The Influence of Emotion on Interpersonal Relations during Bad News Conversations

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Abstract. Using language involves more than exchanging information through a combination of words. Emotional elements in language can strongly influence the meaning of conversational actions which goes beyond the simple exchange of information. To evaluate current emotion models, we study how they deal with situations that arise in conversations (e.g. the intentions of a speaker). We will give insights on how computational models of dialogue can take features of emotions models into account. We present a prototype of dialogue system that allows one to practice holding bad news conversations. We discuss the ideas behind the system, the architecture, parts of the implementation and a study that has been conducted to gain more insight into the features of bad news conversations and the requirements they place on emotion models.

1   Introduction

Language, in a conversational setting, is almost always used for a purpose which goes beyond the simple exchange of information. Language is used to persuade, to surprise, to comfort, to scare, to joke, to coach. These affective and social relational aspects of language use do not only determine the choice of words or their timing, but also the tone of voice and the gestures, facial expressions and other actions that accompany the words. Computational models of dialogue that are used in spoken dialogue systems or in conversational agents need to take all of these aspects into account to build affective dialogue systems [1].

In the Human Media Interaction group at the University of Twente the domain of affective dialogue systems is being studied from several different angles. With the INES system [5] a tutoring system that would adapt its strategy and advice on the perceived motivation of the student was investigated. In the SE-MAINE project, the focus lay on the choice of questions and remarks a chatbot would make based on the emotional state of the user. Also the expression of the emotional stance of the agent was done through timing of these utterances [7]. In this paper we discuss a new approach in which a prototype of a dialogue system that allows one to practice holding bad news conversations is constructed [11]. We will discuss the models and theories underlying the system, the architecture, parts of the implementation and a study that has been conducted to gain more insight into the emotions that play a role in bad news conversations.

The focal question of this study is how conversational actions that display emotions influence the interpersonal relation that exists between two interlocutors during the conversation and how the process of affect appraisal needs to be extended to facilitate the construction and maintenance of the interpersonal relation. This is for the purpose of gaining insight in the role the interpersonal relation plays in the manner in which conversations are being held. This includes the ways conversational actions are being formed or selected, but also the way they are performed by the speaker. Interpersonal relations can be seen as a collection of features that determine the association between two people such as trust, liking, rapport, having common ground etc. Such features can be cognitive in nature (e.g. beliefs, goals or intentions) or affective (e.g. emotion states). A large part of establishing an interpersonal relation is determined by the display of emotions and the manner in which emotions influence behaviors in the conversation. The goal of this research is to be able to understand how the relation between emotions and interpersonal relations works and to construct a valid form of representation to incorporate in our dialogue model. Currently work is being performed on extending affect appraisal methods, from existing emotion models, in such a way that they also take into account interpretations about the internal state of the interlocutor, the emotions displayed in his conversational actions and the interpersonal relation. The rest of the paper is organized as follows: In section 2 an overview of both our dialogue model and the agent architecture that is based on it is given. Section 3 describes the results of a conducted questionnaire. Next, the agent system that is currently being constructed based on the agent architecture is described in section 4. Section 5 and section 6 discuss our conclusions and proposed future work respectively.

2   Architecture

The foundational structure of our dialogue model is based on the Beliefs, Desires and Intentions (i.e. BDI) model of agency (See [13] for a good description), which in turn is based on Bratman's folk-psychological model of human practical reasoning [2]. A BDI-based model operates by taking the basic elements for reasoning, i.e. Beliefs, Desires and Intentions, and uses the cognitive processes linked to these elements to process and bring about human behavior. In our dialogue model the BDI elements together form the basis of the representation of the internal states of the interlocutors. This representation of the internal state is extended by the inclusion of elements that represent the social disposition the person has towards his interlocutor and his affect states. The features that make up the social disposition (or social values) include for example the degree of politeness of the conversational actions and the relation between the roles the interlocutors have, such as familiarity. Representation of emotions and the associated process of affect appraisal in the model are based on the OCC theory of emotions [9] and on models that build on this theory, such as the Affective Reasoner [3] and EMA [8],[4]. However, the focus of affect appraisal should not only be aimed at the emotions the agent is experiencing with regard to the

situation, but also on how the emotions displayed by the interlocutor have an effect on internal state of the agent. At the same time we look at how the status of the internal state (including the affect states) of the agent influences the interpersonal relation which is influenced by which conversational behaviors are selected.

