

Lover's Cups: Drinking Interfaces as New Communication Channels

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ABSTRACT

Drinking together has important roles in human relationships and social interactions. In this paper, we suggest drinking as an implicit communication channel and an enhancer of communications. We present Lover's Cups as drinking-together interfaces that promote sharing the drinking time with someone you care about. The drinking interfaces are a pair of cups with a wireless connection that communicate with each other and amplify the social aspect of drinking behavior.

Author Keywords

Drinking Interfaces, Implicit Interaction, Communication, Ambient Media.

ACM Classification Keywords

[H5.2 User Interfaces] Interaction Styles

INTRODUCTION

The behavior of drinking has social meanings and functions. By drinking with other people, people can lower their barriers, relax themselves, feel that they are sharing the time, and thus enhance the communication and social interaction. The words "tea time" or "coffee break" showed how drinking is related with open social activities. People serve tea, coffee, wine, or other beverages with snacks to guests during parties, meetings, or many other kinds of gatherings to lower the barriers between people. Also, people take something to drink while taking a rest or making a conversation with other people even they are not thirsty at all.

People feel more comfortable and intimate with people with whom they are eating and drinking together. While drinking,

people become more relaxed and comfortable with other people, and it makes them more easily communicate with each other and build up social relationships. In Miller, Rozin, and Fiske's study, they found that when college students were sharing their food or feeding other people, there was more intimacy than when they weren't [1].

There have been many studies of enhancing the communication channels and social interactions in the human computer interactions research field. In [2], inTouch addressed how to share the physical force and feedback in different places. LumiTouch presented how individuals inform the presence of each other by ambient ways [3]. In [4], context-aware design approaches encourage understanding human intention by simple sensors and promote human-to-human communication.

In this paper, we explore drinking as a new kind of communication channel by presenting Lover's Cups, as shown in Figure 1, the communication tools for remote drinking-together interactions for a couple in physically different places.



Figure 1 The Lover's Cup in the right picture shows the liquid level of the other cup in the left picture while the other user is drinking. The top area of the cup is illuminated while the other user's lips are touching the other cup.

Drinking with communication enhances traditional communication interfaces such as audio, video, or text communication tools. The Lover's Cups are not intended to replace the other forms of communication such as voice or text communication, but to add more emotional channels to

the traditional communication and improve the quality of interconnections.

Lover's Cups explore the idea of sharing feelings of drinking between two people in different places by using cups as communication interfaces of drinking. Two cups are connected with each other, and respond when the other cup is used. A person can see in his/her own cup how much liquid is in the other's cup and when s/he is drinking by which side. Overlapped on their own real liquid, these kinds of displays can help people to feel as if they are drinking together and even sharing the same cups and the same liquid.

SCENARIOS

Following scenarios show how Lover's Cups can promote emotional interaction, health care, family care, and social activities.

For Lovers

The Lover's Cups connect a couple through drinking behaviors while they are working. A pair of Lover's Cups is owned by a couple working in different offices. Each of them had brought his/her Lover's Cup to work. Due to the magical connectivity of this pair of cups, the wife sees her cup is glowing which represents her husband's cup is in used for drinking. She picks up the Lover's Cup and takes a sip. At the same time, the other Lover's Cup held in her husband's hand starts glowing for the celebration of drinking together.

For Nurse, Family, and Patient

The Lover's Cups can be also extended to health care applications. Patients always need extra care from their families. The Lover's Cups are able to connect the patients to someone who cares about their water drinking behavior. While a patient is drinking water, the paired Lover's Cup reflects to someone related to him/her. If the patient did not drink enough water, through the physical illumination of cups, patients might be motivated to drink water or being taken care.

For Mom and Child

Mom's love water bottle is another Lover's Cup extension for parents and children. Parents are willing to give young children extra care in every possible way. A family-connected water bottle may create emotional linkage between parents and children. During the lunch time of the child's school, his parents could shake their Lover's Cup to make the child's water bottle vibrate or take a sip to make it glow in order to express their care and motivate their child to drink water.

