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# Poster: HelloBot: Facilitating Social Inclusion with an Interactive Greeting Robot

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*UbiComp/ISWC'18 Adjunct*, October 8–12, 2018, Singapore, Singapore  
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ACM ISBN 978-1-4503-5966-5/18/10.  
<https://doi.org/10.1145/3267305.3267616>

## Abstract

Smiling and saying hello to people can possibly increase social inclusion or belongingness, which is one of the basic needs of human. We present HelloBot, a social robot that proactively gives greetings to passersby and reacts to their smiles to induce positive feelings. We performed an in-the-wild trial to evaluate the emotional effect of interacting with HelloBot. We observed 123 students and 32 answered the accompanying questionnaire. 92 of 123 participants made a natural laugh or smile. 50%(N=16) of participants reported that they felt better after interacting with HelloBot. Our results show that interactive social greeting bots have the potential to induce social inclusion and positive feelings.

## Author Keywords

Greeting; Smile; Laugh; Happiness; Face detection; Smile recognition; Communication

## ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

## Introduction

Smiling and saying hello to people is one of the essential elements in our daily lives. According to social



**Figure 1:** no interaction



**Figure 2:** getting attention

psychologists, this kind of behavior is crucial for the basic human need of social inclusion or, in other terms, belongingness [6]. Furthermore, smiling is an important part of greeting, and literature shows that giving smiles to strangers can possibly increase feelings of belongingness in those who received smiles [5].

Researchers have recognized the importance of greeting and smiling through interactive systems design. In their recent study, Heenan et al [2] leveraged social science results of human greeting behaviors to build a state model for greeting that includes a series of steps such as sighting, distance salutation (e.g., waving, nodding, smiling), approaching, and close salutation (e.g., handshaking, embracing, verbal greeting). Most prior studies focus on supporting greeting behaviors as part of their services (e.g., guiding new customers).

We design a proactive and interactive robot that aims to greet passersby (i.e., smiling and saying hello to passersby). The goal is to induce positive feelings and encourage community members (say college students, staff, and faculty) to greet one another.

Overall, our system belongs to the class of systems that facilitate social-emotional interactions in the Ubicomp field. For example, several systems capture and share people's feelings; for example, Mood Meter [3] counts smiles of passersby and shares counts via web pages, and Mood Squeezer [1] displays employees' mood using a shared display. Beyond simple sharing, HappinessCounter [4] recognizes a user's face and smile and enforces smiling behaviors by incorporating an interaction gateway in everyday appliances (e.g., smile to unlock a fridge).

In this work, we designed HelloBot, a social robot that proactively gives greetings to passersby and reacts to their smiles. HelloBot proactively interacts with passersby by saying hello to them and responding to their smiles or laughter with its own light laughter. This kind of greeting behavior mimics a joyful neighbor who tends to make neighbors happy. We performed an in-the-wild trial by installing HelloBot in a university building. We observed the interaction patterns of passersby and collected their experiences via follow-up surveys.

### **HelloBot Prototype Design**

HelloBot supports three main interactions: (1) getting attention, (2) giving proactive greeting, and (3) laughing as reaction.

#### *Getting attention*

HelloBot mimics a popular animation character, Minions (Fig. 1). We chose this appearance to give a favorable impression to the passersby. HelloBot does not immediately say hello to those who pass by because this kind of proactiveness may not draw people's attention easily. Instead, HelloBot lights a LED strip in rainbow colors to draw people's attention (Fig. 2). We used an Arduino and PIR sensor to detect passersby. When people become interested in interaction with the HelloBot, it's likely that they look into the HelloBot's face. This behavior naturally hints the system to make a transition to the next step.

#### *Giving proactive greeting*

We used a smartphone to visualize the HelloBot's face (eye area). The device was mounted onto the robot's eye area. A mobile application displays HelloBot's facial expression depending on the interaction of a user (or



**Figure 3:** giving proactive greeting



**Figure 4:** field study

passerby). The default facial expression is a bored face. When a user looks at the HelloBot's face, its face will turn into a smiling face (Fig. 3). At the same time, HelloBot greets a user by saying "Hi there." We used the Google Machine Learning kit for face detection. The smartphone is connected to a Bluetooth speaker.