By using the BDI model of agency, the features of the conversational actions performed by the speaker (including the displayed emotions) can easily be expressed in the elements of the internal state of the listener. The listener deals with the conversational actions of the speaker by using cognitive processes, such as the interpretation of new aspects of the situation, the evaluation of the interpretations of the situation and subsequently the selection of the most appropriate response behavior. All the cognitive processes in the listener operate through the manipulation of elements of the internal state. Such manipulations include, but are not limited to, the formation of new elements in the internal state, evaluation of the current elements of the internal state and subsequent alteration or deletion of such elements. The cognitive processes of evaluating the interpretations of the conversational action are performed for different types of elements in the internal state, such as emotions, social values, goals or intentions. Particularly, appraisal of affect and appraisal of social values are of great importance for the construction and maintenance of the interpersonal relation. It seems likely that the process of affect appraisal of the the conversational action of the speaker is influenced by newly formed elements in the internal state. As such the appraisal of affect and of social values should be performed by including BDI elements of the internal state as appraisal variables, in additions to more traditional appraisal variables, such as likelihood, desirability and causal attribution (see [3] and [8] for more on appraisal variables). This holds for elements such as beliefs about the affect states of the interlocutor (obtained through evaluation of conversational actions that contain displays of emotion) and beliefs about the intentions of the interlocutor, that are obtained by evaluating the intended effect ascribed to the conversational action. Both types of beliefs have a large influence on the interpersonal relation.

In order to express the dialogue model mentioned in a more concrete form, an agent architecture has been developed that incorporates modules that contain the elements of the internal state and rule-systems that represent the cognitive processes. The main purpose of developing the agent architecture is to find adequate representations of the different components that are present in the dialogue model and to indicate how the relations between the components operate. Similar to the model, the basis of the architecture is formed around a tripartite center that consists of a Belief-base, a Desire-base (or Goal-base) and an Intention-base, representing the BDI agency model. These bases are modules that hold large amounts of respectively individual beliefs, goals and intentions. The architecture is extended with two additional modules; an Affect states-base and a Social values-base. Combined, the elements in these five modules form the internal state of the agent. The content of the modules can be manipulated during a conversation: new elements can be added to a base if the interlocutor

provides new information to the agent. Based on the new elements certain elements that are currently in a module can be altered (for example, the intensity value of an affect state can change on a new belief) or elements can be deleted if a new situation makes them untrue (beliefs), contradicting (beliefs) or unobtainable (goals). It is also possible that a certain configuration of the internal state itself can cause manipulation of one or more of its elements, without a change in the external situation. For example, when the agent detects and interprets a conversational action from its interlocutor this may cause the formation of a new belief. This in turn may bring about a change in one of the affective states of the agent. Ergo the new affective state of the agent is not caused by the conversational act of the interlocutor but by the new belief formed by the agent itself. The manipulation of the elements in the modules is performed by the components that represent the cognitive processes in the agent. The cognitive processes in the architecture operate on the combination of two types of input. On the one hand, a cognitive process receives as input a number of elements from the modules that are related to it (i.e. elements that make up the internal state). On the other hand, the cognitive process receives input from a different type of module, one that contains sets of rules that determine if and how manipulations of the elements should occur. For example, the cognitive process of affect appraisal operates on the following types of elements of the internal state: beliefs, intentions and old affect states and secondly it uses affect appraisal rules (from the affect appraisal rule-base) to determine if and how the affect states should be altered.

Some of the components in the agent architecture are not dealt with in detail in the dialogue model as these would have broadened the scope of the research too much. This holds for the Graphical User Interface (GUI) component and the Behavior realizer component. However, the inclusion of these components is essential to create a complete agent system.

