

SoTong: An Aware System of Relation Oriented Communication for Enhancing Family Relationship

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Abstract

In this paper we propose “SoTong” system for enhancing family relationship with relation oriented communication. In the relation oriented communications, we focus on the relationship by representation and promotion of relations together with awareness of other’s situation for the connectedness and the coexistence. The system captures and analyzes communication channels among modern families to extract the relationship and the situation of families for awareness. From the results of the analysis, the system displays context-representative symbols with user’s avatar and relation-representative geometry on a same display. The communication information is decomposed into the quantitative frequency and the qualitative feeling. For the information of relation oriented communication, we proposed two matrices for the status of the communication and RDF description for the status of the family members as avatars and the information will be used for generation of message for a promotion of intimate relation and further context-aware services.

1. Introduction

Family is a basic unit of society and the healthy relationships among the families are essential and fundamental for maintaining the Quality of Life (QoL) of individuals and the society. However, in modern society, the relationships have been obstructed by several reasons: busyness, different life cycle of different ages, living separately, and so forth. By the reasons, a modern family has not enough time and opportunities of communication for the relationship and it generates tensions and estrangements.

As a sort of Computer Mediated Communication (CMC), awareness system has been investigated to solve the problem by enhancing the communication among intimate group members. The Awareness system is defined as a system whose purpose is to help connected individuals or groups to maintain a peripheral awareness of the activities and the situation

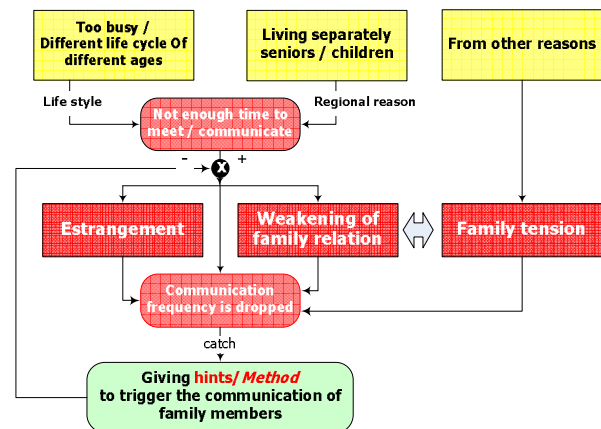


Figure 1. Conceptual model of modern family communication

of each other [1]. The main properties of the awareness system are connectedness [4][6][7][10][12], message exchange [2][3][5][6][9], and ambient display including tangible object [5][4][7][13]. Awareness supports increased feelings of connectedness between people [8][12] as ‘cue information’ to adapt to different ways of communicating with others [4]. The connectedness is related to background awareness, in that awareness of presence creates the experience of connectedness [12] and the connectedness oriented communication is maintaining and enhancing human social relationships [4] by giving a sense of presence information of others. Many studies have pointed out the needs of connectedness for geographically separated family members but the communications among families at a same house are also obstructed by several situations as shown in figure 1. It means that they need not only the awareness of connected coexistence but also the awareness of shared relationship.

In this paper we propose “SoTong” system as an awareness system of relation oriented communication. SoTong means “communication with mutual understanding” in Korean. The connectedness

orientated communication could give the information for social relationships and focused on the connectedness for a sense of presence. In relation oriented communications, we add the concept of the SoTong by enhancing awareness of relationship together with awareness of other's situation. The main concept of relation oriented communication is awareness of relation with other's situation by giving cue of situations and context-adapted message exchange. The system captures and analyzes communication channels among families for extracting their relationship and gets current states of families from logical and physical context sensors. Then the system displays the result of analysis as context-representative symbols with geometric distances on a same frame. The communication information decomposed into the quantitative frequency and the qualitative affinity. All of the information is stored to SoTong model that consists of two matrices for the status of the communication and RDF context information for display of the state symbols.

2. Model of relationship

SoTong system was designed for helping the families communicate with others by giving a hint about their state including communication and by supplying an easy way to generate an appropriate message by storytelling from system context information. For the purpose, SoTong system has two communication matrices and user context models for representing of their individual situation, named SoTong model.

