A BDI Dialogue Agent for Social Support: Specification of Verbal Support Types

(Extended Abstract)

J.M. van der Zwaan
Delft University of Technology
Jaffalaan 5
2628 BX Delft, The Netherlands
j.m.vanderzwaan@tudelft.nl

V. Dignum
Delft University of Technology
Jaffalaan 5
2628 BX Delft, The Netherlands
m.v.dignum@tudelft.nl

C.M. Jonker
Delft University of Technology
Mekelweg 4
2628 CD Delft, The Netherlands
c.m.jonker@tudelft.nl

ABSTRACT

An important task for empathic agents is to provide social support, that is, to help alleviate emotional distress. In this paper, we select five types of verbal social support (sympathy, compliment, encouragement, advice, and teaching) and present our implementation in a prototype dialogue agent.

Categories and Subject Descriptors

I.2.1 [**Artificial Intelligence**]: Applications and Expert Systems

General Terms

Design, Experimentation

Keywords

Conversational agents, Verbal and non-verbal expression, Modeling cognition and socio-cultural behavior

1. INTRODUCTION

Social support or comforting refers to communicative attempts to alleviate the emotional distress of another person. Recent developments in affective computing show that empathic agents are increasingly capable of complex social and emotional dialogues, but so far they do not have the ability to comfort users. In our research, we explore how and to what extent Embodied Conversational Agents (ECAs) can provide social support.

Recently, we proposed a design for an ECA that tries to comfort children who are bullied online [5]. Interaction between the agent and the user takes place in two main stages: 1) Gather information about the current situation, 2) Give advice on how to deal with the situation. The agent uses different (verbal and non-verbal) social support strategies. This paper is focused on the dialogue engine of this agent, i.e. verbal strategies for social support. The embodiment and non-verbal behavior of the agent are beyond the scope of this paper.

Appears in: *Proceedings of the 11th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2012)*, Conitzer, Winikoff, Padgham, and van der Hoek (eds.), 4-8 June 2012, Valencia, Spain.

2. SOCIAL SUPPORT

The verbal social support actions presented in this paper are based a typology of social support in online settings [1]. This typology is relevant for the agent, because online communication is mostly textual and does not depend on additional communication channels (such as non-verbal behavior and auditory information). The five main support categories are [1]:

- Information support (messages that convey instructions),
- Tangible assistance (offers to take concrete, physical action in support of the recipient),
- Network support (messages that appear to broaden the recipient's social network),
- Esteem support (messages that validate the recipient's self-concept, importance, competence, and rights as a person), and
- Emotional support (attempts by the sender to express empathy, support the emotional expressions of the recipient, or reciprocate emotion)

Each category breaks down into multiple subtypes. Five subtypes that frequently occurred in counseling conversations by chat [3] were selected to be implemented; that is sympathy, compliment, encouragement, advice and teaching. Table 1 lists descriptions and examples of these support types.

3. THE AGENT

A prototype of the social support dialogue agent was implemented in GOAL, a high level agent programming language [4]. The agent's reasoning engine is modeled according to the Belief-Desire-Intention (BDI) paradigm [2]. This means the agent has beliefs (e.g., about what advice to give in which situations), goals (e.g., to give social support), and plans (e.g., to gather information about the upsetting situation and to give advice after all relevant information is gathered).

The agent and the user communicate through natural language text messages. Given the complexity of interpreting and generating natural language, in the current system, text interpretation and generation have not been implemented.

Support type	Description	Example
Sympathy	Express feelings of compassion or concern	How awful that you are being bullied!
Encouragement	Provide recipient with hope and confidence	I know you can do it!
Compliment	Positive assessments of the recipient and his or her abilities	Good of you to have told your parents!
Advice	Suggestions for coping with a problem	Perhaps you should tell your parents.
Teaching	Factual or technical information	You can block a contact by clicking the 'block' button.

Table 1: The types of social support implemented in the dialogue agent.