3 Questionnaire

The construction and maintenance of the listener's interpretation of the interpersonal relation can be strongly influenced by conversational actions performed by the speaker. To get a better understanding of which features and forms of conversational actions influence the interpersonal relation and what the underlying motivations of the speaker are, conversations in which interpersonal relations play an important role need to be analyzed. Conversations that strongly influence the internal states of one or both of the speakers, especially their affect states, seem to be appropriate for this. Therefore, the focus of this research lies on conversations that deal with bad news situations. Obviously, the term "bad news conversation" is very broad and diverse; hence the domain is narrowed down to bad news conversations between a doctor and a terminally ill patient. By studying the conversational actions performed in these kind of conversations we aim to recognize and describe the features and form of the conversational actions that are relevant with respect to the interpersonal relation. Given that it

seems likely that displays of ones affect states and social disposition are a major influence on the interpersonal relation, this domain is quite appropriate as bad news conversations provide us with an ample amount of conversational actions that contain emotional and social overtones. Moreover, one of the important factors in delivering bad news is taking into account the internal state of the listener, particularly his emotional states. Also, a large part of the maintenance and improvement of the interpersonal relation in this domain can be achieved through the display of emotions that focus on the wellbeing of the listener, such as *sympathy* and *sorry for* in conversational actions.

In order to gain more understanding about which features and forms of conversational actions, particularly those that are emotionally charged and have an influence on the functioning of an interpersonal relation, a questionnaire experiment was conducted. In addition to finding features that are directly observable from the conversational actions, the aim of the questionnaire was to find out if assumptions could be made about the internal state of the speaker that brought about those particular conversational actions. For example, a conversational action such as "I'm sorry but the tumor had spread out." can be expected to have a negative effect on the listener's internal state, particularly his affective states. Consequently, the interpersonal relation between the patient and the doctor will worsen as the patient will blame the doctor for delivering the bad news. On the other hand it can be expected that the same conversational action positively alters the internal state of the listener, especially his negative affective states (e.g. *fear, shock* or *sadness*), leading to a more positive interpersonal relation between the interlocutors (e.g. the listener would like the speaker better or trust him more, because the speaker has shown to be caring about the listener by saying "I'm sorry").

The setup of the questionnaire was as follows. Participants were asked questions about a video that showed an acted bad news conversation[1] between a doctor and a patient. In this video the patient, who has had an operation to remove a tumor, is told that the operation was successful but that unfortunately, it appeared that the cancer had spread and consequently nothing more can be done for him. In a previous conversation the patient had only been told that the tumor was removed successfully. The video of the dialogue was cut into 16 fragments. Each fragment consisted of a single dialogue turn in the conversation as performed by either the doctor or the patient (with the exception of the individual introductions of both characters) and all fragments were presented in the correct sequence. After each fragment, participants were asked to answer several items on the questionnaire that were related to that particular fragment. Items on the questionnaire were expressed as open questions and consequently participants were encouraged to write down their answers in their own words. The entire questionnaire consisted of 37 items and in total 14 participants filled in the questionnaire. We asked the participants to describe how they perceived and interpreted the elements in the internal state of the speaker they thought were prevalent, what they thought were the intended and expected effects of

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[1] http://www.youtube.com/watch?v=qjLCIVsOpO4

each conversational action and how they would predict the listener to respond. Some examples of questions are: "What do you think the doctor wants to achieve with his behavior?", "Please describe what you think the patient is thinking and feeling at this moment." and "What do you anticipate to be the effect of the doctor's behavior on the patient?".

