

# United-Pulse: Feeling Your Partner's Pulse

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## ABSTRACT

This paper introduces a device that creates remote intimacy by the use of two rings named "united-pulse". Each ring can measure the wearer's heartbeat and send it to the partner's ring. Hereby, artificial corporeality is created between the couple. By means of a working prototype, united-pulse has been successfully tested. Among the 28 participants the prototype has attracted large interest. Through the heartbeat – the essential vital sign – a feeling of being very close to the partner is provided. Touching the ring allows a small moment of intimacy in situations where emotional support is needed.

## Categories and Subject Descriptors

H.5.2 [User Interfaces]: Haptic I/O, H.5.3 [Group and Organization Interfaces]: Synchronous interaction.

## Keywords

Human-Machine-Interaction, Remote Intimacy, Design, User experience, Body-data, Tangible, Wearable, Digital Jewelry

## 1. INTRODUCTION

Within a partnership human beings are used to interact via tactile stimuli. "Touch is critical for [...] physical and mental well-being"[3]. Commonly such interpersonal communication is not available in case of spatial distance between the partners. In the following, a way to overcome spatial distance between the partners by means of tactile stimuli is examined. Within our studies we have been interested in whether it is possible to feel remote intimacy and whether there is a way to enable couples to share an intimate moment using the heartbeat as a bridge over distance. Moreover we wonder whether it is pleasant or irritating to feel close to the partner in this way without touching him or her.

Different from most remote intimacy projects that allow partners to send a sign of love (I think about you), the aim of this project is to enable one partner to bring the other partner close to him/herself – without the remote partner doing anything (I need you, I want to feel you).

At the outset of this project 20 couples, that is 40 individuals

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(aged 15 to 58 years), that live in a relationship for 4 to 33 years were asked what they miss most when their partner is not close by. The most frequent answers in descending order were: body contact (65%), voice (20%) and smell (15%). The awareness of not being alone is a further important part in the relationship, the participants answered. "It is essential to know that there is someone who thinks of me", said one female test person.

In addition the participants were asked how they express a sense of unity within their relationship. In the following some exemplarily answers: a picture in the purse, a picture on the cell phone, saved short-messages on the cell phone, a wedding ring or a tattoo. Moreover there are rituals that the participants employ, e.g. having a telephone-date at set hours (hear the partner's voice) or wearing a used t-shirt or a scarf with the partner's typical perfume (save the smell of the partner) [10].

Physical closeness is not provided by the above-described possibilities. According to the results of the interviews the united-pulse ring would allow what most couples missed, the feeling of body contact. United-pulse makes it possible to experience sensual touch and the physiological presence of the loved person.

## 2. UNITED-PULSE CONCEPT-DESIGN

The "united-pulse" ring has been designed based on the aim to develop a device that allows people to share remote intimacy. At the beginning of the research-process, the most minimal sign of intimacy was searched for [9]. Inspired by pictures of a newborn baby that lies at the mother's breast, the meaning of the symbolism of heartbeat was analyzed [11].

On the one hand heartbeat stands for life and vitality [6, 3]. It might also be an indicator of how someone feels (nervous, sleepy)



**Figure 1: sketch of the ring: To feel the pulse of the partner, the gap in the ring must be filled with the finger.**

[13]. On the other hand the heart as a symbol is closely connected to love. Not just in sayings such as “my heart beats for you”, but also in several songs the heartbeat is a sign for love. To feel somebody’s heartbeat implies being physically close. One’s own heartbeat is a very private and secret good. Letting someone else feel one’s own heartbeat shows that there is a strong trust in this person [2].

Daniel Goddemeyer’s project „Collecting Heartbeats“ [5] deals with the questions whether a heartbeat may serve as a memory (“Can a recorded heartbeat symbolize a lasting memory of a special occasion or situation?”) and how people react that the heartbeat was played-back to (“How do people react when something as personal as a heartbeat (and their state of health or nervousness) is exposed and compared to others?”). The project „Interactivity: imPulse“ [12] examines the feelings of people who feel someone else’s pulse (the participant was unable to differentiate between the own and the external pulse).

These projects are closely related to our united-pulse concept. On the one hand the pulse shall remind of common, golden moments and on the other hand it is interesting to find out if couples are open-minded about giving something so personal, very own to their partner.

As a second metaphor for love and affinity the ring shape has been chosen. The ring symbolizes a common bond (wedding, signet-ring), the round, whole shape suggesting completeness. Ring-shaped devices allow small, inconspicuous movements as the IBM project „Give Me a Ring “shows [8]. Within the IBM project pieces of jewelry were converted into headsets, speakers, etc. Thus electronic technology may be incorporated inside small objects. By positioning such devices at a person’s hand they can be easily reached [14].

United-pulse is composed of two rings. Each partner receives one ring. The inside of each ring contains a pulse measure system. The ring itself is not closed, not completed in its shape (see figure 1). In order to feel the partner’s pulse a small gap in the ring must be filled (pulse measure gesture). The shape has to be completed to feel the partner’s pulse.

If the couple is not together and if one of the partners *needs to feel* the other partner, united-pulse makes this possible. The wearer’s pulse is measured permanently. At the moment one of the partners closes the gap he/she can feel the other partner’s heart rate, which is transmitted by vibrations of the ring worn on the hand. The skin resistance of the fingertip is used to close the circuit of the ring (see figure 1) and the heart rate is transmitted simultaneously. Since fingers are very touch and vibration sensitive, and the ring sits close to the bone, the small vibration of the motor creates a very powerful impression. For data transfer purposes a wireless connection such as Bluetooth is used between the two rings: the measured heart rate is transmitted to the counterpart ring.

