

NOTICEABILITY OF BEHAVIORAL CHANGES OF A CONVERSATIONAL AGENT

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1. INTRODUCTION

- Training communication skills is crucial in various fields
- De Kindertelefoon is a Dutch helpline that provides anonymous and confidential support to children
- Virtual scenarios involving interactive agents help volunteers gain experience through simulations without additional costs, resources and time
- The scenario used in this research is of a (virtual) child being bullied at school contacting a helpline through chat for help
- The conversational agent, Lilobot, based on the Belief-Desire-Intention (BDI) model [1], needs to be evaluated with respect to different aspects

2. MOTIVATION

- Chatting with a simulation of the scenario can give extensive experience and knowledge to volunteers
- Evaluating the behavior of the bot allows further improvement in effectiveness of training

3. RESEARCH QUESTION

- Are the changes in the virtual child's behavior noticeable to the participants?
- How noticeable are the changes?
- What change in behavior is noticed?

4. METHOD

- 10 Participants -> 1 Excluded due to language gap
- Receive guidance on five phase model [2]
- Interact with LiloBot for 5-10 minutes or reach phase 3 of the model
- Questionnaire is generated based on conversation [Fig:1]
- Participants can answer where they noticed a change in behavior and have to specify what they noticed
- Belief report is generated for the conversation indicating which belief of the bot changed after each interaction [Fig:2]
- Content Analysis is used to find commonly noticed behavioural changes
- Descriptive statistics are used to analyse quantitative data

KT: So how do you feel when they call you ugly?
 Lilo: I sometimes go to school with a stomachache. I just have to cry just thinking about it. When I get home, I am always very sad.

Question: Do you notice a change in behavior here? If so, can you explain what is different?

Yes. It seems like it may suddenly be getting more comfortable with talking to me and is starting to share much more with each message.

Fig 1: Survey response, translated from Dutch, with the transcript (in black), the question (in orange) and the response (in blue)

KT: So how do you feel when they call you ugly?
 Lilo: I sometimes go to school with a stomachache. I just have to cry just thinking about it. When I get home, I am always very sad.

Belief: ↑ (B6) I think KT is interested in my story. From 0.1 to 0.2

Fig 2: Snippet from the belief report, translated from Dutch, with the belief code, belief full name and increase in value is shown

5.1 QUANTITATIVE RESULTS

- Precision Score = 0.93
 - This means that out of all noticed changes in behavior, 93% of the time a belief changed as well
- Recall Score = 0.36
 - This means that out of all changes in beliefs, only 36% were noticed as a change in behavior

5.2 QUALITATIVE RESULTS

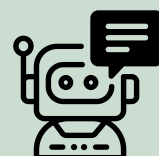
- 70 Responses gathered from the nine surveys
- Double coding performed with a Cohen's Kappa score of 0.322 meaning their was fair agreement
- Four categories are derived: communication style, positive emotion, negative emotion and tone & attitude [Fig:3]
- Overall, participants noticed positive behavior changes more often than negative ones
- This may be a bias as participants assumed they had accomplished their goal of helping LiloBot

#	Communication Style	Positive Emotion	Negative Emotions	Tone & Attitude
1	Repetitive (4)	Happy (8)	Sad (4)	Analytical (6)
2	Unresponsive (4)	Trusting (7)	Upset (1)	Straightforward (2)
3	Dismissive (3)	Hopeful (2)	Disliking (1)	Untrusting (2)
4	Impatient (2)	Friendly (2)	Angry (1)	Requires Reassurance (2)
5	Conveying Emotions (2)	Grateful (2)	Crying (1)	Pragmatic (1)
6	Communicative (2)	Excited (1)		Gullible (1)
7	Communicating Objective (2)			Misunderstood (1)
8	Informative (1)			Hasty (1)
9	Situational Awareness (1)			Uncertain (1)
10	Hesitant (1)			Unconvincing (1)
Total:	22	22	8	18

Fig 3: The four categories and the codes for each one with the number of responses

6. CONCLUSION

- The combined quantitative and qualitative analyses provide valuable insights into participants' ability to detect behavior changes
- The performance metrics, precision and recall can be improved
- Positive behavioral changes are most noticeable, followed by the change in the communication style of the agent
- Behavior perception has an intricate and subjective nature



7. FUTURE WORK

- Expanding the participant pool to achieve a much larger sample size, enhancing the generalisability and statistical power of the findings can be beneficial
- Improving the bot's understanding of user input and providing a more refined method for input is crucial for better noticeability in change of behavior

REFERENCES

- [1] Carole Adam and Benoit Gaudou. *BDI agents in social simulations: a survey*. PhD thesis, 2017.
- [2] Trine Natasja Sindahl. *Chat Counselling for Children and Youth - A Handbook*. 2011.