For a Social Event

Lover's Cups can be distributed in a social party where everyone uses Lover's Cups to drink. When one's Lover's Cup meets with another cup by toasting, two of them will become a pair of Lover's Cups until one of them toasts with

other cups. For example, in the Lover's Cup social event, Jackie is holding a Lover's Cup and meeting with Anny who holds another Lover's Cup. They toast for good luck and their cups remember each other by the action of toasting. Whenever Anny takes a sip, Jackie's cup glows to motivate him to take a sip at the same time. When Jackie shakes his cup, Anny can feel that her cup is vibrating. Using the cups, they have a new way of interacting with each other while drinking. After a while, four of Anny's friends arrive. Anny and her friends hold their cups together. At this moment, their cups become a group of Lover's Cups. Whenever one is in use for drinking, the other cups will also glow and celebrate this moment of drinking.

For Magicians

A pair of Lover's Cups is remote-connected interactive devices. A magician demonstrates the special connectivity between the two cups; they fall in love with each other. When one of this pair breaks, the other cup also breaks.

INTERACTIVE TECHNIQUES

Multi-modal sensing and actuating features can be extracted from the scenarios as follows.

Attentive Illumination

Lights can be designed as both attentive and ambient interfaces representing different meanings. The Lover's Cups are like normal cups sitting quietly on the table if no one picks them up or there is no liquid inside. When a person holds one of the Lover's Cups, it triggers soft glowing processes for the paired cup. If a person is sipping on one cup, the LED illumination of the paired cup is at its maximum. Glow wires are embedded into the Lover's Cups for displaying the level of the liquid inside and also the color of the liquid.

Virtual Kiss

When the paired Lover's Cups are held by two people, the cups start glowing slowly to let this couple become visually aware of each other by the illuminated cups. When both of them take a sip at the same time, this pair of Lover's Cups is glowing at its maximum illumination to celebrate the shared intimacy and the feelings of drinking with someone s/he cares about.

Connectivity

The paired Lover's Cups are connected by wireless technology. By sensing drinking behaviors and multimodal actuation, it creates the emotional illusion of connecting with other people. Depending on the situations, the cups use different types of networking module for transmitting and receiving sensing data. In the same room or short distance, within 30 meters, the Radio-Frequency (RF) modules are effective peer-to-peer transceivers. For long-distance or cross-country, the RF transceivers need to be hooked up to the Wi-Fi network as access points for the Lover's Cups in order to send and receive data through the Internet. We also

consider embedding GPRS mobile phone modules into the Lover's Cups for sending sensing data for worldwide uses.



Figure 2: Lover's Cups interact with people's hand behavior.

Shaking Hands

People may shake their glasses to send active signals. By inter-communicating the networked cups, we designed a hand-shaking action. As shown in Figure 2 (left), if a person shakes one of the Lover's Cups, the other cup will vibrate to generate the remote hand-shaking feeling to the other person.

Toasting as Commitment

When using Lover's Cups for social events, toasting two cups together makes them into a pair of Lover's Cup, as shown in Figure 2 (right). With toasting's social meanings, we designed the toasting actions as commitment for drinking together. By using Lover's Cup, the drinking behaviors are amplified as adding new channels of communication.

IMPLEMENTATION

The hardware of Lover's Cup consists of a double-sided acrylic cup, sip and liquid sensors, LED displays, actuators and wireless communication, as shown in Figure 3.

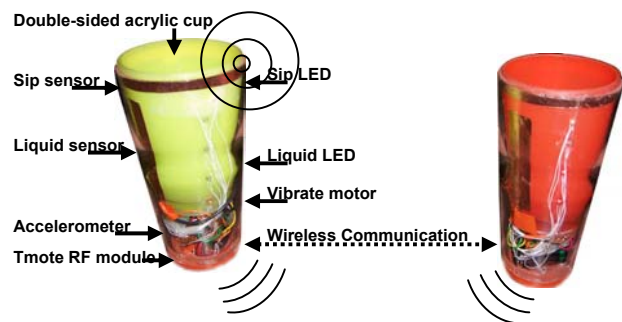


Figure 3: Lover's Cup consists of a double-sided cup with non-contact liquid sensing mechanism, LED displays, actuators and RF communication module.

