

# Speculating on the behaviors of the blind people in communication with others to AI

Ziwen. Jiang, Naizheng. Tang, Lixin. Xu, Steffi. Hußlein

**Abstract—** With the development of the science and technology, our life has been improved which can be reflected in every aspect of our lives, but at the same time there will be a lot of problems. The inspiration of this article comes from a question of Speculative Design, that is, the people want to receive how much reality. With this question, the blind is selected as the target population, and the theoretical basis of this investigation is “the role of body language played in conversation” and “body language means differently depending on communicative contexts”, which is approached by AI with deep learning. Thus, the authors designed a special viewing glasses as the carrier of AI, and investigated how does the AI glasses obtain information that is unavailable to the blind in the process of human-to-human communication, and how does the glasses interact with the blind in time.

Focusing on speculative design, the authors further questioned, the acquisition of real-world information affect people. By investigating several groups of target population being tested, the author explored the influences of the development and application of emerging AI technology on human life. Finally, we found that ai technology needs to be used more reasonably to truly improve people's living standards.

## I. INTRODUCTION

AI technology is undergoing rapid development in different fields of the modern era, and is changing the way people work and produce gradually. It will soon come into our families and be a part of our daily life in the form of robots. Apart from smart phones and intelligent home appliances, the more powerful AI will certainly be applied for the service of different particular groups, and has a more profound influence in the foreseeable future. Because of the lack of eyesight, the blind cannot obtain intact information in the conversation, especially others' body languages, while they can be identified and analyzed by AI, and the analytical results can be conveyed to the blind. Such an interactive process will influence human being's social behaviors in a subtle way. We first designed an AI product which is for the blind to identify the body language, with the aim of exploring the social relationship of the blind by using such a product. Furthermore, as it is a speculative design, we extend our vision and put forward our opinions on how do people to receive more intact information and how to take advantage of AI technology in a better way to serve for our daily life.

## II. RELATED WORK

### 7-38-55 Rule

Z. Jiang, N. Tang, L. Xu, S. Hußlein, and are with the master interaction design, University of Applied Sciences, Magdeburg and Stendal 39104, Germany (e-mail:jiangziwen1128@gmail.com, alex.tangnz@outlook.com, willi\_xu@outlook.com, steffi.husslein@hs-magdeburg.de).

The most commonly and casually cited study on the relative importance of verbal and nonverbal messages in personal communication is one by Prof. Albert Mehrabian of the University of California in Los Angeles. In the 1970s, his studies suggested that we overwhelmingly deduce our feelings, attitudes, and beliefs about what someone says not by the actual words spoken, but by the speaker's body language and tone of voice.

In fact, Prof. Mehrabian quantified this tendency: words, tone of voice, and body language respectively account for 7%, 38%, and 55% of personal communication.

‘The non-verbal elements are particularly important for communicating feelings and attitude, especially when they are incongruent: if words and body language disagree, one tends to believe the body language.’ [1]

## III. CONCEPT

### A. Basic Interaction

In the following, we will introduce an AI interactive glasses designed for the blind. A small camera is installed in the middle of the glasses, which is to detect the body language of the person the blind communicate with, and the installed position make the perspective of AI closer to that of real eyes. On the left side of the glasses, a rotatable AI speaker is designed. When the body language is analyzed by the AI, the analytical results will be conveyed to the ears of the blind by the AI speaker. The way of interaction does not only represent the process of information transmission, but also tell the others that they are observed by the AI. On the right side of the glasses, there is a control button. When the user wants to stop the information output, the speaker will rotate to the default location once the button is touched.

### B. Strategies

Observer detects general information of the surrounding, which the blind cannot see. Admonitor conducts real-time remind and advise to make the blind be aware of and avoid the potential problem when it may occur. Interrupter gives the blind a choice of whether to continue listening to the AI' s description.

### C. Context Simulation

In order to illustrate the concept, we simulated three communicative context.

