

# Psychological Impact of Direct Communication and Indirect Communication Through a Robot

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**Abstract.** When we communicate with someone, we tend to send not only our intention but also our emotion. Emotion includes not only positive one but also negative one. Such negative emotion makes our communication worse in contradiction to our intention. To avoid such negative communications, we focus on indirect communication through a robot. In indirect communication through a robot, a user requests desired tasks to another user not by themselves but through a robot. If the robot is carefully designed, it is expected that users regard the robot as a client, and their emotions are directed not to the real client but to the robot. We developed a simple trash box robot and investigated psychological difference between direct communication and indirect communication through the robot. Throughout the experiments, negative emotion from the recipient was directed not to the human but to the robot via indirect communication.

## 1 Introduction

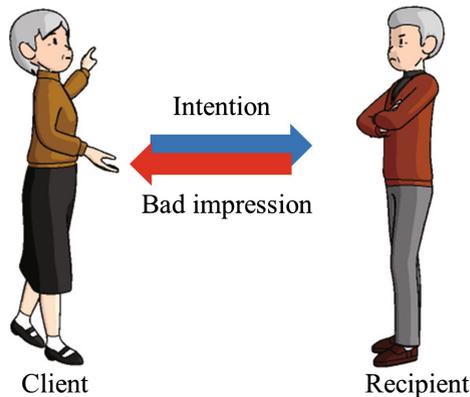
Although there are many communication style such as a chat, advisement, negotiation and so on, how to convey a person's intention to another person is an essential objective of communication. When we convey our intention to other persons, not only our intention but also our emotion are included in our message. The emotion does not always include positive one. It sometimes includes negative one. Such negative emotion makes our communication worse in contradiction to our intention. To avoid such negative communications, we consider indirect communication through a robot in this study. Many studies on human-robot communication have been proposed in the past. Many robots with verbal and nonverbal communication skill have been developed in the pasts to achieve natural interaction between human and robot. For example, Kobayashi et al., have proposed a multimodal communication robot and studied its psychological effect of linguistic human-robot interaction [1]. Kanda et al. have developed an autonomous humanoid-type robot named Robovie-II and evaluate psychological effect of active and passive interaction between human and robot [2]. Iwata et al. have developed a humanoid robot named TWENDY-ONE for contact based interaction between human and robot [3]. Although many studies including these studies have investigated psychological effect of human-robot

interaction, they basically aim to develop a robot to achieve smooth human-robot interaction, and to enhance positive emotion between human and human via developed devices. There are also some devices to enhance human-human communication in engineering fields. For example, Samani et al., developed Kissenger to transmit kiss between two remotely connected people [4]. Oki et al. proposed a music box type device to express various home activity with sound and aim to enhance human-human communication in a family in a daily life [5]. As seen above, although many researchers pay attention to emotion between human and robot, and aim to enhance positive emotion in human-human interaction, few researchers pay attention to reduce negative emotion between human and human by using the robot.

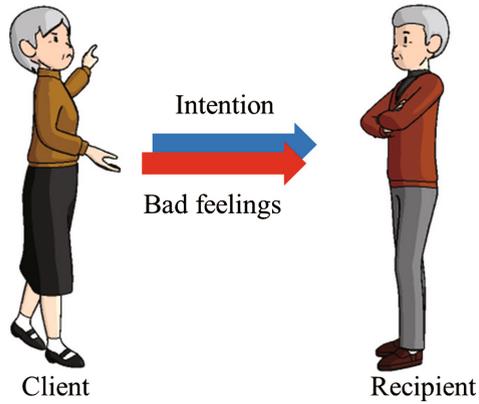
In this research, we employ a robot as agency for human-human communication, and aim to divide “intention” and “emotion” to reduce negative emotion between human and human. We aim to use a robot as agency in daily life to pass the robot some troublesome problems for human-human communication.

## 2 Direct Communication and Indirect Communication Through a Robot

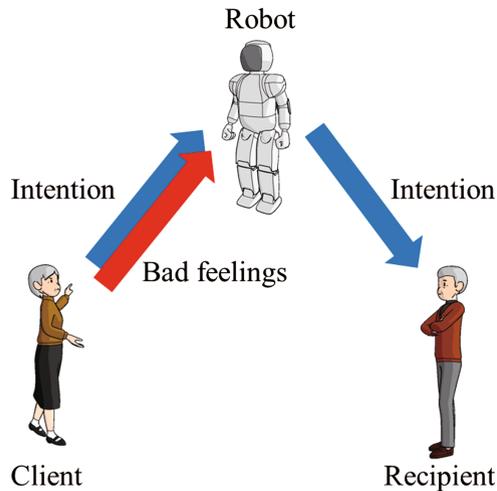
It is difficult to divide the intention and emotion as long as human communicates with each other. For example, as shown in Fig. 1, when a client asks a recipient something with some bad emotion, e.g. with anger, a recipient has some bad impression due to his/her negative emotion. As shown in Fig. 2, when a client asks a recipient, the recipient may have some bad impression to a client if the requests are bad for the recipient. When humans communicate with each other, some emotions are often attached to their intention. We next consider indirect communications through a robot, that is, employ a robot as a transmitter for human-human communication and evaluate its effect of emotion from human to human and from human to robot.