#### *Laughing as reaction*

HelloBot expects a user to smile as part of its greeting process. This is because in our design, HelloBot is holding a paper card that says "Give me a big smile." When a face is detected, HelloBot constantly monitors whether a user smiles or not. If a smile is detected, HelloBot reacts to the smile by saying "Have a nice day" with a light laughter of "HA HA HA HA."

#### **Field Study**

We conducted an in-the-wild field trial from 11 AM to 7 PM for one day. We placed HelloBot in the building lobby of a large technical university where most summer session classes are held (Fig. 4). First, we observed how passersby interacted with HelloBot. We sat in a back seat that was near HelloBot but was also not easily noticeable to people approaching the robot. We recorded interaction situations by focusing on: (1) verbal and non-verbal interactions, (2) situations in which people gave a natural smile or laughed, (3) expressions during/after interactions, and (4) cases of multiple interactions with HelloBot. Furthermore, we placed a laptop next to HelloBot so that passersby could respond to a survey questionnaire. The survey questions were as follows.

- Q1. How do you feel after interacting with HelloBot? (select among Feel better / No change / Feel worse)  
 Q2. Please give, with as much detail as possible, the reason behind your response above.

Q3. If you have any comments on how to improve HelloBot in the future, please write them down freely. To encourage participation, we noted that there will be a random selection of 10 participants for rewards of coffee coupons (worth about 5 dollars).

#### *Participants*

We observed 123 people, and 32 participants finished online surveys (12 female and 20 male). Their ages were from 19 to 31 (mean: 22.1, sd: 2.9).

#### **Evaluation**

##### *Observational Results*

From observation, 92 of 123 participants made a natural laugh or smile. Natural laughs were observed when they first noticed HelloBot, interacted with HelloBot, and had a follow-up conversation with their friends about HelloBot. A group of 6 friends laughed with HelloBot. They had a conversation, saying things like: "Wow, it's so cute", "It is greeting us!", "Hi there" was what the robot said", "Wow, what is this?" and "Amazing!" Also, they mimicked HelloBot's laughter of "HA HA HA HA." 43 participants spoke positive words to HelloBot such as, "It laughs when I smile; it's amazing." Many of them commented that it is exciting that the robot recognizes presence and reacts to their behaviors. 34 participants repeated what HelloBot spoke to them. Despite its limited capabilities, we observed that some participants (n=11) tried to make further verbal interactions or attempted to make physical interactions (e.g., waving hands, or touching its body).

##### *Survey Results*

50% (N=16) of participants reported that they felt better after interacting with HelloBot, while 40.6% (N=13) said no change; 9.4% (N=3) said they felt worse. The majority of the positive respondents

described the reason for feeling better as the robot's laughter in reaction to their smiles. One participant wrote, "It pleased me that a robot recognized that I was laughing and laughed with me (P20)." Also, the robot's greeting itself gave people better feelings (25%); one participant commented, "I passed by the robot without much thinking, but the robot greeted me. It was attractive and interesting (P6)." Furthermore, interaction with a robot was perceived as a new experience, which brought people some excitement. For example, P30 said, "It seems like I had the new experience of interacting with a robot. Interacting with a robot is something new to people." The robot's cute appearance was positively perceived.

Those who marked that no changes were found commented that HelloBot's interactions were not very natural and looked too mechanical. One participant commented, "I greeted the robot but there was no big change in my mood because the robot's voice was hard (P17)". Most negative comments were technical issues – for example, "I smiled but it does not laugh (P12)." HelloBot judges whether a user smiles using machine learning. If participants laughed without notable facial expression, HelloBot could fail to recognize smiles.

### **Conclusion and Future Work**

HelloBot proactively gives greetings to passersby and reacts to their smiles to induce positive mood. Our preliminary results documented the potential of a social greeting bot. Future work includes improving social greeting interactions (e.g., supporting more natural speech, rich greeting interactions), visualizing/sharing interaction across multiple HelloBots (by installing an interactive display on HelloBot), and conducting a large-scale field experiment on campus.

### **Acknowledgements**

This work was supported by Institute for Information & communications Technology Promotion (IITP) grant funded by the Korea government (MSIT) (No. R7124-16-0004, Development of Intelligent Interaction Technology Based on Context Awareness and Human Intention Understanding).

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