedly go through when working out a decision whether to do an action or not. Our model is implemented as an experimental dialogue system and can be used, among other applications, as a “communication trainer”.

In our previous paper, calls to a travel agency have been analysed with the aim to find out strategies implemented by a travel agent in order to influence the reasoning processes of a customer to book a trip [4]. It turned out that customers wanted only to get information in most of the analysed calls, and argumentation has been used only in a limited number of cases.

In this paper, we consider the dialogues where a salesclerk of an educational company calls another institution (a manager or another responsible person) and offers courses of his/her company. Both the participants are official persons. We may expect that a salesclerk tries to influence the partner in such a way that (s)he decides to book a course for the employees of his/her institution. Our further goal is to model a salesclerk in a DS.

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The paper is organised as follows. Section 2 gives an overview of our model of conversation agent which includes a reasoning model. In section 3, a corpus analysis is carried out. Section 4 represents an argumentation model which can be used by a conversation agent, and some conclusions are made in section 5.

## 2 MODELLING COMMUNICATION

In our model, a conversation agent is a program that consists of 6 (interacting) modules (cf. [5]):

(PL, PS, DM, INT, GEN, LP),

where PL – planner, PS – problem solver, DM – dialogue manager, INT – interpreter, GEN – generator, LP – linguistic processor. PL directs the work of both DM and PS, where DM controls communication process and PS solves domain-related tasks. The task of INT is to make semantic analysis of partner’s utterances and that of GEN is to generate semantic representations of agent’s own contributions. LP carries out linguistic analysis and generation. Conversation agent uses goal base GB and knowledge base KB in its work. A necessary precondition of interaction is existence of shared (mutual) knowledge of agents.

### 2.1 Reasoning Model

We try to model a “naïve” theory of reasoning, a “theory” that people themselves use when they are interacting with other people and trying to predict and influence their decisions.

The reasoning model consists of two functionally linked parts: 1) a model of human motivational sphere; 2) reasoning schemes. In the motivational sphere three basic factors that regulate reasoning of a subject concerning an action D are differentiated. First, subject may wish to do D, if pleasant aspects of D for him/her overweight unpleasant ones; second, subject may find reasonable to do D, if D is needed to reach some higher goal, and useful aspects of D overweight harmful ones; and third, subject can be in a situation where (s)he must (is obliged) to do D – if not doing D will lead to some kind of punishment. We call these factors WISH-, NEEDED- and MUST-factors, respectively.

The values of the dimension obligatory/prohibited are in a sense absolute: something is obligatory or not, prohibited or not. On the other hand, the dimensions pleasant/unpleasant, useful/harmful have a scalar character: something is pleasant or useful, unpleasant or harmful to a certain degree. For simplicity’s sake, it is supposed that these aspects have numerical values and that in the process of reasoning (weighing the pro- and counter-factors) these values can be summed up.

We have represented the model of motivational sphere of a subject by the following vector of weights:

$$w = ( w(\text{resources}), w(\text{pleasant}), w(\text{unpleasant}), w(\text{useful}), w(\text{harmful}), w(\text{obligatory}), w(\text{prohibited}), w(\text{punishment-D}), w(\text{punishment-not-D}) ).$$

In the description,  $w(\text{pleasant})$ ,  $w(\text{unpleasant})$ ,  $w(\text{useful})$ ,  $w(\text{harmful})$  mean weight of pleasant, unpleasant, useful, and harmful aspects of D,  $w(\text{punishment-D})$  – weight of punishment for doing D if it is prohibited and  $w(\text{punishment-not-D})$  – weight of punishment for not doing D if it is obligatory. Here  $w(\text{resources}) = 1$ , if subject has resources necessary to do D (otherwise 0);  $w(\text{obligatory}) = 1$ , if D is

obligatory for the reasoning subject (otherwise 0);  $w(\text{prohibited}) = 1$ , if D is prohibited (otherwise 0). The values of other weights are non-negative natural numbers.

The second part of the reasoning model consists of reasoning schemes, that supposedly regulate human action-oriented reasoning. A reasoning scheme represents steps that the agent goes through in his/her reasoning process; these consist in computing and comparing the weights of different aspects of D; and the result is the decision to do or not to do D. There are three reasoning procedures in our model which depend on the factor that triggers the reasoning (WISH, NEEDED or MUST).

The reasoning model is connected with the general model of conversation agent in the following way. First, the planner PL makes use of reasoning schemes in order to predict the user’s decision and second, the KB contains the vector  $w^A$  (A’s subjective evaluations of all possible actions) as well as vectors  $w^{AB}$  (A’s beliefs concerning B’s evaluations, where B denotes agent(s) A may communicate with). The vectors  $w^{AB}$  are used as partner models.

For the DS, its partner (user) is similarly a conversation agent.

### 2.2 Communicative Strategies and Tactics

A communicative strategy is an algorithm used by a participant for achieving his/her goal in interaction.