The system monitors the frequency and positive and negative nuance. The frequency is measured by a number of communication trials and the nuance is detected by the nuance of words which are used for each communication trials. We supposed four inter-communication channels of a modern family; phone-call (mobile or home), instant messenger, email which are suggested in [11][12] and direct conversation in home or outside. The conversation in home can be monitored by voice recognition and speaker recognition as a sort of the services of smart home environment. The electric messages exchanged though email, instant messenger, and phone call. The channels are analyzed separately to extract the frequency and

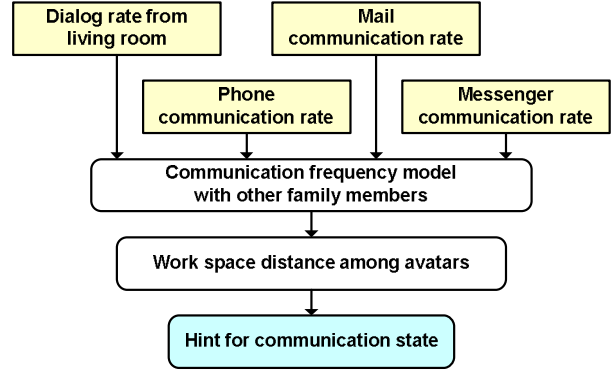


Figure 2. Four communication channels in family

nuance. Recently, the channels are unified into one solution such as Microsoft Office Communication Server 2007 and British Telecom Web21C SDK. The further development of the unified solutions will make the analysis task easier.

SoTong model consists of two matrices and RDF documents and it is used for handling the context information. The communication state is modeled as two matrices for frequencies and affinities among the family members. They are communication frequency matrix C and affinity matrix A . Each communications channel (suppose channel number is k for an arbitrary channel) has a communication frequency matrix C_k and an affinity matrix A_k with weight coefficients χ_k and α_k respectively. In the matrix C_k each element represents the communication frequency between a family member i and j and c_{12} means a communication frequency from 1 to 2 though channel number k . The elements in a main diagonal are all 1 explicitly for a frequency of communication. The weight coefficient χ_k and α_k are multiplied to each element in the matrices and the average of all communication channels are calculated for visualization. Each element should be normalized for the visualization.

$$C_k = \chi_k \begin{bmatrix} 1 & c_{12} & c_{1j} \\ c_{21} & 1 & c_{2j} \\ c_{i1} & c_{i2} & 1 \end{bmatrix} \quad A_k = \alpha_k \begin{bmatrix} a_{11} & a_{12} & a_{1j} \\ a_{21} & a_{22} & a_{2j} \\ a_{i1} & a_{i2} & a_{ij} \end{bmatrix}$$

$$C = \frac{1}{M} \sum_{i=1}^M \chi_i C_i \quad A = \frac{1}{M} \sum_{i=1}^M \alpha_i A_i$$

Where,

χ_k : Frequency weight coefficient for a channel k

- α_k : Affinity weight coefficient for a channel k
- C_i : Communication frequency matrix (for distance)
- A_i : Affinity matrix (for color and shape of relation)
- M : Maximum number of family members

The frequency and nuance are displayed on a single display as distances and directions with colored shape respectively. If a family member 1 and 2 has high value of c_{ij} and c_{ji} , then their distance in the frame is distant, i.e., the values of a pair of elements in C matrix and distance between symbols of two members are in inverse proportion.

We suppose the real time display of context information of each family member as a sense of virtual companionship [4][12] and it could be very helpful to share the feeling of connectedness among the family. A father can easily feel the situation of his daughter in abroad at once. The current contexts for the display of user's situation are temperature, weather (rainy, snowing or sunny) and time (morning, day, evening or night). We described contexts of the situation by Resource Description Framework (RDF). The RDF schema (RDFS) consists of two main classes; "Who" and "Situation" for representing information of a family member and context information respectively. The "Situation" class has a one sub class; time and three properties; location, weather, and temperature. The "time" class has three properties: season, date, and time. The meta data are used for visualization and other context-aware services such as communication message generation and so forth. The "Who" class has 2 groups of properties; properties for the family member and properties for the relation with other family members. The former group has name, age, weight, height and sex properties, which are mainly related with the appearance and another group has wife, husband, father, mother, son, and daughter properties, which are related with further relation inference. Figure 3 shows a validation result of the RDFS from W3C's RDF validation service. The RDF described information will be used as a source of knowledge for more advanced context-aware services in the smart home environment.

