

Emotion Sharing via Self-Composed Melodies on Mobile Phones

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ABSTRACT

In their role as personal communication devices, mobile phones are a natural choice for sharing and communicating emotions. However, their functionalities are currently very limited in power to express affective messages. In this paper, we describe the design of a system that allows users to easily compose melodies and share them via mobile phones. We show that by using these melodies information about the current emotional state of the sender can be expressed and recognized synchronously by the receiver in a simple, quick, and unobtrusive way. Further, we reveal that self-composed melodies have a stronger impact than pre-composed or downloaded messages, similar to crafted pieces of art offered to a beloved person. We then present findings from a user study that assesses the implementation of a functional prototype and the adequacy of the system for emotional communication.

Categories and Subject Descriptors

H.4.3 [Communications Applications]. H.5.2 [User Interfaces]: Auditory (non-speech) feedback. H.1.2 [User/Machine Systems]: Human factors

General Terms

Design, Experimentation, Human Factors.

Keywords

emotion sharing, synchronous, composer, mobile phone.

1. INTRODUCTION

Intimacy is a crucial element of domestic life and many interactive technologies designed for other purposes have been adapted for use within intimate relationships. Symbols such as flowers, photographs, or love letters have long been used to share emotions among people closely related to each other. Nowadays people use numerous techniques and technologies during the physical absence of their partner to maintain an emotional connection and create a sense of presence-in-absence. SMS, webcams, emails, in-

stant messaging, and blogs are examples of such technologies used as mediators of human interaction for people living at a distance, and for romantic couples in distance relationships [7].

In our work we explore how music on a mobile phone can be used for sharing emotions. Mobile phones are perceived as very personal gadgets, and people are emotionally attached to them[9]. Hence, their usage has a two-fold linkage between private and emotional aspects: users engage with their mobile phones, and use them for personal communication. Whereas it seems on one hand it is natural to use this device as a mediator for sharing the emotions, and on the other hand, currently only very basic and simple ways of deploying these devices for sharing emotional states. One of the most popular services is SMS even though it lacks expressiveness, has confusing syntax, and is error prone [6]. Still, sending a text message via a mobile phone is increasingly being used to forge new romantic relationship [2] and to coordinate with intimate friends [6]. We use this service as communication channel but leverage its capabilities to easily, quickly, and cheaply create awareness of the emotional feeling between friends or partners. This is achieved by providing a web-based composer allowing users to easily and quickly create a melody, which is sent as a short message and played immediately on the receiver's phone.

The contribution of our work is twofold. First, we provide means for sharing emotions in a synchronous way. When using asynchronous communication, such as SMS, the intention of the sender may be changed or get lost due to the difference in time between sending and receiving a message. Hence we believe that time is a crucial factor while sharing emotions. Second, we explore the impact of self-composed music as a crafted piece of art. Music is an important way to communicate one's state of mind and is often characterized as the language of emotions. Listening to different types of music can express the mood of a listener or feelings about another person. So far, mobile music has been studied mainly from the consumption point of view [8][10]. Here, we show how making it a unique piece of art can increase the impact of music as a way to share emotions.

2. RELATED WORK

Several researchers have been looking into how to represent and send emotion with tangible objects. An early work is the inTouch system that creates the illusion of manipulating the same physical object by distant users [1] More recently, picture frames [3], wed-

wedding rings [11], or an entire bed [5] have been augmented for use as emotional communication devices between partners.

One example is the LumiTouch system, which is designed as an asymmetric, bi-directional channel of communication to enhance the symbolic power of a picture frame by providing a subtle real-time communication link. It focuses on communicating emotional content in addition to presence information [3]. A more intimate approach can be found in the Sensing Beds. These are beds that mediate between two romantic partners who are not co-located by sensing the body position in each bed and using a grid of small heating pads to warm the congruent point in the other bed [5]. The “united-pulse” composed of two rings has been designed to allow people share remote intimacy. Each ring can measure the wearer’s heartbeat and transmit by vibrating of the partner’s ring [11]. Another example is the Lovers’ Cup, which explores the idea of sharing feelings of drinking as a communication channel for a couple in physically different places [4]. The cups are used as tangible communication interfaces. Last, conVISUAL showed how olfactory technologies could be used on mobile phones. The German company holds a patent on using scents or mobile messages¹.

3. SHARING EMOTIONS BY MUSIC

Emotion sharing has been widely explored and several devices and applications exist which support the remote expression of a person’s feelings. We explore the impact of music in the context of emotion sharing on mobile phones. Music has long since been one of the most important forms to express a person’s mood and thoughts and is hence connected to emotions for many people.

