

Acquisition of Subjective Representation Using Body Parts by an Object

Hiroataka Osawa (osawa@ayu.ics.keio.ac.jp)

Jun Mukai (mukai@ayu.ics.keio.ac.jp)

Graduate School of Science and Technology, Keio University
3-14-1 Hiyoshi, Kohoku-Ku Yokohama 223-8522, Japan

Michita Imai (michita@ics.keio.ac.jp)

Faculty of Science and Technology, Keio University
3-14-1 Hiyoshi, Kohoku-Ku Yokohama 223-8522, Japan

Abstract

Our purpose is that an object acquires subjective representation by anthropomorphization and it communicates with humans. Although, there are many studies on anthropomorphic agents to communicate with humans via an object, it's unnatural because these agent is unrelated to the object directly. In our method, the object is directly anthropomorphized so it can conduct task-related communication using its intrinsic body image. We designed and implemented eye-like device for anthropomorphization and conducted an experiment to evaluate a body image made by this device. The result indicated that there is a significant difference between anthropomorphized object and object not anthropomorphized.

Keywords:

Computer Science, Analogy, Human Factors and Human-computer interaction, Robotics

Introduction

In a communication, a human refers an object's location relatively. For example, we indicate location of object from another object like "on the table." or "near the door". Considering human-computer communications, an information system also need to use their own standpoints, where the system talks or looks from. To represent standpoints of the system, anthropomorphic agents such as robots, androids and CG agents are generally used.

There are precedent studies for anthropomorphic agents (see left of Figure 1). They use their own bodies and standpoints for communication with a human(Mukawa et al., 2001; Kanda et al., 2002). For example, they can easily point out objects with their own bodies.

With anthropomorphic agents, however, instructions sometimes become irritating for users because they need to communicate with the agent apart from the devices. For example, When a system helps users to instruct the usage of a dishwasher, they must communicate with its anthropomorphic agent, not the dishwasher itself. It is unnatural because that the agent itself is irrelevant to a dish washing task. On the contrary, if we anthropomorphize an object, the object obtains its own standpoint (see right of Figure 1). For the case of the example above, the task is achieved by that the dishwasher only says "please put all objects on me!" which makes the

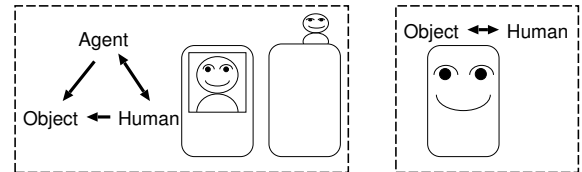


Figure 1: Difference between anthropomorphic agents and anthropomorphized object



Figure 2: Anthropomorphized desk and pot.

communication simple. Here are examples of anthropomorphized objects, one is an eye-like device and the other is an arm-like device (see Figure 2).

In this study, we conducted an experiment to evaluate the subjective representation of an anthropomorphized object, using an eye-like device attached on a refrigerator. As a result, it is indicated that the device reinforces intrinsic body image of the refrigerator, and users understand subjective representation from the anthropomorphized object more naturally than indirect audible instructions.

Experiment

In the experiment, a participant collects 9 dummy fruits in accordance with positioning instructions from a refrigerator. The experiment applied to 21 participants. Their ages are between 19 to 25. First, we divide participants randomly into 2 groups as below. 9 male participants and 2 female participants are in the Group A(experimental group), using the anthropomorphized refrigerator (left of the Figure 3). 9 male participants and 1 female participants are in the Group B(control group), using just the refrigerator and audible instructions(right of the Figure 3). Dummy fruits are placed as Figure 4. Our hypothesis is that participants become possible to percept the refrigerator's body image, and

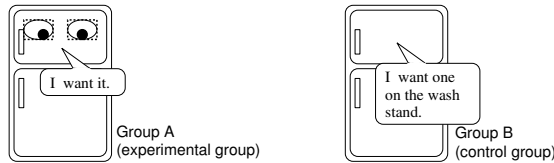


Figure 3: Conditions for an experiment A and B.

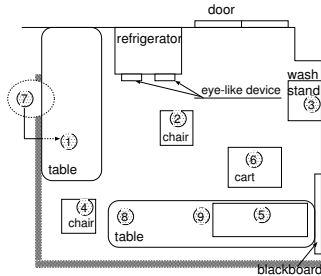


Figure 4: Field of the experiment.

they understand its subjective representation, using the device for anthropomorphization.

Before the experiment, we presented 2 notices to all of a participant. A first notice is “a machinery is set in front of you.” and a second notice is “something will be heard.” When a participant enters the room after these instructions, the system informs him/her about positions of fruits by controlling the eye-like device and a speaker. The eye-like device was installed in front of the refrigerator and the speaker was installed on back of the refrigerator. The instructions are as follows. In the Group A, the device looked at a participant, then it looked at targeted object (this is for gaze-drawing) while doing to say requests “I want it”. In the Group B, we used instructions from the speaker only, and we added a sentence telling place such as “the one on the table near the refrigerator” after the word “I want” to instructions. The partial sound “I want” is same as sounds of the Group A. Requests for the participant were repeated 3 times in both cases, until he/she responded to it.

There are 5 seconds between each instructions. If there was no response during an interval, we proceeded to the next instruction. All instructions were finished, eye-like device or speaker says “please put them into my stomach.”

Results and Discussions

Participants’ responses for the instruction “please put them into my stomach.” are on Table 1 (see Figure 5). All participants in the Group A and 6 participants in the Group B put fruits into the refrigerator if fruits are left on default places, and if fruits are already into the refrigerator, he/she opened a door and checked them. In comparison, 4 participants in the Group B did nothing with the refrigerator when they heard this instruction.

Since 2 numbers are less than 5 in Table 1, we conduct Fisher’s exact test instead of chi square test with Table 1. The result is shown as $p = 0.03509 < 0.05$, and a sig-

Table 1: Participants’ behaviors for the fruits.

PARTICIPANTS	Group A	Group B
put fruits into the refrigerator	11	6
do nothing	0	4

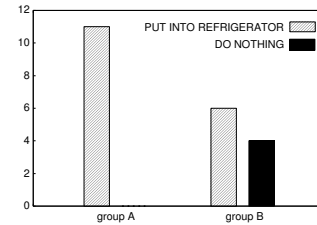


Figure 5: Difference of participants’ behaviors.

nificant difference was found between the experimental and control groups with participants’ responses for the system. We can’t find no significant difference between male and female participants.

We interpret the reason of the significant difference is generated with a lack of understanding body image in the Group B. The reasons are as follows. First, there are no difference of a sound “I want” between the Group A and the Group B. Second, the four people in the Group B understand just places of fruits informed by the refrigerator. Because all of them looked at a fruit according to indications. For these reasons, we suppose that they cannot understand who is talking, they cannot understand subjective representations like “want” or “my stomach”. One of them caught one of the fruits and attached it on his stomach, after last instruction “please put them into my stomach.” This action was caused by the lack of body image of the refrigerator. With these results, our hypothesis that the refrigerator gets subjectivity with eye-like device and human detects a requirement of the system, is verified.

Conclusion

In this study, we evaluate anthropomorphized object. As a result, we found that users can communicate with the object and understand subjective representation of the object more easily with anthropomorphized object than the object just itself.

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