

Exploring the Potential of Audio-Tactile Messaging for Remote Interpersonal Communication

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ABSTRACT

Shake2Talk is a mobile messaging system that allows users to send sounds and tactile sensations to one another via their mobile phones. Messages are created through gestures and then sent to the receiver's phone where they play upon arrival. This paper reports a study of the Shake2Talk system in use by six couples, and begins to uncover the types of messaging practices that occur, and the values and meanings that users ascribe to these messages.

Author Keywords

audio, haptics, mobile phones, messaging

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

Most conventional systems for remote communication are based on speech or the exchange of visual media such as text and images. Yet communication in everyday life is much richer than this, including touch, and non-speech sound. Using these modalities in remote communication may offer new opportunities: a simple touch can have a much stronger impact than words, and ambient sounds can evoke strong emotions and associations [9]. Systems which incorporate these channels may therefore open up new, expressive forms of communication.

Recent studies have shown a diverse set of ways in which technology can support the close relationships between family, friends and intimate others. For example, scribbled notes and text messages enable families to send "I'm thinking of you" messages to each other [10], a form of communication that has been called "social touch". Text messaging between friends exhibits many of the same qualities of gift-giving [11]. The display of coarse-grained

location data can be used by people who know each other well to support shared awareness [1]. And even a simple click on an icon on a PC can be used to express affection to a remote partner [7]. This underscores the fact that communication is not necessarily about the bandwidth of a modality or the transmission of information. Rather, it is about understanding how the affordances of different technologies are played out and realized within the auspices of different kinds of interpersonal relationships.

In this paper we report on the use of an audio-tactile messaging system by couples. While a range of work has been conducted exploring how audio and haptics might be used in remote communication [3-6], these systems have rarely been evaluated in context. Here we explore the potential of these new forms of expressivity through the deployment of the prototype Shake2Talk system.

The Shake2Talk Messaging System

Shake2Talk [2] is a mobile audio-tactile messaging system. Audio-tactile messages are composed by a user through simple gesture interactions with a mobile phone and sent to the a paired phone by SMS. Upon arrival the message is played back immediately, with no intervention from the recipient, allowing users to retrieve message content peripherally. Shake2Talk comprises a Windows Smart Phone with a sensor pack attached to it. Inertial sensors (accelerometers, gyroscopes and capacitive sensors), are used for gesture recognition, and an eccentric motor provides tactile output. For a full description see [2].

Four different gestures are recognized: stroke, tap, flick and twist. To compose a message the user presses record, and performs the gesture(s). Each gesture is associated with a different audio-tactile message which is played to the sender as they perform the gesture. To avoid accidental triggering of sounds, gesture recognition only occurs when a 3-way rocker button on the device is pressed. This button also determines the particular audio-tactile message produced, with three possible audio-tactile messages for each gesture (Table 1). The user then presses stop, and then sends the message to the paired phone. The temporal pattern and envelope of the sounds is synchronized with vibrotactile feedback (i.e. a long, strong vibration

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accompanies a long, loud sound, while short sounds are accompanied by short vibrations). This synchronized feedback means that messages can be felt as well as heard, and that it may be possible for user to identify them by touch alone (i.e. in a noisy environment).

Table 1: Audio-tactile messages by gesture and button position

Gesture	Button Up	Button In	Button Down
Flick	Whip	Slap	Plate smash
Twist	Key in lock	Beer pour	Car start
Tap	Tap glass	Hit metal	Knock on wood
Stroke	Cat purr	Snore	Heartbeat

The Shake2Talk system offers fairly low bandwidth communication: the sounds that can be sent are limited to the twelve provided. However, Kaye's work [7] shows that couples ascribe meaning and value even to single bit communication in the click of a button; with Shake2Talk we can explore how couples develop a communication language with this slightly more expressive channel.

AN EVALUATION OF SHAKE2TALK

Our exploratory study sought to investigate how Shake2Talk would be used by couples to communicate with each other, and to provide insights into the potential of audio-tactile messaging. Specifically, we had the following research questions: How do couples develop a Shake2Talk vocabulary? What is the value of Shake2Talk messages? And, what is the value of the interaction method?

Six couples (aged 24-35) participated: Couples 2 and 3 were married with young children, Couples 1, 4 and 5 were married or co-habiting with no children, while Couple 6 lived separately. This study focused on couples because we felt that they might be most willing to adopt a system where the sender could control sounds on the recipient's phone, but could be extended to other relationships in future.

Each couple was given a pair of Shake2Talk phones for two weeks. The phones were paired exclusively to each other, and couples were asked to use the system to communicate with each other during this period. System use was logged in software, and users were asked to keep a diary of their communication. Additionally, couples participated in two interviews, one prior to and one following the study. The first interview explored couples' current communication practices, while the second interview asked about the experience of using Shake2Talk. Particular behaviors were probed more deeply by looking at the diary entries and logs.