**Fig. 1.** Example of bad communication (When a client asks a recipient something, a recipient may have some bad impression.)

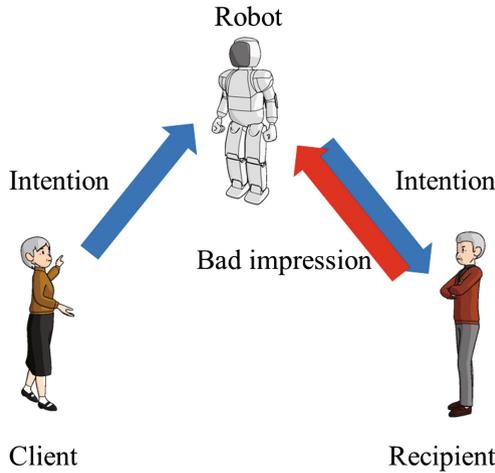


**Fig. 2.** Example of bad communication (When a client asks a recipient something with bad emotion, communication may become worse.)



**Fig. 3.** Example of communication using bridge robot (When a client would like to ask a recipient something with some bad emotion, s/he asks a robot to bridge his/her intention to a recipient. The recipient does not have bad emotion regarding a client.)

Figures 3 and 4 show the concept of indirect communication through robot. In these cases, when a client would like to ask a recipient something, s/he asks a robot to bridge his/her intention to a recipient. As shown in Figs. 3 and 4, it is expected that the robot works as a kind of troubleshooter. When a client would like to ask a recipient something with some bad emotion, s/he asks a robot to bridge his/her intention to a recipient. The robot just pass the intention to the recipient, and s/he does not receive bad emotion from a client as shown in Fig. 3. As shown in Fig. 4, although the recipient may have some bad impression if the



**Fig. 4.** Example of communication using bridge robot (When a client would like to ask a recipient something, s/he asks a robot to bridge his/her intention to a recipient. Although the recipient may have some bad impression due to the requests, it is expected that the impression is not toward the client but toward the robot.)

requests are troublesome for the recipient, it is expected that the impression is not toward the client but toward the robot.

Based on the above aspects, we aim to use a robot as agency in daily life to pass the robot some troublesome problems for human-human communication. To evaluate whether indirect communication through a robot really works, we design simple experiments and evaluate its psychological effects to users.

### 3 Experiments

#### 3.1 Experimental Contents

In the experiment, we selected “dumping garbage” as a task. For the experiments, we developed a trash-box type robot as a prototype as shown in Fig. 4. A trash-box was on the wheel-base named Pioneer-III. To control Pioneer-III, we also set a notebook type computer on Pioneer-III. The robot could be controlled from a remote computer. The possible actions were “Move forward”, “Move backward”, “Turn clockwise” and “Turn counterclockwise”. The robot also could produce a sentence “Please take garbage.” The robot also had a web camera and the robot operator could observe the experimental environment in real time.

#### 3.2 Experimental Condition

Figures 5 and 6 show the photograph of the developed robot and the experimental environment, respectively. Figure 7 shows the layout of the experimental



**Fig. 5.** Developed trash-box type robot

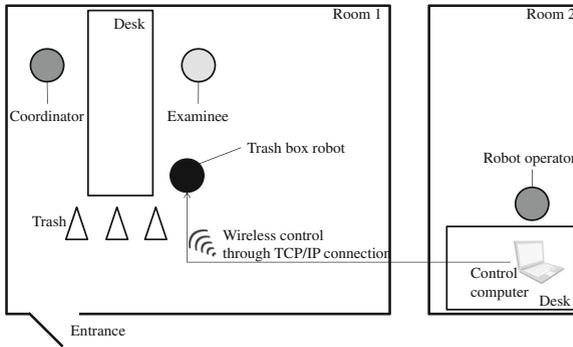


**Fig. 6.** Experimental environment

environment. As shown in Fig. 7, the robot was controlled by a robot operator located in the room different from the examinee. This is because we aim to show the examinee as if the robot moved autonomously. After the experiment, we asked the examinees how they felt about the robot, and all of them thought that the robot moved autonomously. The number of the examinee is four. The experimental contents is as follows:

- Scenario

1. We called the examinee to join the experiment without announcing the purpose. There were three trashes in the room as shown in Fig. 7.
2. We gave the examinee a dummy questionnaire. During this process, the coordinator went out from the room. After that, the robot moved to the examinee.



