

SAM: A Spatial Interactive Platform for Studying Family Communication Problem

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Abstract. Communication among nuclear family is a complex but immediate problem due to the small number of family members and the diverse daily schedule of modern society. Because family members have to live together every day, so they must consider and coordinate mutually in communication to avoid estranging by over indifference. With the ambient environment and sensible space technology mentioned above in place, the aim of this study is to explore the possible calm interface. While with nuclear family context in mind, how to build such interface and its implication to the family communication is the problem. For building up an interface using plant-as-media, this study is using the property of plant phototropism. According the above concept, we build up the wall-formed plant interface and two perceptible family spaces practically. Starting with studying on family communication, and this research implements an ambient environment (Spatial Ambient environment, SAM) utilizing sensible space technology and calm interface.

Keywords: Interactive Behavior, Spatial Interface.

1 Introduction

Communication among nuclear family is a complex but immediate problem due to the small number of family members and the diverse daily schedule of modern society. Because family members have to live together every day, so they must consider and coordinate mutually in communication to avoid estranging by over indifference. The difference of family environment from other environment is family members are required to consider and make sense of reciprocally. However, there always are misunderstandings or unpleased events happened in unexpected situation. For example, under the situation of member is busy or rests, the other member may want to do some interaction with a family member in an undesired moment; or some member hope to be concerned but no one knows. These events will hurt the feeling of family gradually and eventually break the relationship. One of main causes for these events is by neglecting others feeling and lacking of good communication.

On the other hand, with new technology nowadays, there is lots of contextual information surrounding people either virtually or physically. In addition to the

contextual Information, researchers have conducted studies on human gestures and activities to expose the possible intention of human behaviors that are indirect and ambient. Weiser brought up a word “calm” in 1997, he believe information deliver is tranquil and need less attentions [1]. Consequently, the purpose for this study is to find a method reflecting the family situation and give members moderate (calm) information feedbacks, encouraging the members to contemplate the relationship with more interaction.

1.1 Activities Classification of Family Members

When technology is involved in supporting family member communication, the major issues are convenience, safety and awareness[2]. In communication behavior, Argyle indicated the linguistic communication includes oral communication and writing communication. Non-linguistic communication is comprised of facial expression, gesture, tones, attitude, and location and distance of people[3]. Further, we can use where people sit in a living room to guess the relationship of people, but such data is quite ambiguous. Additionally, the daily routines of each member will affect others. Huang classified time into “essential time”, “restraint time”, and “free time”[4]. ”Essential time ” means brush teeth, take a bath and eating and so on. “Restraint time” is the time for member to do their own work. “Free time” is the period to do casual activities. They contact other members in various situations under disparate time classification.

1.2 Sensible Space

On the technology part, with the development of physical computing and embedded computers aids sensing technology in awareness and managing physical object and environment. This expansion makes computing technology in a way that people can control both virtual and physical objects by body gestures or direct manipulation. For this reason, we can get data by sensor set in space and convert them into useful information after computing analysis and processing. For example, when user swirl handle means he/she want to go out or back. This provides the sensing ability to the surrounding spaces in family environment.

1.3 New Media as Interface

Addition to the sensible space, interface plays an important role in the message transmission in the space. Interface or human-computer interface studies how computer gets data, makes messages provided on the interface be easy to read and allow human perform the tasks without interference. New type of interfaces using different media technology to provide a more nature feedbacks. Such as, ambient display is a novel way to present information by light and voice in surrounding. This way is not limited by computer monitors but allow human manipulate the property of environment and media convey information with clear affordance[5]. New media provides a new type of interface. Nevertheless, new media such as plant interface

changing by time used or digital interface has the results of stronger feeling and stimulus to urge user to contemplate profoundly.

Ambient environment can aware the condition of people in space and this situation will change the environment itself incrementally. Consequently, the environment becomes livable and will grow up with habitants. When bringing computing technology into family environment, it will allow the environment to display data and transmit that provides the basic platform for this research. Chen ever brought up the way of social media to solve family communication[6]. This study takes nuclear family as studied object, and the family comprises parents and two kids. The concept of calm technology in family environment claim a spatial media interface to help members think the problem of getting along.

