

User context conjecture system using location and schedule information

Naohito Ogasawara*¹, Kiwamu Sato*¹, Hiroshi Nunokawa*¹, Norio Shiratori*² and Shoichi Noguchi*³

*¹:Faculty of Software and Information Science, Iwate Prefectural University

*²:Research Institute of Electrical Communication/
Graduate School of Information Sciences, Tohoku University

*³:Sendai Foundation for Applied Information Sciences

In recent years, with the spread of communication media, such as a cellular phone and E-mail, we are able to communicate with others without any restriction of position or time. However, complexity of communicative context has increased so that user has to guess a partner user's situation and status in order to use various medias efficiently. This problem will grow larger as new media are brought in the expanding communications network.

To solve this problem, we propose the system that guesses the context in communication by a user's media from the position information on PHS (Personal Handy phone System) and schedule information from schedule application. In this system, a user's agent guesses automatically the context that owner has set, and answers the demand of the context from a partner user. Moreover, the agent decides a suitable answer, when there is a demand of communication by the media, which cannot be used.

1. Introduction

By spread of various communication tools such as PDA, Note PC and cellular phones, we are able to communicate via telephone or E-mail anywhere, any time. However, some restrictions are necessary considering a partner user's status and environment. For example, since a telephone cannot be received when one is driving car, or in a meeting or in a train, conversation that asks a partner's status -- "whether it can talk now" -- has to be carried out in many cases. Capability of using various medias causes increase degree of complexity of a communication context. Therefore, it will be difficult to conjecture partner user's status or environment.

To solve this problem, we have proposed the communication method that gets dynamically the

communication information that consisting of a partner user's address information and presence information using Media Integration Agent (MIA), which is a user's personal agent. Utilizing MIA an user can get/receive a partner user's context easily, and choose which media is suitable to communicate.

This paper describes the construction of a system, which guesses the presence information that MIA manages from the position information of the PHS and schedule information by schedule application.

2. Communication environment supported by MIA

We have designed a method of acquiring communication information by using a personal

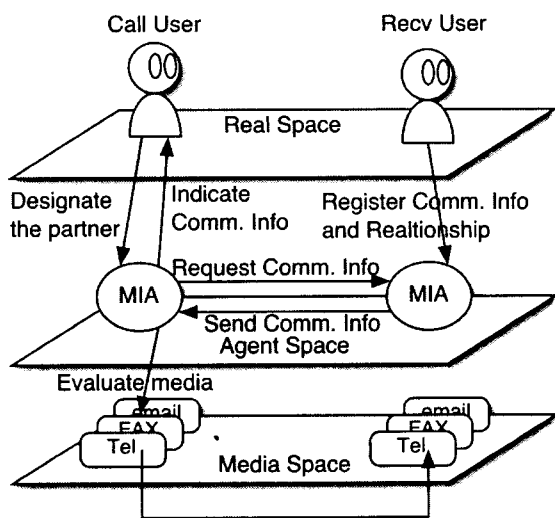


Figure 1 : Model of communication

agent[1],[2],[3]. The model of the communication using this method is illustrated in figure.1. The outline is as follows:

- Each user has his agent that manages his own communication information. This agent is called MIA (Media Integration Agent). The communication information that MIA manages are the address information about the media which a user uses, the presence information on whether the present use is possible about each address, and information on relation with the partner user with whom he communicates.
- When user starts communication, calling side user's MIA sends request to the receiving side user's MIA, and gets address information and presence information dynamically. Then, MIA supports selection of the optimal media by showing the calling side user the information and options.
- Receiving side MIA can determine the communication information about which media to be required by the caller, based on information on relation between the caller and the receiver. By the

communication introduced by MIA, to get communication information dynamically leads user to know change of an address, address information that shows which media should be used, and to get the correct presence information.

Because receiving side MIA can determine the communication information, the calling side user is able to get communication information, without taking into consideration the disclosure of communication information to others. Accordingly, the communication environment which does not limit users and which supported the form broad from a formal way to an informal way, is realizable.

By constructing our present MIA, the user needed to input the presence information on the ability of each address to be used to his MIA manually. Therefore, we propose the method of guessing the presence information, which MIA manages, by getting user's various context information and analyzing it.

3. Model of context in communication

The context information in this research is defined as more information, which can be acquired from the environment, which surrounds the user, such as the user's position information, a schedule, a state of PC, those that are near the user, and apparatus.