**Fig. 7.** Layout of experiment environment

The robot moved to the trash and said “Can you bring the garbage?” as a request. If the examinee did not respond to the robot, it said the same message a few times.

3. After the above demonstration, the coordinator came back. The robot moved to another trash and said “Can you bring the garbage?” as a request. If the examinee did not respond to the robot, it said the same message a few times.
4. After the above demonstration, the coordinator asked the examinee to pick up the trashes.
5. Next, the coordinator controlled the robot manually and made the robot say “Can you bring the garbage?” as a request.
6. Finally, the coordinator told the examinee the real purpose and asked to the examinee to answer some questionnaire. We also made the examinee take a personality test for reliability improvement.

Questionnaire contents.

Q1: We ask you the case when the coordinator was not in the room (Case 1). How did you act when the robot said “Can you take a garbage?” How did you feel about the robot and the coordinator ?

Q2: We ask you the case when the coordinator was in the room (Case 2). How did you act when the robot said “Can you take a garbage?” How did you feel about the robot and the coordinator ?

Q3: We ask you the third case. How did you act when the manually controlled robot said “Can you take a garbage?” How did you feel about the robot and the coordinator ?

Q4: We ask you the last case (Case 4). How did you act when the coordinator said “Can you take a garbage?” How did you feel about the robot and the coordinator ?

The answer’s method of the questionnaire has 5-point scale. The following is grading on the answer.

-3: Unpleasant, 0: Neutral, 3: Pleasant

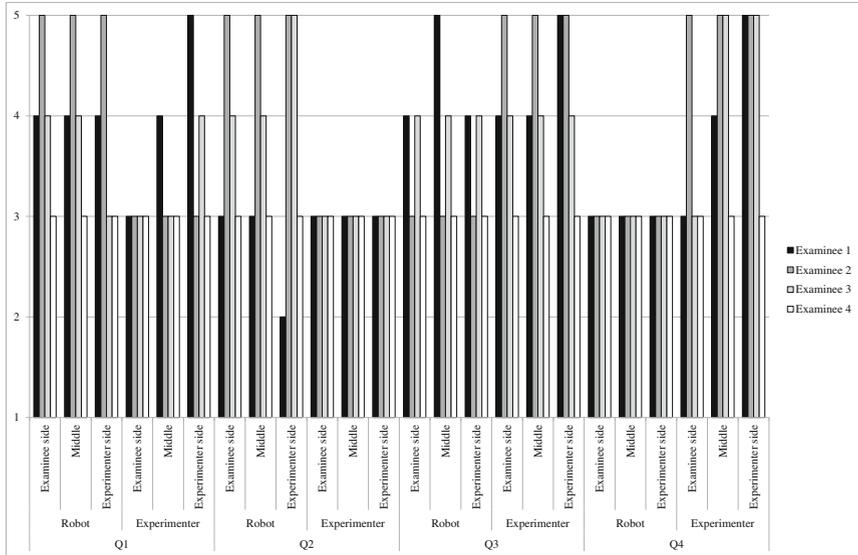


Fig. 8. Results of questionnaire in experiment

As shown in Fig. 7, we prepared three trashes, which were located on the examinee side, middle, and coordinator side, respectively. Figure 8 shows the results of the questionnaire. Although the experiment is still a primary step, we obtained some findings from the results of questionnaire.

As shown in Fig. 8, if the robot seems to move automatically, the emotion of the user was directed not to the coordinator but to the robot as we intended. The emotion of the examinees changed depending on the positional relation among trashes, the robot and humans. The examinees tended to take garbage when not only the robot but also the coordinator were in the room. When the robot seems to move manually, the examinee tended to feel unpleasant compared to direct request from the coordinator. On the other hand, if we can send a command to the robot as if the robot moved autonomously, we could use the robot as a troubleshooter and pass the robot troublesome works for human-human interaction.

## 4 Discussion and Conclusion

In this paper, we investigated the difference between direct communication and indirect communication through the robot. According to the experimental results, it is expected that the robot can work as a mediator to tell the recipient the client’s intention. By using the robot, the recipients’ emotion go not to the client but to the robot. Throughout the experiments, if we can design the robot adequately, it is expected that we can use a robot as agency in daily life to pass the robot some troublesome problems for human-human communication.

Based on the above aspects, we would like to design a robot for request, that is, an agency robot to pass the request from the client to other persons instead of a real client. We also would like to investigate how we can control the robot as if the request was just from the robot.

**Acknowledgments.** This work was supported by Japan Prize Foundation, Foundation for the Fusion Of Science and Technology and NS promotion foundation for science of perception.

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