2 The Problem

With the ambient environment and sensible space technology mentioned above in place, the aim of this study is to explore the possible calm interface. While with nuclear family context in mind, how to build such interface and its implication to the family communication is the problem.

3 Literature Reviews

To understand how environment aware data and display, as well as the spatial interaction design, we discuss by the following viewpoints:

3.1 Using Plant as an Ambient Display

Calm technology engages both the center and the periphery of our attention and in fact moves back and forth between the two[1]. Such display technique makes people focused on work in hand, and show data around without interfering people attention and deliver to people passively. Data transmission of Calm technology retain between center and periphery[7]. In this study, living room, dining room, kitchen and bedroom which are main space for people living are set as center and aisle are periphery.

In 2004, Easterly combined rubber tree with physical computation device and Wi-Fi to switch data from network to information. Make a control on plant given water to display the information on network to users. After a long time, there is variation on plant growing[8]. Plant Display makes a further integration of such idea with the thought of ambient display. We take advantage of present transformation of plant interface to present people feeling and affection to describe this interface can show quality of time. User can be moved and impressed by the behind meanings of interface when seeing it[9]. The data conveyed by plant interface can't present concrete information but deliver abstract affection ingeniously.

3.2 Space Awareness and Spatial Interaction

Chan brought up concept of ambient trigger in 2006 that enable environment to realize the state of designer in space. Through the movement of “trigger” makes system recognize the state of designer and filter redundant and outside data[10]. Huang applied the way user moves steps into change of large-scale projector on 3D spatial angle of view and communicate with clients by this method[11]. Except let people not perceive the existence of computer, environment and object own the ability of computation. On the other hand, preset the usage is more precisely assisting users’ demands.

Wan and etc. put a physical interface utilized plant phototropism in an open space and compare with others to observe whether people alter behavior in virtue of existence of interface. Although the effect is minimum on the beginning, the effect will transform into biggest after two weeks test time. The interface can enforce and change people essential activities slowly[12]. Interactive Grass system created an environment to reflect the atmosphere on working by designing a working table connected with network and take grass as an interface[13]. So, plant interface can be the organic media for people getting along in environment by unique plant time property to show context of environment to affect people behavior implicitly.

4 How We Approach

For building up an interface using plant-as-media, this study is using the property of plant phototropism. The system controls the position of light to make growing curve disparity of plant to arise particular visual variation, as Fig. 1. For applying such interface to reflect the interaction situation of family members, it is the distance of members, location and time to be selected to display the favorable impression of members in model of family interaction. The changes of the supplied water or light to make variation in plant growing slowly as time passed is the property this study is aiming to control.



Fig. 1. Plant arise visual variation because of phototropism

We perform such concept into practical family environment and put the plant interface on the aisle as the wall to connect two spaces. When moving in two spaces,

family members can see the variation owing to plant phototropism and acquire some mental feedbacks. Further, urge the family members to think the interaction of family.

5 SAM System

According the above concept, we build up the wall-formed plant interface and two perceptible family spaces practically. Taking the living room as the first design prototype, we called this prototype as Spatial Ambient environment, SAM for short. We use foliage plants as the prototype of plant interface, as Fig. 2-(a).

We gather the specific action data of people in living room and kitchen by sensors. After the regional system (space server) receiving the data, it will deliver the data to main system (SAM server) to analysis information and to manage position and time of plant light by physical computation way. In long-termed experiment period, the position of light will cause difference of plant growing direction. When all plants are near one side of wall, it means the family space linked to wall need to be concerned, as Fig. 2-(b).



Fig. 2. SAM interface prototype. (a)Wall-formed plant interface. (b) The magnification of part of interface.