3.1 Music as a Unique Work of Art

Offering crafted gifts, such as a hand-made birthday card or an artifact instead of an off-the-shelf one, is a powerful way of expressing emotions and feelings towards a beloved person. Similarly, self-written (love) songs have the power to deeply touch another person. We envision that applying the concept of craft tradition to emotion sharing via the mobile phone will strongly influence the connection between two persons.

Our idea is to encourage users to compose music themselves instead of using pre-composed songs or ringtones hence creating an achievement similar to a crafted artifact. This strongly influenced our design decision both on the sender and on the receiver side.

3.2 Design Decisions for the Sender

We believe that a unique piece of art such as a self-composed melody can be created by any person without having any formal knowledge about the notation of music. To support this, we provide a web-based interface allowing users to compose and send a melody to any mobile phone. The following design principles influenced the development of the composer.

Ease of use

Writing songs based on complex chord patterns and several voices is not an easy task. Nevertheless, a basic melody expressing sadness, happiness, excitement, or longing can be created by trial and error without knowledge of major and minor, tonality, and notation of notes. Our interface allows for composing melodies of 32 tones in an average time of 30 to 60 seconds, which is comparable to the time required for writing an SMS.

No learning required

Learning an instrument such as a piano requires a lot of effort, training, and talent. Our composer interface does not require any learning due to its simple representation of notes. It provides 32 quarter notes on the y-axis and 8 tones (which are in accordance with a C major diatonic scale) on the x-axis [see Figure 1]. Breaks between the notes are set simply by not selecting any note.

Focus on a smooth creation flow

Crafted pieces of art such as paintings or hand-written poems are unique due to the flow in their creation process. Similar to a signature they are not a combination of predefined patterns as we normally see it in the digital world but rather include the current mood of the maker. We tried to simulate this by letting the user compose a melody not by individually selecting tones (which is nevertheless possible as well) but by smoothly moving the mouse cursor or the pen on a touch screen over the composer interface.

No storing of the melody

Uniqueness is one of the most important properties of an art piece. This is difficult to realize in the digital world, since everything can be stored and duplicated. We deliberately decided neither to provide any means for storing or replaying the created melody nor to include pre-composed melodies to preserve inimitability.

Full control of the composing process

Our system allows full control of the entire composing process by the users. Thus, they can decide when, where, how, and with whom they want to share their emotions.

By following these design guidelines, we were able to create a system supporting a balance between ease of use and a high level of expressiveness.

3.3 Design Decisions for the Receiver

Mobile phones are designed to be carried wherever the users go and thus have the potential to be used as objects that can share emotions. Consequently, we provide an interface to send the composed melodies to a mobile handset. In order to not generate additional costs for the receiver or rely on data connections, we decided to transfer the melodies using standard SMS. In the following we address important issues related to emotion sharing such as time constraints, interaction and control for the receiver.

No interaction required

Traditional forms of digital messages such as e-card, email, and also SMS require interaction by the receiver such as opening a certain URL, an email program or the inbox of his mobile phone. We believe that the time of receiving an emotional message is a key factor and carefully chosen by the sender (similar to the time when performing a self-written love song). Hence our system was designed without requiring interaction on the receiver side and the incoming melody is detected and played automatically.

Giving control away

Allowing a person to send a message at any time requires the receiver to give up control on when to read or listen to a message. However we consider this to be a sign of trust between friends, which even increases the power of sharing emotions via a mobile phone. Nevertheless, the current configuration of the mobile phone is considered to show the content of incoming messages.

Moving from notification to content

Digital communication is often asynchronous and several mechanisms exist to notify a user of new messages. Those mechanisms include visual clues, such as a letter symbol indicating a new email, or notification. We use this mechanism to not only indicate

¹ <http://www.convisual.de/presse/meldungen/517.html> and <http://www.inside-handy.de/news/11777.html> (in German)

that a message is available but also deliver the content of the message. Hence it is possible to assure that a person receives a message as close as possible to the time it was intended by the sender.

Limited duration

An important aspect of emotion sharing via the mobile phone is the duration of the message. Since the message is delivered directly in order to maintain the sender's intention, the receiver might be busy upon the time of receiving. Yet we believe that the time required for listening to the melody, which is comparable to checking a just received SMS, is short enough to not disturb the receiver, but long enough to express the emotion of the sender.