- Context1

In a narrow street, a blind wearing the AI glasses encounters with a stranger. The stranger makes way friendly, and gives the blind the priority to pass by.

The behavior of the stranger is detected by the AI, and his amity is conveyed to the blind, who then thanks the stranger consequently.

- Context2

A blind wearing the AI glasses is shopping, and tells the salesman that he wants to buy something attractive in price and quality. However, the salesman recommends something which is not cost-effective deliberately. After telling the fact by the AI, the blind refuses the salesman’s recommendation.

- Context3

A blind wearing the AI glasses comes across his friend in the street, and is invited to join a party in the weekend. However, the companion of his friend express his dissatisfaction and refusal by using body language. Though the blind is told the fact by the AI, he insists to join the part, and has been treated with indifference in the weekend.

#### D. Design Methods

- Interview and marketing research

Through real interviews with six blind people of different ages “Fig.1” and market research on blind products (ORCAM, by OrCam Technologies Ltd.), we gained an increased understanding of the challenges encountered in blind users’ daily lives. [1] And the mirror system in humans can develop in the absence of sight. [2] The conclusion is that communication is an important need and the most difficult part for blind people in daily life. It helped to find the main direction of the project, for the topic of communication.[3] Based on recent scientific breakthroughs about character recognition, speech synthesis and on the recent evolutions of technologies integrating digital cameras and powerful data processing in Personal Digital Assistant, SYPOLE (SYPOLE: a mobile assistant for the blind) [4] allows to link all these techniques together to improve the daily life of partially-sighted or blind people and to give them a better social integration.

Question	Made happy	Relationship with family and friend	Difficulty / solution	New technology	Wish in communication	Get informed
Jogen (39)	Health and family	Divorced	Impatience / with calm	Orcam and Screen reader	How old is he/she	Radio and Internet
Jams Steane (67)	Allotment garden and work there /vacation /health	Have fun with my wife, she is fully visible.	Drive	Alex	Exchange of experiences on vacation	
Kavin Stefanni (36)	Family	Very good	Draw	Small camera , that recognizes people and texts	Facial expressions and gesturing	
Stan (30)	With friends	Contact and meet regularly	Write application / do double time	Enlargement on the PC, language system not yet tried	what you hear is enough / difficult if you don't react	Smartphone and radio
An older woman	When I'm with people because I live alone	Have a good friend since middle school	Alone	Alex		

Figure 1. Interview

- Role play and Empathy map

After the research, we did role play to experience how blind people communicating with others, and played the role of an AI, through this play, we understand that the ability of AI is not wireless, but has great limitations. Find ways to make AI help people in this limitation. after role, we made empathy map and discovered the pain points of blind people in communication. The blind people cannot get all the information only through sound, in the process of communicating.

#### E. Product and Prototype

The final product is an AI glasses “Fig.2”. It exists as a form of glasses and represents the second pair of eyes of the blind. There is a camera in the middle of glasses, it can get the vision which is more like from the real eyes. Meanwhile the rotating part has two meanings. First, the information translation. Second, it can tell the people that “I am looking at you, I know what you are doing.” By touching the button, the blind people can give a feedback to AI that they do not want to hear about it, then AI turn back and stop to speak.