FINDINGS

Although our intention was that the system be used for two weeks, the actual duration of use varied between couples, from 2 days up to 1 month (average: 10 days). At the extremes, Couple 2 stopped using the system after two days due to technical problems, while Couple 4 requested to keep the system for an additional two weeks. The number of Shake2Talk messages per couple per day ranged from 0-11 (average: 2.5). For most couples the system was not used

every day, and use tended to peak at the start of the study, tailing off over time. In some cases it stopped completely, but in others this initial peak was due to novelty and, while it became used less on any given day, it became more part of the routine, with certain messages sent on most days.

The prototype nature of the system meant there were technical problems (connections between phone and the sensors, calibration, and battery life). Participants reported this as a major reason for not using the system more; the technical problems often put them off trying to use it when they did not have much time, and they were sometimes unable to use the system at all because it was not working. In addition, as the phone was not their main device, people reported that it was cumbersome to carry an extra device, and this may have hindered use.

More interesting than the exact statistics of use, are the types of messages that were sent, and the meanings and value of these messages to the couples. The following sections report the findings as uncovered in the interviews, where log data and diaries were used as prompts.

Vocabulary development

Meanings were not pre-imposed on the Shake2Talk sounds: couples were free to interpret them as they wished. It is, therefore, interesting to explore how users assigned meanings to these. The six couples developed vocabularies in very different ways. Couple 5 systematically assigned meanings to each of the sounds in advance (e.g. whip = feed dogs, plates smashing = gone to training). Couple 2 did not discuss the meaning of the sounds in advance, but when one was not understood the recipient would phone their partner to ask what it meant and, subsequently, would understand the meaning. Couple 6 developed a vocabulary as they went along, for example by saying to one another "send me a car sound when you're on your way". Context was important to understand sounds. Couple 2 used the "ting" sound to indicate both restaurant and hotel, as they interpreted it as meaning "service". The exact meaning was understood through knowledge of the other person's daily routine. The other couples (1, 3 and 4) did not develop a vocabulary in a structured way. They mostly used the device in a playful way, just sending any sound to amuse the other person, or to let them know they were thinking of them, rather than assigning specific meanings. This was mostly because they felt that the preset sounds were not relevant to them and what they wanted to communicate:

"We didn't sort of associate a meaning so much to different sounds, I think because they weren't personal to us. So, the times that we did use it, it was more of sort of a playful way rather than having a set meaning."

There were a few exceptions to this. Couple 4 used the car starting sound to indicate going to or leaving work, and a slap sound to say "wake up". These were understood implicitly by the literal nature of the sounds and the context in which they were used. These more literal sounds were interpreted in the same way by all couples, whereas some

sounds were interpreted very differently e.g. “Ting” meant restaurant/hotel to one couple and “dentist” to another. This indicates that the choice and meaning of sounds is specific and personal to each couple. All couples felt that the preset messages limited the “usefulness” of the communication, and expressed a desire to customize the system by choosing sounds more relevant to them.

Value of Shake2Talk messaging

To understand the value of Shake2Talk messaging, we examined the types of messages that were sent. They fall into four categories: coordination of events/ calls for action, awareness/reassurance, playfulness and social touch.

Coordination of Events/ Calls for Action Messages:

The system was used regularly for practical messages, and most couples expressed that this was the main purpose for which they wished to use it. This was expected as all the couples had previously indicated that the majority of their remote communications with each other were of a practical nature. The main event co-ordination message was the use of the car sound which, depending on the couple, meant “I’m just leaving work”, or “I’m on my way to collect you”. All couples used the system for this purpose at least once, and expressed that they found this more useful than sending a text or calling, which they had often done in the past, as it is quicker to input and can be understood by the recipient without them having to interact with the phone.

Participants reported that they would like to add additional call to action messages, and Couple 5 adapted other sounds in the existing system to represent these (e.g. whip=feed the dogs). Most couples wanted to send a sound to request that the other person go to the supermarket on their way home. As there was no appropriate sound for this, most couples did not do this within the study, but Couple 5 assigned the beer sound to this request. The fact that the sound can be received peripherally meant it was perceived to be a useful means to alert someone to stop at the supermarket if they were driving; they could then call to get the shopping list. One limitation of the system is that the use of short sounds only allows for very simple communications that do not require a response. Participants felt this might be improved by the addition of sounds for responses like “yes”, “no” and “ok”, especially to respond to calls for action.

Awareness/Reassurance Messages

Shake2Talk messaging was also used for awareness or reassurance. Snore sounds were sent to mean “I’m bored/tired”, or “I’m going to bed”, beer sounds indicated “I’m going to the pub”, and the key in the lock that the sender had arrived at their destination safely. Users expressed that they would like to have more sounds to represent specific activities and emotions relevant to them.