The participant A, having a goal that B will decide to do D, can realize his/her communicative strategy in different ways (using different arguments for): stress pleasant aspects of D (i.e. entice B), stress usefulness of D for B (i.e. persuade B), stress punishment for not doing D if it is obligatory (threaten B). We call communicative tactics these concrete ways of realization of a communicative strategy. Communicative tactics are ways of argumentation. The participant A, trying to direct B’s reasoning to the positive decision (to do D), proposes various arguments for doing D while B, when opposing, proposes counter-arguments.

There are three tactics for A in our model which are connected with the three reasoning procedures (WISH, NEEDED, MUST). By tactics of *enticing* the reasoning procedure WISH, by tactics of *persuading* the procedure NEEDED and by tactics of *threatening* the procedure MUST will be tried to trigger in the partner.

In case of institutional communication, both of enticing and threatening can be excluded because a clerk is an official person and (s)he is obligated to communicate cooperatively, impersonally, friendly, peacefully (i.e. to stay in a fixed point of the communicative space). (S)he only can persuade a customer. The general idea underlying the tactic of persuading is that A proposes arguments for usefulness of D trying to keep the weight of usefulness for B high enough and the possible negative values of other aspects brought out by B low enough so that the sum of positive and negative aspects of D would bring B to the decision to do D [5].

## 3 CORPUS ANALYSIS

For this paper, a closed part of the EDiC has been used, consisting of 44 calls where a salesclerk of an education agency offers different courses of his/her agency (language, book-keeping, secretary training etc.) to customers. The dialogues have been put into a secret list on the ethical reasons, according to an agreement with the company.

14 dialogues out of 44 are excluded from the current study because they do not include argumentation at all (the needed person is not present, the number the clerk is calling is wrong, the recording breaks off). The remaining 30 dialogues can be divided into two groups: 1) the salesclerk (A) and the manager or personell administrator (B) of another organization are communicating for the first time (6 dialogues), 2) they have been in the contact previously (24 dialogues). The action D is 'to book the offered course'.

A call consists of three parts: (1) a ritual beginning, (2) the main part which starts with A's proposal and ends with B's agreement or rejection, (3) a ritual ending.

### 3.1 The first contact

Let us start with considering the dialogues where the participants are communicating for the first time. The average length of these dialogues is 88 turns (min 54 and max 113 turns). In two dialogues, the salesclerk starting a conversation points another person from the same institution who has recommended just that person.

A typical dialogue starts with A's introduction and a question whether B does know the education company. Then a short overview of the company is given (e.g. *we are an international company, we are acting six years in Estonia, we are dealing with sale, service, management, marketing*). All the statements can be considered as arguments for taking a training course. Then a proposal is made by A to take some courses. A points the activities of B's organisation which demonstrates that (s)he has previous knowledge about the institution (e.g. *your firm is dealing with retail and whole sale, therefore you could be interested in our courses*, Ex<sup>2</sup> 1). If B does not make a decision then A asks B to tell more about B's institution in order to get more arguments for necessity of the courses for B, and offers them again.

(1)  
A: ja no Ti- Tiritamm pakub just nüüd ka sellist sellist koolitust et kuidas kuidas neid (0.5) mm kliente nüüd and Tiritamm offers just such such a training how how [to find] customers (1.8) leida eks=ole, oma turgu to find, yes, [to increase] your own market (1.5) e suurendada. ja (0.8) ja (0.5) ja samas ka see et=et kuidas neid püsikliente hoida (1.0) kas e (...) suhtlemist et. kuidas teiele tundub kas ned teemad võiksid teile huvi pakkuda? to increase, and how to keep regular customers. how do you think - are you interested in that themes?

All the dialogues end with an agreement to keep the contact (A promises to send information materials to B, call B later), B does not decide to accept nor reject a course but postpones the decision. Still, that can be considered as a good result for A, it shows that his/her arguments were reasonable. B needs some time for reasoning, weighing positive and negative aspects of D.

### 3.2 Continuing communication

Most of the analysed dialogues represent the situations where A and B have been in contact before. B has had the time to evaluate the information about the courses in order to make a decision). The average length of such dialogues is 94 turns (min 12, max 264 turns). Therefore, these dialogues are in general longer than the first conversations. B agrees to take a course only in one conversation, (s)he agrees with reservations in two dialogues, and does not agree in one dialogue. In the remaining dialogues, A and B come to the agreement to keep the contact like in the case of the first communication. So, B postpones the decision. A always starts the conversation with pointing to a previous contact (*we communicated in November, I sent catalogues to you - did you receive them, which decision did your direction make*, Ex 2).

(2)  
A: kevadel rääkisime natuke pikemalt sin (. .) viimati. (. .) et e (. .) kuidas teil läheb ka? (. .) we talked in the spring quite long the last time, how do you do?

It is significant that the introductory part is quite long in the dialogues. A behaves very politely, friendly and sometimes familiarly (this holds especially for male clerks), Ex 3.

(3)  
A: mt (. .) kuidas on elu vahepeal läinud, kõik kenad reisid on seljataha jäänud. how did you do meanwhile, all the nice trips are remained behind?