5.1 Framework

Spatial Ambient environment (SAM) includes: the sensor module, database module, computing module and organic visualization module. SAM is responsible for controlling and conveying information between every sensor module and links to database to analysis data. SAM interface is distributed into contact light and ambient light; system framework shows as Fig. 3.

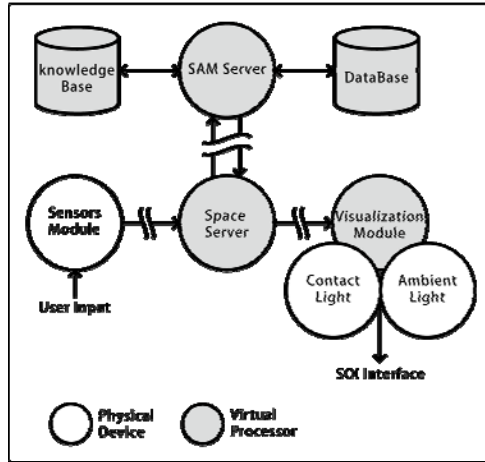


Fig. 3. System communications flow

We take living room as earlier stage study environment embedded designed sensor module. Every module is communicating by wireless way to transmit information. This study takes location and distance of people as data resource. The following will introduce contact light and ambient light separately.

(1) Contact light. Contact light system set the distance between people more close means the relationship to people more intimate. Therefore, two people to be more closely, the number of light turned on will be more; when the duration of people to get along is longer, the length of contact light opened will be longer, as Fig. 4.

(2) Ambient light. Due to the situation of spaces, ambient light will display different color by yellow, red and green to indicate “essential time”, “restraint time” and “free time”. The color will give family member cues directly to understand what kind situation of family members are in this space.

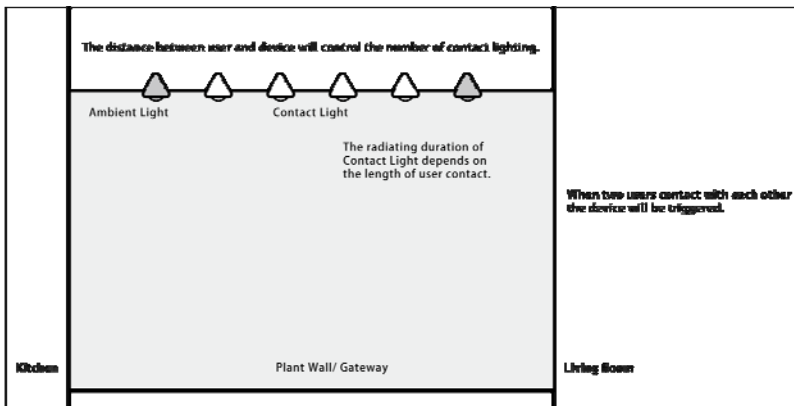


Fig. 4. SAM interface

5.2 The Activity Analysis

This part explains the disposition of sensor module in living room and the analysis of behaviors of member to approach each other. The experimental space is located in SOFTLab, NYUST. The sample behaviors in the living room are shown in Fig. 5. The Fig. 6 displays the position of sensor and serial number. The reed pressure sensor is used on coach. When people sit on coach, sensor will be triggered and this means the situation of there is people on the coach.



Fig. 5. Interactive behaviors in living room

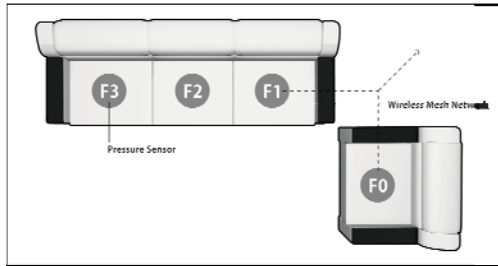


Fig. 6. The disposition of sensors put on coach

We take two people contact mainly to analysis the distance and time of member sit on coach. Sensor will judge the position of first one, and then decide the distance by position of the second one. As Table 1, the system will receive the input data and output the relatively response. When there is the third one sit in this space, system will be input by the situation of F0 and F1.