No replay

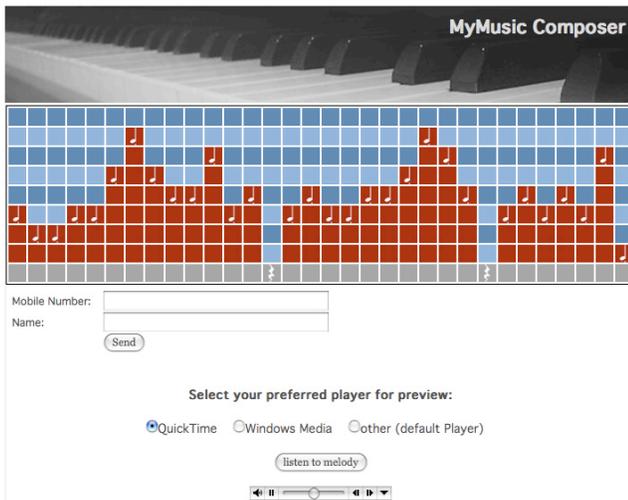
Similar to the sender side, we do not allow storing or replaying the melody on the receiver side. We thus avoid that the receiver ignores the message the first time it is played (because it could be replayed later) which increases the awareness of the sender's emotion at that particular moment in time.

4. SYSTEM DESIGN

The system consists of two main components: a web-based composer hosted on a web server which has the functionality of sending SMS to any mobile numbers over GSM networks and a JAVA-based application running on a mobile phone. The user can compose melodies without installing any specific applications by simply using a web browser and send them as short messages to the recipients. On the receiver side, the application detects the melodies as incoming messages and renders them immediately.

4.1 Composer

The composer is an AJAX application allowing for creating a melody of 32 quarter notes. Figure 1 shows the composer's interface. Each note is represented by one column in the composer and can be assigned a value between 0 and 8 where 0 represents a crotchet rest, and 1 to 8 is mapped to a C major diatonic scale.



**Figure 1: The Composer Interface (1) Melody Creator (top)
(2) Preview and sending of the melody (bottom)**

In order to support a flowing composition, the application implements an `onmouseover` listener, which is activated upon holding down the mouse button. Hence, the melody can be created not by selecting each single note but by smoothly moving the mouse cursor over the single notes.

To be able to listen to the created melody, the composer application generates an XML file on-the-fly which is translated into a midi-file and loaded into any media player such as QuickTime or Windows Media Player upon clicking the "listen to melody" button. The melody can be sent to any mobile number; however the receiver needs to install the application for playing the music file (a link to which can be included in the first SMS).

As a means to transfer the melody to the receiver, the web application translates the XML file into a string, which encodes the pitch and the length of the note in Midi conform format. On the receiver side, this string is decoded to generate the melody.

4.2 Player

To play the incoming melodies on the mobile phone, a JAVA-based application was developed. The application runs in the background and listens to incoming messages on a specific port.

Users only need to install the application once on the phone and then leave it running in the background. When a message including notes is detected, the notes and the sender's number are extracted. From the extracted notes, a midi melody is generated and directly played and information about the sender is shown on the screen. The melody is played only once and there is no way to store or replay it. Technically, in order to generate the melody, the Mobile Media API available in JME (Java Micro Edition) is used.

Additionally, the player takes the current configuration of the mobile phone into account: if the silent mode is activated on the phone, the incoming melody is not played but the sender's number is shown on the screen.

5. USER STUDY

We evaluated the idea and the prototype with 12 people (6 male, 6 female) ranging from 23 to 34 years. Five of them showed musical interests and one of them was a composer. An initial questionnaire revealed that eleven participants had already changed the default ring tone of their phone and eight had changed the SMS notification tone. The experiment and the interview took approximately 30 minutes for each participant.

5.1 Test Setup

The participants used the composer through a Firefox browser and their performance was recorded with a screen capture program. The study itself consisted of an initial questionnaire, an interview, two tests, and a couple of post-hoc questions about the tests. All sessions were voice recorded.

During the interview, the participants were asked about their text and multimedia messaging behavior and whether they felt that the current communication methods provided by their phones, were sufficient for expressing feelings and emotions. After the interview, the participants were asked to compose and send a musical message to one of their friends using the composer. They were explained that, at this point, the messages would not be sent to anyone in order to create a more relaxed testing situation. For the second task we provided them a mobile phone with the player application installed and asked to imagine being at home; a melody from the opening titles of "Looney Tunes" was played for them. After that, they were asked about their thoughts about the musical message. In addition, we asked why one of their friends could send this kind of messages to them and if they liked to answer to the message and how. At the end, a few additional questions revealed the participants' willingness to use this kind of service.

5.2 Results

Based on the result of the questionnaire, 9 participants expressed their feelings through the phone and only 2 of them conveyed feelings rarely. 11 of them shared their feelings by writing text messages and 7 by calling. In addition, 5 mentioned that they use emoticons as feeling indicators. All of the participants felt that they are able to express their feelings with their phones, yet 3 believed that there is room for improvement. One participant mentioned that sending multimedia messages could be easier.

Composing task

Each of the participants was able to complete the first composing task in less than seven minutes (including learning the interface, composing, listening to the melody, re-composing, and sending), the shortest one needed approximately two minutes. However, the talkativeness and the participants' willingness to modify the melody affected the process quite a lot. The maximum time for composing a melody consisting of 32 notes only, took on average 57 seconds which shows that the time required to learn how to use the composer interface was quite short.