### 3. PROTOTYP DESIGN

To evaluate the concept a prototype that integrates a very small vibration motor has been developed (see figure 2). Usually this vibration motor is employed in Nokia mobile phones (model 7250 & 7250i). Every heartbeat is translated into a small vibration. Depending on the heart rate, the vibration motor runs faster or slower. The prototype measures the pulse by an ordinary PC-linked pulse oximeter. Using the Arduino Board [1] and Processing [4] as programming language, the vibration motor



Figure 2: prototype “united-pulse”



Figure 3: closing the circuit with the finger

reacts in time with the measured heartbeat. While closing the ring with a finger – closing the circuit via skin resistance – a small vibration that feels like the measured heartbeat is perceptible.

### 3.1 User Responses

The following research questions have been analyzed in a user-study with 28 participants.

1. What do potential users think of this device? What is it like to feel someone’s heartbeat?
2. Does this device support a feeling of remote intimacy?
3. Would the users prefer to send their heartbeat to their respective partner instead of receiving the partner’s heartbeat?
4. Would the users prefer to send their pulse and to receive the partner’s pulse simultaneously?

The study took place under laboratory conditions. All participants live in a relationship for at least 3 months. The study participants consisted of 6 couples (12 persons) and 16 individuals (the partner not taking part in the test), among them 12 male and 16 female persons. The participants were not informed about the device in advance; they were only told that the study is about the topic remote-intimacy.

Before the actual study, the project leader’s heartbeat was measured by a PC-linked oximeter. Subsequently the measured heartbeat was simulated by means of Processing [4]. This heartbeat was used in the test (instead of a live-heartbeat) as simultaneous measuring and transmitting was not feasible with our prototype.

The participants were given up to 15 minutes time to test the device. They were told to put a finger on the ring to close the circuit and to feel the partner's heartbeat (see figure 3).

The singles tested the ring individually in the same room, one after the other. The couples also tested the ring successively, whereby the respective partners were simultaneously located in adjoining rooms. Regarding the participating couples, the pulse that was received by one of the partners was passed off as the other partner's pulse. For the individual participants the tangible pulse was said to be the project leader's pulse.

Most of the test persons reacted enthusiastically. They were asked to describe their feelings. 22 persons said it was a very pleasant sense since united-pulse creates a feeling that is very similar to a known heartbeat. "Even if I can see the cables and even as I know that this is just fake I really can feel my partner and this is quite calming", a female test person (29) said.

Five persons were irritated at the very first moment. Only one person described the feeling as aggravating and compared it with an electric shock.

"Using the ring additionally while speaking with the partner on the phone may be very nice", a female test person (25) told us. "I would like to feel her all the time", another test person (male, 40) commented.

The evaluation has shown that 24 persons could envisage using the ring. A further test person (female, 22) remarked that she would play with the ring unknowingly. "That is nice, because if I touse my boyfriend's hair I do not realize it as well".

All participants were attracted by the poetic aspects of the design concept. The question of whether there should be tangible feedback at the other partner's ring, informing them about the transmission of his/her pulse taking place, did not result in a clear answer. So far, an optimal way of interaction between the two rings could not be identified.

"It has elements of surveillance, I don't want my partner to know my exact heart rate", a male test person, 26 said. "When I play tennis, what might my partner think?" On the other hand the trustful aspect of a relationship were highlighted: "I do absolutely trust my partner, and if she needs me she would be able to feel me wherever I am. Always, no matter what I am doing", a male test person, 56 said.

Thus to find out the optimal way of interaction, further user scenarios are going to be tested. Overall, most of the participants were impressed by united-pulse and could imagine receiving a sensual touch from the partner despite of the use of technical devices.

### 3.2 Feasibility Considerations

Currently united-pulse is a prototype that provides a pulse-similar-feeling. The final product will require various technical components such as a microcontroller, a heartbeat sensor and a vibration motor. For the purpose of pulse measurement a small heartbeat sensor is needed. Furthermore a means for wireless data transmission needs to be identified (e.g. Bluetooth). Also the exact implementation of the motor for united-pulse needs to be tested.

Especially in sports and healthcare, developments towards minimal high-end heart rate monitors are observable. As a result,

in the near future, it will be possible to readout and transfer the heartbeat via wireless connections.

United-pulse uses the skin of the fingertip to close the circuit. There are a few projects like the Remember Ring [7] that already apply such minimal sized technology: "Using a micro thermopile, The Remember Ring™ converts the heat from your hand into electricity, keeping the battery charged and microchip [...] running perpetually." This project shows that it is possible to assemble the necessary electronic devices inside a small ring. Thus, in the near future, a realization of united pulse should be possible.

## 4. CONCLUSION AND FURTHER STEPS

We have developed a concept and a prototype for a ring that measures and transmits the partner's pulse whenever the wearer touches the ring.

We have been able to show that the united-pulse ring can generate artificial bodily intimacy. Most of the participants have described the pulse-feeling as very pleasant and were interested in using it. The test has clearly shown that the minimal tangible output is sufficient in order to create a sensual touch.

There has not been a clear result on how to interact with the united-pulse ring, in particular on the preferred direction or mode of transmission. Various variations of the application in other use-scenarios can be tested:

- The partner whose pulse is measured receives an impulse feedback when the other partner closes the circuit (notification).
- If one of the partners closes the ring in order to attain the other partner's pulse, the pulse is mutually exchanged between the partners (receiving and giving).
- Both partners are in the position to activate the pulse all the time (permanent).

Therefore it might be attractive to elaborate the above described options.

This paper has introduced a device, which transforms internal "data" into an external format that is tangibly perceptible for other people [16]. United pulse is a unique way for people to connect by tactile stimuli. This intimate moment is nearly invisible for the public - so even if the couple is not together it allows for a private, secret moment of intimacy.

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