The data gathered from the questionnaire yielded quite a bit of interesting information. Although the actual answers provided by the participants per question varied due to the openness of the questions, the gist of the answers was quite alike for a considerable part of the participants. To illustrate this, in one of the fragments the doctor says "I'm sorry to hear the news. We were hoping that surgery and a course of chemo would cure this tumor". One of the questions we posed after this fragment was "What do you think the doctor wants to achieve with his behavior?", to which some of the provided answers were "He (i.e the doctor) seems to want to relay his commiserations", "express his sympathy for the bad news" and "show compassion to the patient". These answers are similar in the way that the participants of the questionnaire interpreted the intended effect of the conversational action to be that the doctor wants to give the patient the feeling that he sympathizes with him. Answers that showed particularly a high rate of similarity, were the interpretations of the affect states that were related to conversational actions. For example, words such as "felt frightened", "felt anxious" and "felt worried" (all in response to the same question) included in the answers can be seen as different instances of the same emotion type, as defined by [9]. Such answers were often given in response to questions that inquired after what the participants thought the speaker was thinking and feeling at the moment. While the participants quite frequently ascribed the status of the speaker's affect states to underlie the conversational actions, they only occasionally motivated their assumptions by mentioning the display of emotions. It is assumed that the high similarity of ascribing the same affect states to a specific conversational action is caused by the intuitive processing of displays of emotion during the conversational action. Only in the few cases, where the emotional display was really pronounced, did the participants motivate their answers. It is interesting to note that in almost all of those cases, the answers provided by the participants were assumptions about the fact that the display of the speaker's affect states was the intended effect of the conversational action. It is thus not surprising that these answers were often provided as a response to questions that inquired after what the speaker wanted to achieve instead of what he was thinking and feeling. Affect states that most often were ascribed to the patient included *fear, shock* and *sadness*, while in the doctor's case *concern for the patient* and *sympathy* were frequently ascribed. Particularly these latter affect states seem to strongly influence the selection of conversational actions that have the intentions of bringing a positive change to the interpersonal relation.

With respect to the interpretation of the intended effects of conversational actions that showed a low amount of emotion displays, the degree of agreement between the participants was less. Different intended effects were ascribed to the same conversational action, most of which seemed to make plausible assump-

tions about the speaker's internal state. One of the conclusions we draw from this observation is that a single conversational action can result from multiple intentions that are formed by different features of the internal state. For example, the conversational action "I'm sorry but the tumor had spread out." can simultaneously be brought about by the intention of the speaker to inform the listener about his (i.e. the speaker) belief about the situation and by his intention to display his affect state of sympathy towards the listener. As a consequence it is difficult to determine exactly what the internal state of the speaker is that underlies the intended effect of the conversational action. An important question that arises here is; Would the form of the conversation action be significantly different if only one of the intentions hold. If not, than appraisal of the affective states based on the ascribed intentions (derived from the interpreted intended effects) might also be in fault. This in turn will influence the interpersonal relation. Fortunately, the data also showed some conversational actions for which there was consensus of the intended effects of the conversational actions, such as "get more explanation" for the patient and "make the situation clear" for the doctor. It should be mentioned that these conversational actions often had a very small amount of emotional display.

Regarding the interpersonal relation between the two interlocutors, the data shows that intended effects ascribed to the doctor's conversational actions often indicate that the doctor has modification of the internal state of the patient in mind. For example, behaviors like "bring the bad news gently" or "make sure the patient understands the situation correctly" concentrate on keeping the elements of the internal state of the patient in a positive perspective. This is reinforced by observations of the participants that regard the displayed and attributed emotions of the doctor: *Concern for the patient, sympathy* and *sorry for* are the affective states most frequently ascribe to the doctor. Conveying these emotions is done to increase intensity of the positive affective states of the patient and decrease his negative ones. The combination of these factors implicitly leads to the conversational actions of the doctor strengthening the interpersonal relation through the display of emotions aimed at the patient, instead of emotions that the doctor himself experiences with regard to the situation. On the other hand, interpretations of the conversational actions of the patient suggest that the intended effects and emotional displays focus primarily on the patient himself. The point that arises is that, although the configuration of the internal state of the patient is adjusted by interpretation of the conversational actions of the doctor, the primary elements of the new internal state of the patient have not shifted into the direction the doctor was aiming for, but focus rather on dealing with the situation, even though that may lead to a negative disposition of the internal state. The resulting selected behaviors are in line with what is known about coping strategies when dealing with bad news situations [6].