After the test, the participants were asked to score ease-of-use and how much they enjoyed using the application on a 5-Point-Likert scale (ranging from 1-5). The average value for ease-of-use was 3.75, for enjoying the use of the application was 3.1. Two of the participants did not like the composer's layout; one considered it not to be powerful enough and one was confused because it did not provide any manual. Overall, seven of the users said that they would not use this kind of service, four would try it, and one who was a composer, would definitely use it.

Receiving task

All of the participants could describe situations in which this kind of musical messages could be used. These included amusement, cheering, creativity, sharing memories, and sharing feelings.

Overall, 2 out of 12 participants stated that they definitely liked the idea of receiving music, 9 out of 12 were willing to reply to the message using arbitrary ways of communication, and 4 would like to do so using a musical message as well.

As an additional comment, one user stated that she thought not to be musical enough to use the application and one thought that she was too lazy to use it. Further concerns of the users were mainly related to the quality of the output and the loss of control. Hence, five of the users had doubts as to how the melody would sound like on the receiver's phone and five thought that their personalized settings should not be touched.

6. CONCLUSION

We created a system, which allows for synchronously sharing emotions via the mobile phone by using a web browser-based melody composer. In an initial user study we evaluated how users liked the idea of creating and receiving self-composed melodies.

According to our study, on the composer side, people tended to have high subjective requirements for the piece they composed. We revealed that people wanted messages to be something aesthetically pleasing - something beautiful or cute, which you would dare to send without feeling embarrassed. Creating a musical message satisfying the sender is not too easily obtained. This should be taken into account when designing such musical UIs, and can be incorporated, e.g., in selecting the chords, tones and echo.

On the receiver side, the results of the study show, that most of the participants can imagine a situation in which they could re-

ceive a composed melody message from a friend or partner. Yet several concerns were revealed. Predominant concerns were misinterpretation of the message, social embarrassment, and feeling lack of control (e.g. when expecting the phone to stay silent). These aspects illustrate the phenomenon of the users' need to stay in possession of the control over the device. Yet, we think that this is an opportunity rather than a flaw of the system, which can be seen as means for giving trust away to friends or partners.

Overall, the findings reveal that the composer was seen as a tool for three different functions: sharing emotions, creativity, and fun among friends. Composing melodies was seen as a tool for creating jokes, sending funny things, or even teasing. Here, the technology can support group cohesion. For sharing moments, the music provides different opportunities – it could be used for provoking memories from something, which the sender and receiver had experienced together, or describing the current atmosphere.

As future work we plan to enhance the composer's UI and run a larger study to obtain quantitative data on the user experience.

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8. REFERENCES

- [1] Brave, S., Ishii, H., and Dahley, A. 1998. Tangible interfaces for remote collaboration and communication. In Proc. CSCW 1998. New York, 169-178.
- [2] Byrne, R. and Findlay, B. Preference for SMS versus Telephone Calls in Initiating Romantic Relationships. Australian Journal of Emerging Technologies and Society, Issue 2, 2004
- [3] Chang, A., Resner, B., Koerner, B., Wang, X., Ishii, H. LumiTouch: an emotional communication device. In Proc. CHI 2001, Seattle, 313-314.
- [4] Chung, H., Lee, C-H., and Selker, T. Lovers' Cup: Drinking interfaces as new communication channels. In Proc. CHI 2006, 375-380.
- [5] Goodman, E. & Misilim, M. The Sensing Bed. In Proc. UbiComp 2003 Workshop.
- [6] Grinter, R.E. and Eldrige, M.A. Y Do Tngrs Luv 2 Txt Msg? Proc. ECSCW '01, Kluwer Academic, 2001, 219-238.
- [7] King, S. and Forlizzi, J. Slow messaging: Intimate communications for couples living at a distance. In Proc. DPPI 2007, 451-454.
- [8] Nettamo, E., Nirhamo, M., Häkkinä, J. A Cross-Cultural Study of Mobile Music – Retrieval, Management and Consumption. In Proc. OZCHI, 2006, 87-94.
- [9] Ventä, L., Ahtinen, A., Ramiah, S., Isomursu, M. "My phone is a part of my soul" - How People Bond with Their Mobile Phones. In Proc. UBICOMM 2008.
- [10] Volda, A., Grinter, R. E., Ducheneaut, N., Edwards, W. K., Newman, M. W. In: Practices Surrounding iTunes Music Sharing. In Proc. CHI 2005, 191-200.
- [11] Werner, J., Wettach, R., Hornecker, E. United-Pulse: feeling your partner's pulse: In Proc. MobileHCI 2008, 535-538.