Table 1. Action corresponded to SAM sensor and visualization module

Action	SAM sensor module	SAM visualization	Visualization condition
A user sits in living room	F0 or F1 or F2 or F3	CL1 Duration = 8/h	Plant will grow deviously
Other one sits in the living room	<u>F0, F3</u> or <u>F1, F3</u> or <u>F2, F0</u> or <u>F3, F0</u> Duration = 20/m	CL1,CL2 Duration + 10/m	

Table 1. (continued)

When one approaching an other	<u>F0, F2</u> or <u>F1, F0</u> or <u>F3, F1</u>	CL1, CL2, CL3 Duration + 20/m	
	Duration = 20/m		
Then they are to be near more closely	<u>F0, F1</u> or <u>F1, F2</u> or <u>F2, F1</u> or <u>F2,</u> <u>F3</u> or <u>F3, F2</u>	CL1, CL2, CL3, CL4 Duration + 30/m	Plant grow upwardly
	Duration = 20/m		

CL = Contact Light.

6 Lessons Learned

Two lessons learned from this research. One is the plant display in interaction design might invoke different plants for different purpose, and another is prototyping is the important process and technique to the contextual interaction design problem. More problems will be discovered and resolved during the prototyping process. They are described as follows.

(1) Plant display mainly depends on what kind of plant used. Different type of plants will have different representation and the information it can represent. In the case studies, grass, foliage plants are applied for the representation of plant display. Generally speaking, using a single plant for representing the whole interface, although it can simplify the interface, but if the changes itself is not noticeable easily, then the consequence will not be clear enough for users to understand. Therefore, finding another plant that has noticeable changes over time is a desirable choice. This suggests a hybrid plant interface with multiple plants. Such as zebrine pendula will change its color according to the sunlight (as shown in Fig. 7). When there is plenty of sunlight, the leaves of zebrine pendula will turn red, reverse, the leaves will then turn silver color.

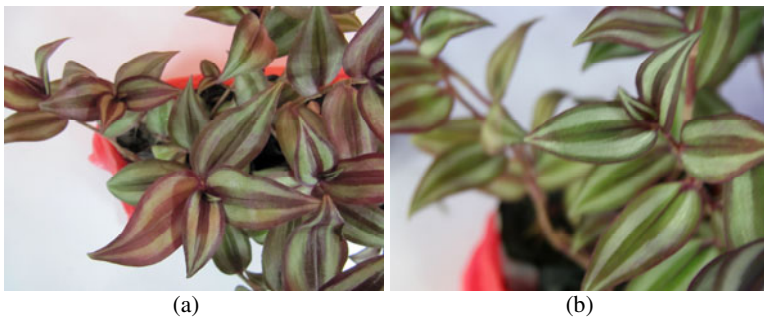


Fig. 7. The color changes of the leaves of zebrine pendula (a) plenty of sunlight: red, (b) lack of sunlight: silver

(2) Prototyping is the important process and technique to the contextual interaction design problem. While using living room in SOFTLab as the platform for experiment, the activity analysis of family members can then be studied and designed the corresponded sensing spaces. Many details will not be spotted without actually working in the prototypes. Such, the chatting among members, the tone of conversation are discovered as the factors for friendliness among members. However, due to timing constraints, the sofa and coffee table have been selected as the sensible furniture in the prototype. There are still other systems can be applied and developed in this experiment platform.

7 Conclusion

Starting with studying on family communication, and this research implements an ambient environment (Spatial Ambient environment, SAM) utilizing sensible space technology and calm interface. A prototype and its framework are proposed and developed. The key calm interface is a plant interface connecting both contact light and ambient light. This interface is located in the hallway in a family context that can reflect both conditions in two adjacent rooms. In addition, the SAM platform invokes both server and sensing spaces to form a complex framework that can be used for further studies on actual family communication. The idea of this research is simple (building up an augmented ambient environment) but once the implementation involving physical environment the problems increase tremendously. However, with this platform, further research can then be conducted.

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