4 System

Currently, an agent system is being constructed based on the agent architecture. The purpose of this agent system is twofold. The first purpose is to provide a means with which evaluation of our dialogue model can be performed. If the outcomes provided by the agent system are appropriate and realistic an inference about the validity of the assumptions made in the dialogue model can be made. The second purpose is the function of the system itself, which is to allow doctors to practice holding a bad news conversation by talking to a virtual patient. The cognitive processing of the conversational action by the virtual patient is performed by the agent system. Such a tutoring system allows doctors to gain more experience in conducting a bad news conversation and furthermore allows them to gain insight in why a (virtual) patient gives a certain behavioral response.

When using the system, the user (i.e. the doctor) can interact with the virtual patient via the GUI (see Fig. 1). Each time it is the user turn in the conversation, he can select one of three suggested sentences which are more or less appropriate in that part of the conversation. In addition he can indicate on the Emotion circle which kind of emotion he wants to display to the virtual patient and with which intensity. After a sentence and an emotion display form are selected, the agent will provide the user with an appropriate conversational response. This response is the result of the configuration of the agent's internal state, which is manipulated after receiving the user's selected sentence and displayed emotion. Subsequently, the user is offered three new sentences with which he can respond to the virtual patient's conversational action and the emotion circle is reset, allowing the user to possibly select another emotion to display. Note that the Emotion circle currently used is the Geneva Emotion Wheel [10]. However, this needs to be adjusted as the Geneva Emotion Wheel focuses on what types of emotions a person (i.e. the speaker) experiences in a situation, while the purpose of the circle in the system should be to indicate what emotion type the speaker wants to display towards the listener. The types of emotions that are displayed on behalf of the listener are often things as "express comfort", "show sympathy" and "feel sorry for".

The possible sentences and display emotions from which the user can choose contain a lot of information about what the user wishes to convey to the agent and what he wants to achieve with his conversational action. Identification of this information is normally done through a myriad of interpretation processes performed by the listener (e.g. processes that are studied in the fields of Automatic Speech Recognition and Natural language processing). These processes are not included this study due to lack of time. Instead, interpretation of the content and the purpose of the conversation actions is now done manually by linking the possible sentences and the display emotions from which the user can choose to pre-generated tags. These tags contain information about the following features of the conversational actions:

- The intended effect of the selected sentence
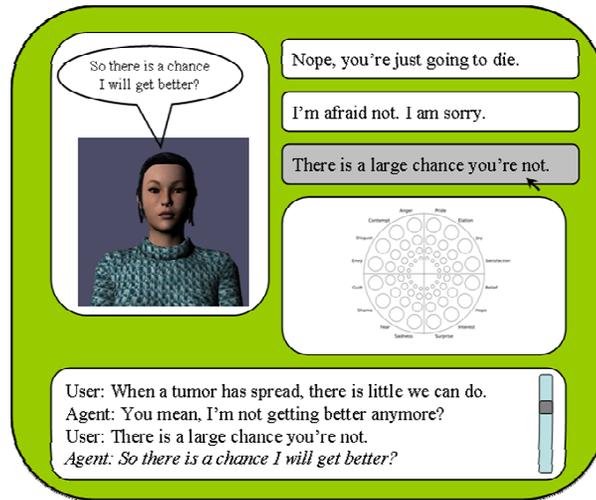- The expected effect of the selected sentence

Fig. 1. Graphical User Interface of the Bad News Dialogue System

- The dialogue act type of the selected sentence
- The social aspects (e.g. politeness and liking) that are associated with the selected sentence
- The affective states that are displayed and their intensity