We used integrated sensor boards, Tmote Skys, which already include the microprocessor, IEEE 802.15.4 radio module, and other integrated peripherals such as ADCs and UART bus. Capacitive sensors and Piezo sensors were used

in sensing parts, and LEDs and vibrators made visual and tactile outputs.

Liquid and Sip Sensors

The Lover's Cup consists of a double-sided cup with a non-contact liquid sensing mechanism using PIC microcontroller. The sensing part included the sensors to measure the level of liquid and the sensors to sense the touch of the user's skin on the rim of the cup. Capacitive sensing techniques were used for detecting liquid level and drink action without contacting the liquid, so sensors could be invisible.

To measure the level of liquid inside, a pair of capacitive sensors was used. The long and thin sensors were embedded on the inner side surface of the double-sided cup, vertically abreast. As liquid was filled in the cup the capacitance between two sensors would be varied. Thus, we could measure the volume of the liquid inside the cup by measuring the capacitance between two sensors. One of the two sensors was connected with a signal generator, and kept sending the reference signal from the signal generator to the other part of the sensors. The other sensor received the signal through the cup and sent the signal to an ADC input pin of the microcontroller through an amplifier. Because the amplitude of the signal was modulated by the volume of the liquid between two sensors, the microcontroller could infer the level of the liquid from the signal.

A similar method was used to sense the touch of user's skin on the rim. Another pair of capacitive sensors was used. However, one sensor transmitting the reference signal was installed on the surface of the cup to be touched by a user's hand when the cup was held by a user. The other sensor to receive the modulated signal was put on the inside of the rim to be nearly touched by user's lips when a user drank. The reference signal passed through the user's body and showed whether user's skin touched the rim of the cup or not by its amplitude.

Displays

The drinking information was also displayed by green color LEDs as feedbacks. LEDs (Light Emit Diodes) are used to show the status of the other cup. For example, if one is drinking, the top area of the other cup will be illuminated to show someone is drinking and how much left. If user 1 poured coffee in cup 1, cup 2 displayed the volume of the coffee in cup 1 by the height of illuminated LEDs so that user 2 could recognize that user 1 might be using his/her cup. If user 1 drank and touched his/her lips on the rim of cup 1, the rim of cup 2 glowed and indicated the drinking behavior of the user 1 to user 2. The information transmitted from the counterpart cup was displayed by several colors of LEDs attached on the cup. Five yellow LEDs were vertically set on the side of the cup and displayed the level of the liquid in the other cup. Red LED glowed when the other user was actually touching the other cup and drinking.

Shaking Sensors

The cups could be used in other ways than pouring and drinking. Piezo sensors and micro motors made more active communication possible. If a user shakes a cup on purpose, the Piezo sensors send strong and relatively continuous signals to the microcontroller. The controller sends the shaking information to the paired cup, so that the paired cup can make a vibration to imitate the tangible feelings of shaking. By this way, users can send active signals to the other users.

Wireless Transceiver

The communication between the two cups was using RF to send messages to one computer. For a short distance transmission, like home or office, the two cups used RF to communicate with each other. In a large area or long distance, the communication needed to rely on the Internet; the messages sent out by one cup needed a computer to send it out through internet, so that it could reach another computer and also the other cup through RF.

Toasting

Another possible, but not implemented in our prototypes, interaction is toasting. When users toast their cups together, two cups can recognize and communicate with each other cup to make special relationship or to exchange information.

We tried to implement this interaction with Piezo sensors and IR communications; if a cup sense a strong physical impact, the microcontroller sends its own ID through the IR LED and waits for the answer from the other cup. If they can recognize each other with the IR communications, it means they were toasted, and then they can make special interactions. This technique is not implemented in our

current prototypes, but we are planning to embed it in our next prototypes.

CONCLUSION

We present the Lover's Cups as new interfaces which explore the area of drinking together with sensory communication channels. This interface addresses drinking interaction for emotional interaction, health care, family care, and social activities. This project implies that communication in our daily life should not be limited by certain form such as audio or video, but also can be extended to other daily actions such as drinking or eating behaviors.

ACKNOWLEDGMENTS

We thank Minna Ha and '04 Tangible Interface class for their valuable inputs.

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