The model of the user context-conjecture-system consists of three types of agents. They are context information agent, presence information agent and MIA. There exists one context information management agent for each context information from the environment, which surrounds the user.

The agent gets and manages each context information. There exists one presence information management agent to each media, which MIA

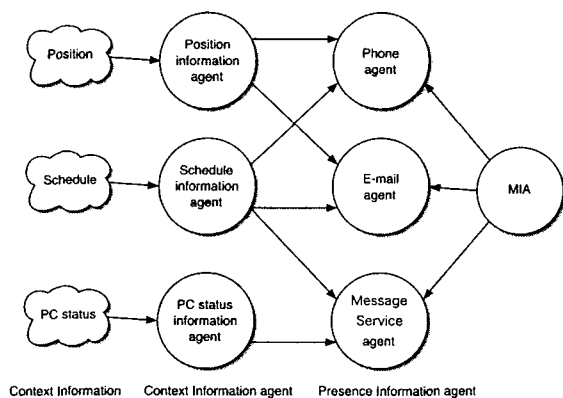


Figure 2: Model of user context conjecture system

manages. In addition, it gets context information from context information agent, and guesses the presence information on media. The presence information, which the presence information agent guesses, is one information which is set on (i.e. possible to use) and the rest is set off (i.e. impossible to use). In addition, if presence information is off, the agent guesses the information when its use becomes possible. Although the guessed presence information is used in case of MIA answers to a request of the communication information from a call side user's MIA, the information is set on when its use becomes possible. This is sent only if the relation between users is close.

4. User context conjecture system

Based on the model, we constructed the system that guesses automatically the presence information on a cellular phone with a mail function. The context information in this system consists of a user's position information and schedule information. Therefore, context information agents consist of the position information agent and the schedule information agent corresponding to each context information. In addition, the presence information agents consist of the phone agent and E-mail agent

that guess automatically the presence information.

Position information agent

A user's position information uses "Imadoko MAPION" that is the position information service currently offered with PHS (Personal Handy phone System) of NTT DoCoMo. With "Imadoko mapion" service, we can get the position of PHS from the nearest base station where PHS is connected. The error of the present position is about 200m at maximum. Using this service, the position information agent gets the user's present position (i.e. latitude and longitude) every 15 minutes, and calculates the context information of the present user's movement speed.

Schedule agent

The schedule agent acquires the information about events which the user is planning from a user's schedule application. A user will register events to a schedule application as information that include time and place. Therefore, the schedule agent can get the location where user should be. In case a user registers an event into schedule application, registration of a place can be simplified by referring to the place beforehand registered into the address book.

Phone agent

The phone agent gets the place information, user's present position, and movement speed from the schedule information agent and the position information agent. From this information, the presence information on a cellular phone is guessed as follows.

- Move speed is more than 30 km/h, since it is under movement -> off.

- Move speed is less 30km/h and position is the place where the event is planned.
 - The event is unsuitable to receive telephones, such as a meeting and an arrangement -> off
 - The event is the other kind of thing that may receive a telephone -> on
- Move speed is less than 30km/h and the position is not the place where the event is planned. ->on

Moreover, if impossible, the phone agent guesses the possible time when the event of a meeting or an appointment is due to finish, or anticipating the time of arrival at the place where the event is planned.

E-mail agent

Since E-mail is an asynchronous media, it is possible to receive mail even if a user cannot talk by a cellular phone. Therefore, the E-mail agent guesses the information about whether answering mail is possible.

- Move speed is more than 30 km/h, since it is under movement -> off.
- Move speed is less 30km/h and position is the place where the event is planned.
 - The event is unsuitable to answer mail, such as a meeting and an arrangement -> off
 - The event is other kind of thing such that a mail could be answered -> on
- Move speed is less 30km/h and position is not the place where the event is planned. -> on

5. Future Work

For the position information by the PHS, since the position was gained at regular interval of 15 minutes,

and movement speed is calculated from the distance of the two positions, the error of movement speed becomes large. To solve this problem, we are considering to shorten the interval of search position, or to adaptively change interval time according to move speed. Since there is no method of grasping when unexpected event has occurred, or an event is canceled, the wrong presence information may be guessed using the context information on a schedule and position information. So it is necessary to use other context information such as a state of PC, or information about who are near the user, in order to improve the accuracy of presence information.

6. Conclusion

In this paper, we propose the system that guesses the context in communication by a user's media from the position information on PHS (Personal Handy phone System) and schedule information from schedule application.

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