For the implementation of the system we make use of a dialogue specification system developed in the Human Media Interaction group for the SE-MAINE Project, FLIPPER [2]. The tags are represented as variables in Flipper, a template-based library for specifying dialogue rules for dialogue systems. Flipper uses XML-templates to express the preconditions, effects and behaviors of dialogue rules. Throughout the agent system XML-templates are grouped into subsets, depending on the type of rules they represent. As such the agent system has a base of Belief-formation-rules, Belief-update-rules, Goal-adoption-rules etc. Manipulation of elements in the internal state occurs through application of the appropriate template. For example:

```
<template id="AffApp21" name="affective appraisal rule 21">
    <preconditions>
     <compare value1="$belief.current.cancer_is_not_gone.name" value2="cancer_not_gone" />
    <compare value1="$belief.current.cancer_is_not_gone.value" value2="0.8" />
    <compare value1="$belief.current.aff_state_sympathy.Other.name" value2="sympathy" />
    <compare value1="$belief.current.aff_state_sympathy.Other.value" value2="0.5" />
    <compare value1="$belief.current.aff_state_sympathy.Other.intensity" value2="0.7" />
    </preconditions>
  <effects>
    <update name="current.aff_state_fear.inten" value="$current.aff_state_fear.inten+0.1"/>
    </effects>
</template>
```

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[2] http://sourceforge.net/projects/hmiflipper

The shown template takes the following elements of the current internal state (variable values are scaled from 0 to 1): The agent has the beliefs *the cancer is not gone*, of which it is quite certain (value 0.8) and *the user displays sympathy, quite strongly (intensity value 0.7)* of which the agent is less certain (value 0.5). These preconditions make that the agent updates the intensity variable of his affect state *fear* to its current intensity value + 0.1. The processing of the interpreted conversational action of the user requires the application of several different templates (for example belief formation, emotional appraisal and social value updating). After processing input, the new configuration of the internal state leads to the selection of an appropriate response behavior by the agent, through templates that represent behavior selection rules. These behavior selection rules are strongly influenced by the condition of the affect states and by the formed interpersonal relation. The selected behavior is sent, together with the (possibly) updated affect states to the Behavior realizer module. In our agent system the behavior realizer module is Elckerlyc [12]. The Elckerlyc system converts the XML-variables that are the outcome of the behavior-selection templates into conversational behaviors performed by the virtual patient, such as speech, facial expressions and head movements. The information sent by the affect state modules to Elckerlyc influences the manner in which the selected behavior is performed (e.g. provides prosodic information).

5 Conclusion

In this paper we have presented ongoing work on our affective dialogue agent system, the ideas behind it, the agent architecture and parts of the implementation. In this study we propose that contemporary dialogue systems need to include a representation of the interpersonal relation that exists between two interlocutors, as it plays a large role in the manner in which conversations are being held. Specifically the focus on how emotions displayed in conversational actions influence this interpersonal relation and how the process of affect appraisal should be extended to facilitate this, is mentioned. We hope to have shown that the inclusion of beliefs about the affect states of the interlocutor and beliefs about the intentions of the interlocutor as appraisal variables enables a dialogue system to construct such a representation of an interpersonal relation. As can be seen in the data obtained through the questionnaire, beliefs about the affect states and intentions of the speaker can be deduced from respectively the emotions displayed in the speaker's conversational actions and from the intended effect attributed to conversational actions. This allows for affect appraisal to cover not only how a person interprets and evaluates a situation with respect to himself, but also how he perceives the disposition of the interlocutor towards the situation. As these aspects (i.e. interlocutor-aimed emotional displays and interpersonal relations influenced by emotions) are quite common in open conversation it seems prudent that more research should be performed on them in order to 1) gain more insight in their workings and 2) to be able to equip dialogue agents with such aspects.

6 Future work

Based on the information we have gathered from analyses of the data acquired from the questionnaire, we are currently working on constructing new templates and new elements of the internal state of the agent systems. Future work will consist of the inclusion of templates that indicate how elements of the affect states module influence the adoption and adaption of the goals and intentions of the agent and also how the perception of the interpersonal relation plays a role in the selection of appropriate behavior. In addition a study shall be performed on the intricacies of specific aspects of elements in the internal state, such as the certainty value of beliefs and the intensity values of affect states.

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