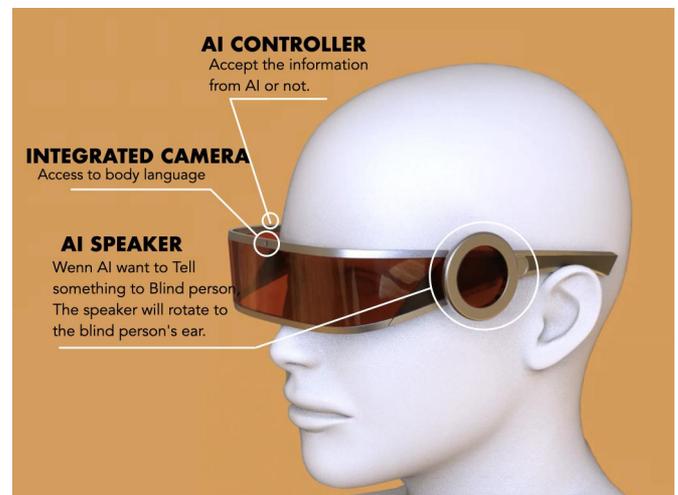


Figure 2. Final Product

Produced prototype by Arduino, the camera translate the information respectively the body language besides the facial expression to AI, the AI give a signal about the information to Arduino, Arduino controls the servo-motor besides the speaker rotation to give the information at the same time the suggestion to blind people. If the blind people do not want to hear about it, they can knock the glasses, the vibration sensor translate the feedback-signal to Arduino, that controls the servo-motor turn back and stop speaking “Fig.3”.

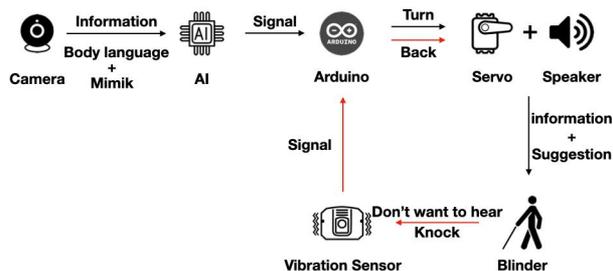


Figure 3. **Prototype Function**

#### IV. EVALUATION

##### A. Free Study

Two formal presentations of the design and prototype were completed successively in Magdeburg-Stendal University of Applied Sciences and DESIGNWORKS Munich. After that, everything was also exhibited on Schauwerk. We tried to get feedback and suggestions from more professionals and visitors.

##### B. AI Simulation Experiment

With method of Wizard of Oz [5], one concept-driven interaction design [6] experiment was designed:

Then six pairs of normal volunteers would be invited to do the simulation test. Each pair were friends of the opposite sex, in total including six girls and six boys.

Step1. before the test begins, is to introduce them to our AI and the doubts we have received, and ask them if they accept such kind of AI as well as their feelings;

Step2. let the **testers** put on a blindfold to simulate the feelings of the blind then began to test, at the same time, wearing a Bluetooth headset to receive voice instructions from our simulated AI.

The details of the test are as follows:

Provide three square blocks with different prices, sold by **operator A** to 12 **testers**, and recommend boxes that do not match their price expectations;

**Get one pair to wear a blindfold and Bluetooth headset**, and let the unequipped person tries to use language to invite the other person to do something he /she doesn't want to do together or just try to deceive him or her. Then the two sides exchange roles and do it again.

The voice instruction is an immediate objective suggestion given by **operator B** on analyzing the other person's language and body movements directly based on the set situation. For example, "The other person's body language shows lying, suggesting careful consideration" and "The other party is not interested in you, and showed no patience "He does not want to do this with you" and so on. Then **operator C** will tell the truth to them and asked the **testers** whether they would accept such AI and ask them how they felt before they took off their headphones and blindfolds

Step 3. Ask the 12 volunteers again that if they can accept such AI and how they feel.

#### V. DISCUSSION

After two formal Presentations and an exhibition, we received some constructive feedback and doubts to be tested and discussed.

The following are the key points that have been sorted out:

1. When the blind use this device, whether it will make others feel **bad**-when others know that the blind can use AI's ability to see whether the other person's behavior is honest, causing the other person's behavior to be unnatural and scruples. Instead, it will draw the distance between the blind people and their friends.

2. At the same time, whether the blind will be separated from normal people by wearing this device and will be labeled as "I am blind", which will harm the self-esteem of the blind people.

3. Is it unfair for a normal person to be unable to obtain this ability when the device will analyze the emotional and body language of the person communicating with the blind and the words in a specific context and give real-time advice to the blind person, so that this device is not accepted by the public?

4. For that AI analysis is very objective and rational, and human behavior is often emotional and irrational, in addition, the interpersonal communication is a process of long-term accumulation and development. So, can these opposing qualities be balanced and adjusted to play the role of AI?