In this way, A prepares the background for his/her proposal and herewith makes a refusal more difficult for B, Ex 4.

(4)  
B: [jah väga meeldiv.] tähendab ä nüüd on nimodi=et selleks suureks koolituseks me .hh (0.8) otsustasime: ühe teise firma kasuks. .hh küll aga ma sooviksin registreerida sis sinna juhtide avalikule m esinemis-kursusele nüüd ühe inimese. yes, very nice. it means that it is so that we decided for another firm for the long training but I'd like to register one person to the public performance training course

In the main part of a dialogue, A gives various arguments for the usability of the courses for B's institution and meanwhile collects new information by asking questions in order to learn more about it and have new arguments for doing D (Ex 5,6).

(5)  
A: ee küsiks nüüd seda et=et ta on (. .) noh põhimõttelt mõeldud ütleme mt (. .) e juhtidele ja spetsialistidele ütleme kes vastutavad rahvusvaheliste kontaktide arendamise eest. I'd like to ask that, it is designed for managers in general and for the specialists who are responsible for development of international contacts  
B: mhmh.  
hem  
A: a kas teil on rahvusvahelisi suhteid, but do you have international relations?  
B: mm=  
hem

(6)  
A: e on nad selealast koolitust ka saanud,

<sup>2</sup> Transcription of conversation analysis is used in the examples.

did they obtain a (language) training too?  
 B: ee üldseelt 'mitte (.) @ täendap 'mina ei  
 ole inglise keelt 'kunagi 'kusagil 'õppinud. @  
 no, in general, it means, I have never learned  
 English  
 A: ahaa  
 aha!

#### 4 MODELLING ARGUMENTATION

The tactic of persuasion based on the reasoning procedure NEEDED (cf. above) is implemented in our model of conversation agent (Fig. 1). When persuading B, A tries to indicate useful aspects of D in such a way that the usefulness of D would go greater than its harmfulness and B therefore would trigger the reasoning procedure NEEDED [5].

WHILE B is not agreeing AND A is not giving up  
 DO  
 CASE B's answer of  
 no resources :  
 present a counter-argument in order to point at  
 the possibility to gain the resources, at the  
 same time showing that the cost of gaining  
 these resources is lower than the weight of the  
 usefulness of D  
 much harm :  
 present a counter-argument to decrease the  
 value of harmfulness in comparison with the  
 weight of usefulness  
 much unpleasant :  
 present a counter-argument in order to  
 downgrade the unpleasant aspects of D as  
 compared to the useful aspects of D  
 D is prohibited and the punishment is  
 great :  
 present a counter-argument in order to  
 downgrade the weight of punishment as compared  
 to the usefulness of D  
 END CASE  
 Present an argument to stress the usefulness of  
 D.

Fig. 1. Persuasion (author – A, addressee – B).

If B when opposing indicates other aspects of D then A reacts them but in addition tries to direct B's reasoning to the relationship of usefulness and harmfulness of D. For example, if B indicates that the resources for doing D are missing then A answers with an argument which explains how to gain them and that it does not cost much (Ex 7).

(7)  
 B: .hh meil ei ole 'praegu eriti: 'ruumi  
 vel põhimõtteliselt meie ainukene 'õppe 'klass  
 on tehtud 'arvutiklassiks  
 /---/  
 we have no room at the moment, our single  
 classroom has been changed to a computer room  
 /---/  
 A: [jajaa] a'haa /--/ et noh oleks  
 võimalik võtta ka ütme 'tulla (.) 'meile seda  
 tegema et=see ühe ruumi üür ei ole eriti=eriti  
 'soolane  
 yes, yes, aha, it would be possible to take,  
 let me say to come to us to make it, the room  
 rent is not very salty  
 B: [((yawns))]

In institutional negotiation dialogues, persuasion (mainly) operates with usefulness, harmfulness and resources of doing

D. There are no examples in our corpus where B would indicate that D is unpleasant or prohibited.

An experimental dialogue system has been implemented which can play the role of both A or B in interaction with a user. At the moment the computer operates with semantic representations of linguistic input/output only, the surface linguistic part of interaction is provided in the form of a list of ready-made utterances (sentences in Estonian) which are used both by the computer and user. Our implementation represents just a prototype realisation of our theoretical ideas and we are working on refining it.

#### 5 CONCLUSION

We investigated the conversations where the goal of one partner, A, is to get another partner, B, to carry out a certain action D. Because of this, we have modelled the reasoning processes that people supposedly go through when working out a decision whether to do an action or not.

The goal of this paper was to verify our argumentation model on Estonian spoken human-human dialogues. Calls of salesclerks of an educational company were analysed in order to find out how clerks try to bring customers to a decision to take a training course. Various arguments are used by the clerks to stress usefulness of courses for customers. Still, customers seldom agree to take a course. In most cases, a decision will be postponed.

Our next aim is to investigate these dialogues from the point of view of customers. We will try to find out the ways of argumentation which are used by customers who avoid making a final decision.

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