Connecting Friends over Distance: Patterns for increasing Closeness in digital Communication

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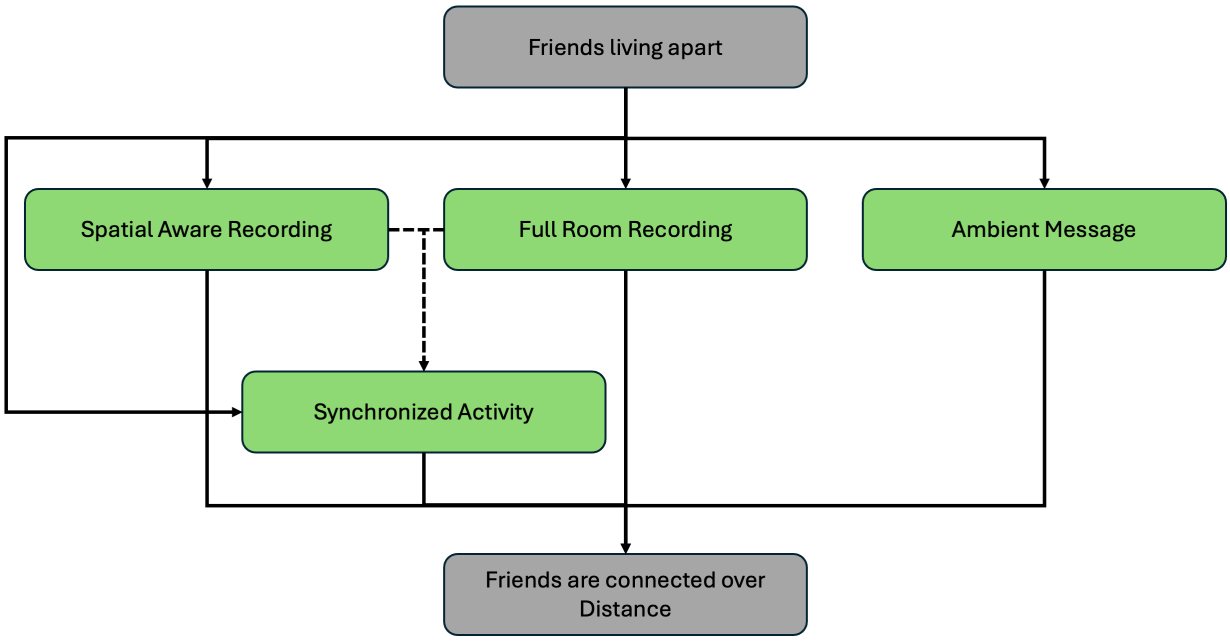

Figure 1: Pattern Overview

ABSTRACT

Maintaining friendships across geographical distances is challenging, especially when traditional in-person rituals are difficult to replicate digitally. This paper, part of the VREUNDE research project, explores patterns designed to foster a sense of closeness and connectedness among distant friends using tangible and non-intrusive technologies. It presents four key patterns: Spacial Aware Recording, Full Room Recording, Ambient Message, and Synchronized Activity, each addressing unique aspects of remote communication. These patterns leverage advances in hardware, such as spatial sensors and 360° cameras, alongside asynchronous and real-time interactions to recreate elements of physical presence and shared experiences. The proposed solutions aim to enhance connectedness, though challenges such as privacy concerns, hardware costs, and varying levels of technical expertise are acknowledged. By integrating technical and social dimensions, this research contributes actionable insights for designing digital communication systems that strengthen long-distance friendships.

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CCS CONCEPTS

• **Human-centered computing** → *Collaborative and social computing devices.*

KEYWORDS

Digital Communication, Tangible Hardware, Non-intrusive Technology, Friendship over Distance

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1 INTRODUCTION

Maintaining friendships can be challenging when individuals relocate to different parts of the world, a common occurrence for friends who, for example, have lived together during their studies but move apart after graduation. The VREUNDE Research Project, which is part of the VEREINT[1]project funded by the Federal Ministry of Education and Research, aims to address this challenge by exploring ways to connect friends across distances, as well as foster a sense of connectedness and closeness by using tangible and non-intrusive technology. This paper presents initial findings derived from various prototypes and brainstorming sessions within the project. The *Spacial Aware Recording* and *Full Recording* patterns both describe highly technical solutions, while *Ambient Message* offers a more general activity that friends can engage in remotely. *Synchronized Activity* also describes more of a general concept, which can be supported by the *Spacial Aware Recording* and *Full Recording*. The relation between the patterns is also visualized in figure 1. While these patterns can be utilized independently, they collectively strive towards the common goal of enhancing long-distance friendships.