Awareness/reassurance messaging was particularly used by Couple 2: the husband was travelling for much of the study, and they used Shake2Talk to maintain awareness of each other’s days (messages were sent to indicate arriving at a hotel, going for lunch, picking up the kids, going to sleep,

etc). The wife sent Shake2Talk messages (car start, key in lock) to her husband to indicate that she had dropped off the children at nursery and returned home safely. Prior to the study she would not have communicated this to him; he appreciated this increased awareness and reassurance. The fact that the sound plays upon arrival, and could only be from his wife, was of particular value as it offered in the moment communication, and the ability to hear that she was fine without having to interact with the phone:

“It’s almost like the person is physically with you there, in some sense..... I know it cannot be anyone else, and I know what it means, that was really, really nice”

His wife also valued the use of Shake2Talk for awareness and reassurance while he was away. She often missed messages as they came in but expressed pleasure in the fact that she could go through the Inbox when she had time, and obtain an audio overview of her husband’s day.

Playful Messages

A large number of the Shake2Talk messages were reported to be playful, perhaps due to the nature of the input method and sounds. In many cases, users would send any sound to each other just to play with the system and make each other laugh. Directed examples of playfulness were also observed: the tapping out of tunes, the sound of a slap to say “wake up”, and the beer sound followed by a text saying “guess what I’m doing?” to tease the recipient.

The interesting aspect about these messages, particularly those which did not have any prescribed meaning, is that, while they may appear to be simply playful, they took on a value beyond just that of fun, and were used for “social touch”: messages sent to say “I’m thinking of you” [10]. Users described their delight at receiving a Shake2Talk message, as they knew their partner was thinking of them. Couple 1 used these to say “hi”, in place of an email:

“because it goes off instantly... even if you are not making any kind of point it’s quite a nice kind of reminder. You know, just kind of a “hello” really, isn’t it?”

“It really is quite lovely to receive [...] I liked getting the noise, anything to say that someone is thinking about me.”

Social Touch Messages

In addition to the playful messages that took on the value of social touch, some couples purposefully sent social touch messages, e.g. purring or heartbeats to say “I love you” and express affection. Several users requested more obvious affectionate sounds like hugs and kisses. Couple 2 described a particularly compelling example of social touch. While the husband was travelling, Shake2Talk messaging took the place of their usual “goodnight” bedtime phone call. The wife had sent a snore sound to say she was going to bed. The husband replied with a heartbeat, and finally the wife replied with the sound of a cat purring:

“what I just wanted to know is, ok, she’s just going to bed and there is nothing special to report [...] just to say “nothing special, just going to bed, I love you, all is fine”.

And you reply “love you too, I’m good” and actually in that sense you can have sounds that represent these things.”

Value of Interaction Method

The current input method, which required three button presses (start, stop, send) in addition to the gesture, was perceived to be cumbersome, and users felt that it would be simpler and more compelling if it were limited to the gesture itself. Nonetheless, the gesture input was perceived to be quick and easy; several of the couples who did not regularly use text messaging expressed that they preferred this form of messaging for that reason. Almost all participants felt that gestures added value over selection from a list as it was more engaging, fun, and made each message seem unique. The gestures also offered eyes-free interaction and one participant stated that using a gesture to input a message was less rude to bystanders than disengaging from a conversation to send a text message.

Participants reported that privacy and annoyance were generally not a problem. Exceptions to this were in formal situations such as meetings, or in enclosed public spaces, where it was felt that the sounds might annoy others. We also saw earlier that this method offers certain value, as it can enable information to be received peripherally, and also makes the recipient feel as though the sender is close to them. The vibrotactile feedback was rarely mentioned by users. Very few users carried Shake2Talk in their pockets, due to its size, but those who did mentioned that it helped to draw their attention to the messages. It was also suggested that, with experience, it might be possible to identify the messages by tactile feedback alone, allowing silent messaging, so this aspect might increase in value over time.

CONCLUSIONS

This research sought to explore the potential of audio-tactile messaging for communication between couples and to uncover the types of meaning and values with which such messages are imbued. Our results show that Shake2Talk messages are used for a range of purposes: *coordination of events and calls for action, awareness and reassurance, playfulness and social touch*. These categories confirm findings with other forms of messaging, including SMS, and home-based messaging [8, 10]. We see that, even with this a set of 12 sounds, couples develop vocabularies. While we could have offered a larger set of sounds for users to choose from, it is interesting to see how people use this low bandwidth communication for expressive means. The system allows lightweight “thinking of you” messages, in a similar way to Kaye’s work [7], whilst offering a slightly richer channel with a range of messaging types and meanings. The results also start to indicate the types of users who might benefit most from use of the Shake2Talk system. The system was used most by couples who spent time apart during the study as it offered a lightweight way

to keep in touch, stay aware of each other’s days and express emotion. Couples who were together more were less engaged with the system; they mainly wished to send practical messages, which often required a response, and the current system did not fully support this. This study has started to uncover the ways in which audio-tactile messaging might be used by couples and reveals that, for certain demographics, and in certain situations, audio-tactile messaging has the potential to offer both expressive and practical communication between couples.

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