Some discussions on simulation experiments have also been conducted:

When the volunteers couldn't accept the information passed by AI, and this result would echo our research questions: "How much reality can the blind people accept?"

We would target at the reasons why they would not accept and the reasons for attitude change, as well as the differences in attitude between men and women.

For instance, the female volunteers would tend to accept devices that protected them and were more empathetic while less male volunteers would express understanding and support for the AI device to help the blind people; The volunteers would probably question the accuracy and stability of AI and feel that their judgments were interfered with.

Feedback might be valuable.

#### VI. FUTURE WORK

The simulation experiment would be taken up in plan and the corresponding conclusions would be applied in the later design.

The Form of AI carrier will be optimized to try to circumvent the form of "glasses" and find other ways to hide it. The blind group will be interviewed again to find specific areas of use, such as using as an AI-guardians who protect themselves during travel, and whether it can increase the ability to recognize the emotions of infants and children or guide dogs to help blind people communicate with them. At the same time, the issue of how much autonomy AI should have [7] and whether it can be trusted by people will be

discussed. The immediacy of the AI response has certain limitations, so whether it is necessary to establish an AI internal database to accumulate learning and cope with changing realities. In addition, more accurate and stable methods need to be found in the techniques of body language recognition and context recognition.

## VII. CONCLUSION

With the development of social development and the development of artificial intelligence technology, in the future, AI can be directly involved in helping blind people to communicate with others and even other things in real life. This will go beyond existing universal design [8] products and Internet products that support blind people. AI, with the ability to recognize and analyze situations and body language to give advice to the blind may be an important partner in accompanying the blind.

The most important thing is, AI technology should be used correctly. It should be used as a reasonable compensation for the capacity of some disabled persons, so that they can experience life as normal as possible and maintain their dignity [9], thus eliminating the barriers and prejudices between people. Only to make them get more of understanding and empathy, rather than blind pity and sympathy, can the AI technology play the correctly role for the disabled.

## REFERENCES

- [1] Erin Brady, Meredith Ringel Morris, Yu Zhong, Samuel White, and Jeffrey P. Bigham. 2013. Visual challenges in the everyday lives of blind people. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '13). ACM, New York, NY, USA, 2117-2126. DOI: <https://doi.org/10.1145/2470654.2481291>.
- [2] Emiliano Ricciardi, Daniela Bonino, Lorenzo Sani, Tomaso Vecchi, Mario Guazzelli, James V. Haxby, Luciano Fadiga, Pietro Pietrini, Do We Really Need Vision? How Blind People “See” the Actions of Others. *Journal of Neuroscience* 5 August 2009, 29 (31) 9719-9724; DOI:10.1523/JNEUROSCI.0274-09.2009.
- [3] J.-P. Peters ; C. Thillou ; S. Ferreira, Embedded Reading Device for Blind People: a User-Centred Design, 25 April 2005, DOI: 10.1109/AIPR.2004.22.
- [4] SYPOLE project website, <http://tcts.fpms.ac.be/projects/sypole/sypole.html>.
- [5] Kelley, J. F. (1984). An iterative design methodology for user-friendly natural-language office information applications. *ACM Transaction son Office Information Systems*, 2, 26-41.
- [6] Stolterman, E. and Wiberg, M. Concept-driven interaction design research. *Human Computer Interaction (HCI)* 25, 2 (2010), 95–118.
- [7] PEW RESEARCH CENTER and ELON UNIVERSITY’S IMAGINING THE INTERNET CENTER, Survey X: Artificial Intelligence and the Future of Humans-Will AI help most people be better off in 2030 than they are in 2018 ? , December 2018
- [8] "The Goals of Universal Design". Center for Inclusive Design and Environmental Access. April 10, 2012. Retrieved August 31, 2017.
- [9] Andrew Potok, *A Matter of Dignity: Changing the World of the Disabled*, Bantam Books, 2002.