3. Implementation

The system consists of context information sources-SoTong model, a context gathering module, a situation visualization module, and a message exchange module. Currently when a user inputs the properties of the "Who" class manually and a smart home agent and health care system also gathers the information of users. An agent on each user's computer analyzes the email exchange among registered family members for frequency and nuance for a week. We use a simple word comparison method with a SVM for a nuance

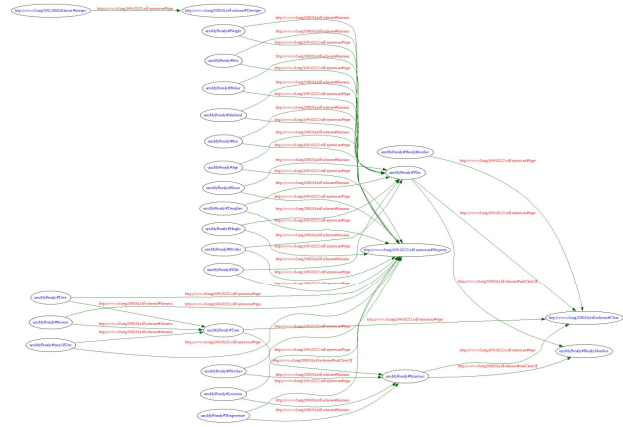


Figure 3. RDFS graph of context information

classification. The classes of nuance are positive and negative for an attitude for each other. The properties of the Who and the Situation class are used for user visualization and the agent obtains properties of the Situation class from logical and physical sensors such as forecasting web site and thermometers. We visualized the Situation class from the RDF data to serve the real time tele-presence but not connectedness. We designed the system as an asynchronous communication system for preventing user's excessive attention to communication. Figure 4 shows the visualization of the Situation class in the 3D space. The data in User class are used to form an avatar of each family member dynamically. The color of bottom circle reveals temperature by color and a frame at back of an avatar shows weather and time (morning, day, evening, and night) information. An icon at the left bottom of the avatar shows the season. A photo that is uploaded by users located over the avatar for image

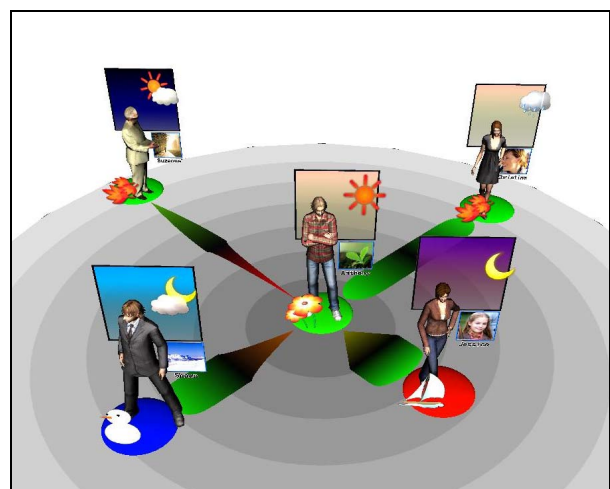


Figure 4. A prototype of context visualization

sharing communication. When a user touches the photo, the photo is expanded for a short time. We intended concept of an ambient display for presenting intuitive and holistic display of information that makes users feel the situation of others at a glance.

SoTong system shows the relation of family members by distances and colored shape among their avatars to represent the quantity of relationship as a spatial representation with a quality intuitively. For user centered relation visualization, an avatar of an instantly selected family member locates at the center of the frame and others locate at the radial position with different distance from the center. Concentric circles give references for comparing the distance for inclined viewpoints for the 3D space. If an affinity family of a family member A is good for B, a tip of a relation bar to B is round and green by the information from the A matrix and red with sharp tip for an opposite case.

The final module is ongoing story generation module for making a message for an estranged family member. We suppose the message exchange is very important to enhance the relation between the families and it might be difficult to generate a message even if he/she was estranged from others. So we are developing the template-based story generation engine based on V. Propp's idea [13] that uses information of the RDF and relation matrices.

4. Conclusion

In this paper we proposed SoTong system for a relation oriented communication to enhance the relation among intimate group members such as families. We defined the concept of the relation oriented communication is awareness of relation with other's situation and context-based message exchange. The system consists of SoTong model for handling context information, ambient display visualization module and a module for easy message exchange for supporting the relation oriented communication. For building the context information the system analyzes communication channels to build up two matrices that are a C matrix for communication frequency and an A matrix for affinity among family members. The system also gathers context information to build up individual context information described by RDF. The system visualizes the information by situation displayed symbol and the distance among the symbols as an ambient display. The context information will be used for more sophisticated context-aware services later.

It is important to analyze and to manipulate communication among a family for maintaining friendly relationship and for serving appropriate group context-aware services. We considered intuitive and easy operation for the elders and children and matching

their communication level by context based auto message generation that needs further study. The personalization is also important for context-aware services and we expect the effects of the visualization can be changed by the preference of each user. In the next phase, we will finish the message generation module and combination with context-aware services in smart home environment for relation oriented home services that are based on not only context information but also stories among others.

5. References

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