The structure of the following patterns consistently follows a standard template. It begins with a description of the context and the fundamental problem. Next, the forces involved are outlined. The main idea is then briefly summarized in bold text, immediately followed by a sentence offering additional details. After addressing the forces, the solution is presented. The core solution is first stated in an italicized sentence and then further elaborated. The consequences of applying the pattern are also detailed, distinguishing between benefits and liabilities. Each point is summarized in a single sentence, with key statements highlighted in bold. Finally, the pattern concludes with known uses to illustrate its relevance.

2 SPACIAL AWARE RECORDING

Context

Within a group of friends, some or all of the friends live geographically apart from each other. A real meeting is not possible due to the distance. In order to communicate with each other, digital communication channels are used for audio and video transmission.

Problem

Current digital communication channels are only capable of reproducing purely audio and visual content. However, this only allows for a limited communication. Compared to a real meeting, digital communication channels are not able to convey a real sense of space or a local distribution of objects in the room, which means that only a lower degree of connectedness can be guaranteed.

Forces

- **Quality of the technology**: Different technical devices such as webcams, microphones, smartphones or computers are of varying quality, which affects the use of digital communication channels. It is therefore not possible to guarantee a uniform experience for every participant in an audio or video transmission.
- **Possible activities**: The context of a digital meeting allows for only limited activities within the group of friends compared to a real meeting in person.
- **Technical expertise**: No uniform technical expertise can be guaranteed within a group of friends, some of whom may experience difficulties when using digital communication channels.
- **Finding an appointment**: Finding an appointment for a digital meeting requires more effort than a spontaneous real meeting.
- **Privacy**: Especially when using digital communication channels, the communication of spatiality or the distribution of objects in the room can be an intrusion into the privacy of individual participants.

2.1 Solution

Existing digital communication channels should be technically expanded so that they are able to perceive spatially
Technical components such as webcams should be connected to additional hardware for spatial perception. This hardware can consist of proximity or ultrasonic sensors, for example. In addition or as an alternative, spatiality can also be achieved purely auditory by using stereo microphones. For a similar effect, several mono microphones can also be placed in the room.

Consequences

Benefits.

- By capturing and conveying spatiality, participants can be given a feeling of closeness and thus increase the **connectedness** of the group of friends when using digital communication channels.
- The transmission of spatiality represents a **new dimension** for digital meetings.
- The dimension of spatiality enables **more opportunities for interaction** within the group of friends.

Liabilities.

- The implementation requires the integration of additional hardware, and therefore results in **higher costs**.
- The use of and possible retrofitting of existing components with specific hardware for spatial perception requires a certain **technical expertise**.
- The communication of spatiality via digital communication channels **can feel unnatural** for people.
- The recording of spatiality represents a profound **intrusion into privacy**, for example for uninvolved roommates.

2.2 Known Uses

Friend's Egg. The Friend's Egg is a technical prototype for spatial, interpersonal and audiovisual communication, which was developed as part of the VREUNDE research project. The aim of the Friend's Egg is to enrich audiovisual communication between friends over distance through the use of spatial information [1].

The basis here is a 3D-printed form into which a smartphone or tablet is inserted. A special web application is used to utilize the full range of functions. Spatial perception is achieved by using

[1] https://www.interaktive-technologien.de/projekte/vereint, last accesses January 8, 2025

Figure 2: The Friend's Egg from the research project *VRE-UNDE* [1]

a proximity sensor, which is attached to the upper part of the prototype.

To use it, at least two friends or groups each need their own Friend's Egg. In audiovisual communication, the spatial information, according to different distance zones as shown in figure 3, is then used to apply specific filters to the image and sound. For example, if a person is directly in front of the device, their image, and sound will be displayed unchanged to the other person. If the person moves away from the device, their video is initially made unrecognizable by reducing the sharpness. From a certain distance, the video signal is then switched off completely and only the sound is transmitted. By selectively manipulating the audio and video stream, the spatial position of the sender can be transmitted to the receiver. The threshold values of the distance zones can be adjusted individually.