Instead, we use logical representations of the contents of utterances (speech acts), for example an utterance such as *I'm being cyberbullied!* is represented by `send(agent, inform, incident(type, cyberbullying))`.

The agent's knowledge is stored in its belief bases. The agent has beliefs regarding the domain (e.g., what questions to ask the user and what advice to give in different situations), social support (e.g., when to give which type of social support), and conversation management (e.g., how to open and close conversations). The contents of the speech acts (and thus of the conversation) are defined by the contents of the belief base.

In the reasoning engine, beliefs are combined to select speech acts the agent will utter.

4. SPECIFICATION OF SUPPORT TYPES

To illustrate the implementation of the social support types, we explain how sympathy was implemented. The information gathering phase of the conversation consists of a recurring pattern of the agent asking a question, the user answering that question, and the agent acknowledging the answer. An acknowledgement is either neutral (e.g., *Okay*) or sympathetic. The agent only expresses sympathy if it follows from his beliefs sympathy is applicable, otherwise it plays safe by staying neutral. The following example shows how sympathetic acknowledgement works:

Agent: *Can you tell me what happened?*
User: *Someone is calling me names on msn*

The user's utterance causes addition of the following `incident` facts to the agent's belief base:

```
incident(type_cb, name_calling).
incident(method_cb, msn).
```

Based on the following rule in the belief base:

```
sympathetic_acknowl(type_cb, name_calling) :-
    incident(type_cb, name_calling).
```

the agent responds sympathetically to the user:

Agent: *That's awful!* (sympathy)

Absence of the `sympathetic_acknowl` rule would have resulted in a neutral acknowledgement of the user's input:

Agent: *I see* (acknowledgment)

The other support types have been implemented in a similar manner. Like sympathy, compliment and encouragement occur in response to the answers the user gives to questions of the agent. Advice and teaching are uttered pro-actively, after the agent gathered sufficient information (this depends on domain knowledge). For advice that requires an explanation, the agent optionally teaches the user how to execute the advice. After giving advice, the agent waits for confirmation from the user. Once the user has confirmed, it moves on to the next piece of advice, or closes the conversation.

5. CONCLUSION

In this paper, we presented five verbal social support types: sympathy, compliment, encouragement, advice, and teaching; and implemented them a BDI dialogue agent. Sympathy, compliment and encouragement are always given in response to user input. Advice and teaching are offered proactively. Whether the agent performs a social support action depends on its beliefs, which, in turn, are determined by domain knowledge.

For future work, we plan to implement more types of support from Braithwaite's typology. In particular empathy is important in supportive communication. To appear empathic, the agent needs the capability to reason about emotions. Therefore, an emotional module will be added to the agent.

6. ACKNOWLEDGEMENTS

This work is funded by NWO under the Responsible Innovation (RI) program via the project 'Empowering and Protecting Children and Adolescents Against Cyberbullying'.

7. REFERENCES

[1] D.O. Braithwaite, V.R. Waldron, and J. Finn. Communication of social support in computer-mediated groups for people with disabilities. *Health Communication*, 11(2):123–151, 1999.

[2] P.R. Cohen and H.J. Levesque. Intention is choice with commitment. *Artificial Intelligence*, 42(2-3):213 – 261, 1990.

[3] R. Fukkink. Peer counseling in an online chat service: A content analysis of social support. *Cyberpsychology, Behavior, and Social Networking*, 14(4):247–251, 2011.

[4] K.V. Hindriks. Programming Rational Agents in GOAL. In A. El Fallah Seghrouchni, J. Dix, M. Dastani, and R.H. Bordini, editors, *Multi-Agent Programming:Languages, Tools and Applications*, volume 2, pages 119–157. Springer US, 2009.

[5] J.M. van der Zwaan, V. Dignum, and C.M. Jonker. Simulating peer support for victims of cyberbullying. In *Proceedings of the 22st Benelux Conference on Artificial Intelligence (BNAIC 2010)*, 2010.