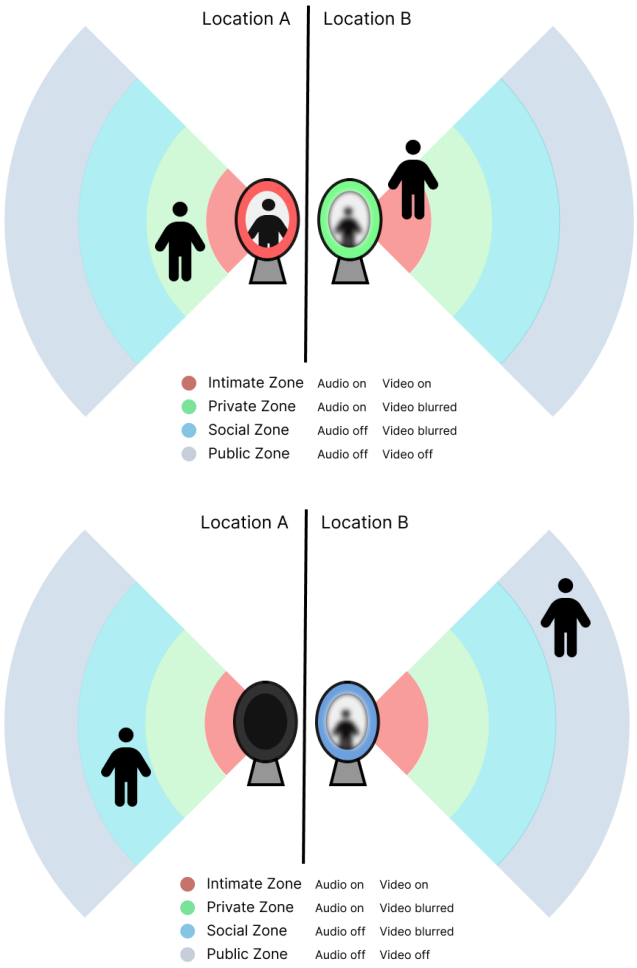

Figure 3: Friend's Egg with distance zones [1]

3 FULL ROOM RECORDING

Context

Within a group of friends, some or all of the friends live geographically apart from each other. A real meeting is not possible due to the distance. Virtual meeting software is already being used to communicate over distance. The individual friends have hardware for audiovisual communication, which includes conventional microphones and webcams or smartphones and tablets.

Problem

Conventional hardware is only able to capture a restricted field of view and therefore limited areas of a room. In the context of a group of friends at a distance, this limits the sense of connection.

Forces

- **Privacy**: The transmission of more angles or areas of a room may constitute an invasion of privacy for some people.
- **Technical expertise**: Within a group of friends, the level of technical expertise can vary greatly between individuals. The complexity of hardware must not exceed that of conventional and already used technology.
- **Restricted freedom of movement**: The freedom of movement of friends in audiovisual communication is limited due to available angles. This is due to the use of conventional camera setups.
- **Restricted activities**: Due to the limited hardware, only limited activities are available to a group of friends, which can be carried out during a digital meeting.

3.1 Solution

Expand digital meetings so that the entire room can be recorded
A technical component should enable the entire room to be recorded. This recording should be able to be seamlessly integrated into digital meetings and existing meeting software. For the technical implementation, it is initially possible to use several conventional cameras together to record the entire room in order to capture several angles. Alternatively, there are already fully integrated 360° cameras that enable large-scale recording.

Consequences

Benefits.

- The extension of the video transmission will create a **more intimate atmosphere** between friends, increasing **connectedness**.
- The wider field of view that is transmitted allows for **more activities** during the digital meeting.
- The more intimate atmosphere allows for **more natural and in-depth meetings**.

Liabilities.

- The need for more or special hardware such as 360° cameras results in **increased hardware requirements**.
- As additional hardware is required by several people, the **general costs** increase.
- The meeting software already in use may not be **compatible** with the additional hardware or this must be supplemented by **additional software**.
- The additional hardware and software requires additional **technical expertise**.
- A larger recorded field of view represents an intrusion into **privacy**.
- The **privacy of other people** who are in the same room, for example in a shared flat, is also restricted.
- Even if people actively decide to record the entire room, it may be the case that **individual areas of the room should not be transmitted**.

3.2 Known Uses

Figure 4: Meeting Owl by OWL LABS[2]

[2]https://owllabs.de/products/meeting-owl-3, last accessed January 08, 2025

Meeting Owl. The Meeting Owl is a 360° camera with integrated microphone and loudspeakers, made by Owl Labs. The Meeting Owl has been specially developed for use in hybrid meetings and offers plug-and-play use with all common meeting software. The image from the 360° camera is split internally by identifying active people using AI and the integrated microphone. The Meeting Owl's output image is therefore a compilation of different sections of the room. The user cannot influence this process. Depending on the size of the room, the Meeting Owl can be expanded with an external microphone or another Meeting Owl.

4 AMBIENT MESSAGE

Context

Within a group of friends, some or all of the friends live geographically apart from each other. A real meeting is not possible due to the distance. Digital meetings are also not possible due to time constraints. For personal reasons such as time, stress or other commitments, it is also not possible for friends to actively exchange information via telephone or messenger services.

Problem

There are no communication channels available to groups of friends that can be used without active engagement. As a result, there is less and less communication within such groups of friends, which leads to the risk that the friendship may fall asleep in the long term.

Forces

- **Distraction**: People do not want to be distracted by messages in their active everyday life.
- **Individual Initiative**: Starting a conversation requires a high degree of initiative.
- **Obligation**: Starting a conversation can be seen as an obligation to the other person and can lead to stress.
- **Technology Fatigue**: Technology fatigue can occur due to the everyday use of technology.

4.1 Solution

An exchange of ambient messages via a communication medium that seamlessly blends into the environment

For an ambient message, an asynchronous digital communication channel is set up using technical components that can be integrated into the current environment. Each participating friend has their own access to the communication channel, which is individually placed in their home.

Consequences

Benefits.

- Due to the seamless integration into the environment, the message exchange is **non-disruptive** and ensures **less distraction**.
- The exchange of messages is **unforced**.
- The possibility of exchanging messages **increases the bond** between friends.
- Receiving a message without prior interaction can increase the **mood**.

Liabilities.

- The ambient message acts as a **further communication medium**.
- **Additional hardware** is required, which could lead to **additional costs**.
- A corresponding **network infrastructure** is required for the exchange of messages.
- At least two friends **must be interested** in using the ambient message.
- Depending on the type of input option, basic **technical expertise is required**.
- The display of the ambient message **must be seamlessly integrateable** into a person's environment **.**

4.2 Known Uses

Figure 5: Vesta Board by Vestaboard Europe, Inc.[3]

Vesta Board. The Vestaboard is a message display developed by Vestaboard Inc. which is capable of displaying messages consisting of a maximum of 132 characters. Each individual character is represented by a bit, patented by Vestaboard Inc., which consists of a rotary motor with correspondingly labelled cards. When the motor is turned, the next card folds forward and becomes visible. The characters can display the letters from A to Z, the numbers from 0 to 9 and various special characters and colors. A Vestaboard can be addressed using the API provided by Vestaboard Inc. For example, it is possible to create messages, set the time for the message to be displayed and perform other automated functions.

5 SYNCHRONIZED ACTIVITY

Context

Within a group of friends, some or all of the friends live geographically apart from each other. A real meeting is not possible due to the distance. Additional time is required for some or all of the friends in the group due to everyday tasks such as housekeeping or cooking.

[3] https://www.vestaboard.com/, last accessed January 08, 2025

Problem

Additional time is required for some or all of the friends in the group due to everyday tasks such as housekeeping or cooking. Due to those obligations, dedicated communication via telephone or messenger services is not possible in terms of time. The lack of communication between friends can lead to a break-up of the friendship in the long term.

Forces

- **Individual Daily Routine**: Each person has an individual daily routine, which makes it harder to find a common time to communicate.
- **Social Battery**: Due to various obligations, a person may not want further social interaction.
- **Time Shift**: Due to possible time difference, communication is further hampered.
- **Individual Preferences for Communication Channels**: Each person prefers different communication channels.

5.1 Solution

Communicate while performing digitally synchronized everyday activities

Friends should communicate while carrying out everyday activities. Due to the geographical distribution, communication takes place remotely via telephone or other communication services.

Consequences

Benefits.

- The parallelization of activities results in **no additional time expenditure**.
- Especially when performing monotonous activities, communication with friends can be a **distraction**.
- The synchronized activities are **not** only **limited to everyday activities**.
- The exchange with friends increases **connectedness**.

Liabilities.

- **Synchronization** between the friends before and during the activity is **necessary**.
- **Some activities**, such as vacuuming, **are unsuitable** for simultaneous communication.
- Not everyone performs the same activities, which can lead to **timing problems**.
- Especially during dangerous activities, such as handling sharp knives, communicating with friends can be a **distraction**.

5.2 Known Uses

Digitally Synchronized Cooking. An everyday task for many people is cooking in the evening, which lends itself to parallel communication with friends. By prior arrangement, one or more friends can cook together at a certain time. The telephone or other digital communication channels such as Discord, Skype or Zoom can be used to communicate while cooking. The camera can be switched on during the shared activity to further increase the sense of connection.

6 CONCLUSION

Distance can become a problem for many friends and group of friends. This is particularly the case when regular rituals have mainly taken place in person and are therefore difficult to transfer to the digital space. The patterns presented and identified as part of the VREUNDE project can serve as tools to create a feeling of connectedness in groups of friends, even at a distance. While the patterns were presented as a group, the individual use can already lead to an increase in connectedness. Even if the technical feasibility of the described patterns can be proven by various technologies, an additional evaluation with groups of friends is necessary with regard to connectedness. In particular, overarching obstacles to the patterns, such as the technical expertise required and the aspect of privacy, should be examined. In addition to the technical perspective, the social patterns in relation to friendships should also be examined.

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