

# Context-aware Communication Support System with Pictographic Cards

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## ABSTRACT

We present a context-aware pictographic display system that facilitates the search for communication cards that bear some relation to the location and goal of the user. The system consists of a server and a mobile device: the server searches for relevant cards on the basis of the context, and then prioritizes them in terms of their relatedness; the mobile device displays pictographic cards according to the priority. This system can help people who have speech-language difficulties by reducing the searching time and difficulties, when the user wants to find the pictographic cards

## Keywords

Context-awareness, Pictographic card, Communication, Speech-language difficulties

## 1. INTRODUCTION

People with speech-language difficulties or impairments often face problems with linguistic communication, especially when using forms of communication that involve literacy skills. The American Speech-Language-Hearing Association [1] has researched Augmentative and Alternative Communication, and has presented various devices for this type of communication, for people with speech-language difficulties or impairments. Pictographic grid displays [2, 3, 4, 5], which involved the use of photos of events or people that are meaningful to the user, enhance mutual understanding and multiple communication exchanges between conversation partners.

However, these devices have some limitations. It is hard for a user to find the exact card, since the user does not know the category in which the card is included. Also, a user should select several steps to find the next communication card related to the current context. In order to solve these limitations, we have considered a system which includes user's context and relations between the cards. By including these two factors, we anticipate that a user can find his communication cards more easily, and also the number of selections will be reduced while a user makes a conversation with conversation cards.

In this paper we proposed a system which is based on the pictographic grid displays and context aware service to provide a conversation helper for the people who have speech-language difficulties or impairments.

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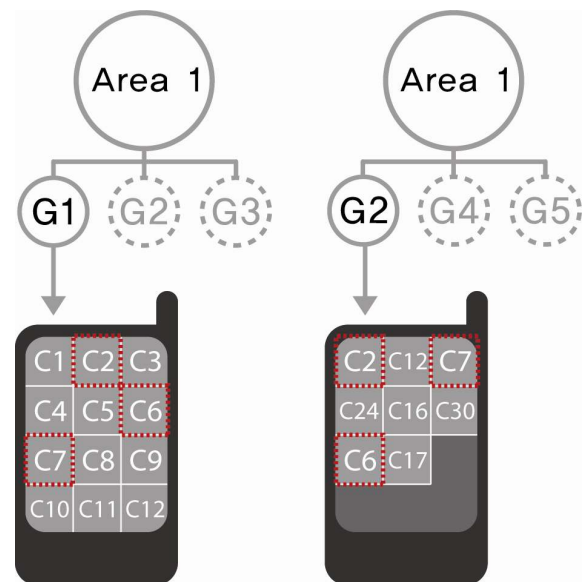


Figure 1. Card arrangement with the context

## 2. SYSTEM DESIGN

To address the problems of existing systems and to provide relevant communication cards, we have developed a pictographic display system that uses context-aware computing technology. Context-aware computing applications, which can recognize and react to a user's changing context [5], have been developed to help users perform complex tasks. Han et al. [6] introduced a context-aware system that can recognize the context of the user and provide relevant information for guidance.

Our system defines the context as a combination of location and goal from the user; the context is used to set the initial structure and the relations of the pictographic cards for communication. For example, when a person is at a restaurant to order some foods, the location is "restaurant", and the goal is "ordering". Based on the location and the goal, the system can provide pictographic cards to the user. Figure 1 shows that the recommended cards can be changed according to the user's goal, even in the same place.

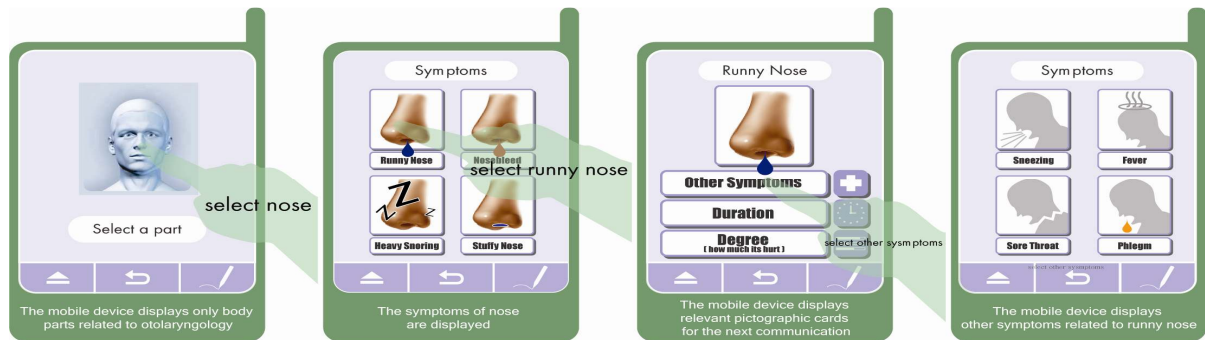


Figure 3. Example Scenario how the pictographic cards are displayed

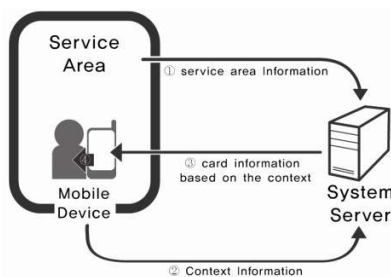


Figure 2. System Framework

Figure 2 shows the framework of the system. The server includes a knowledge model, which relies on the relation between the location and the communication cards as well as the relation between the cards themselves. With the aid of the knowledge model's hierarchy and relations, the system can display digital cards that are relevant to the current card. Furthermore, the server determines the order of priority on the basis of the frequency of use. The mobile device is used to display the cards in such a way that the user can show the selected cards to a conversation partner.

In order to provide context-relevant cards, the system has the procedure as follows. In the first place, pictographic cards used in service areas are registered in our system server; and when a user visits a service area, mobile device sends the location information and the goal of the user to the server; and then the server searches the cards based on the context, and delivers their priorities and relations to the user's device; finally, aligned by the priorities, the pictographic cards are displayed on the device.

### 3. SCENARIO

To test and demonstrate the usability and effectiveness of our system, we designed some common scenarios that could happen in a hospital. One of the scenarios is described below to show how the system works.

Figure 3 shows how the proposed system facilitates a conversation between a patient and an otolaryngologist (that is, a doctor that specializes in the treatment of ear, nose, throat, head and neck disorders). In the first scene, the patient describes feelings of pain. Because the patient is currently located in the department of otolaryngology, there is no need to provide pictures of other parts of the body, such as the limbs and abdomen. In this scenario, the patient has a runny nose; hence, in the second scene the patient nominates the nose and the system automatically displays the common symptoms of various nose disorders. In the third scene, the patient nominates the symptom of a runny nose

and then chooses subsequent symptoms, such as the duration and severity of the condition. In the fourth scene, the patient nominates other symptoms for the next process. All the pictures provided by the device in the fourth scene have a high probability of being chosen by the user because they are all related to a runny nose.

The scenario shows how the system can facilitate for a person with speech-language difficulty or impairment during a conversation. The system provides digital cards that bear some relation to specific types of locations; it also recommends cards that are related to specific conversation goals.

### 4. CONCLUSIONS

We have presented our Context-aware Pictographic Card System, which is designed to facilitate communication for people with speech-language difficulties or impairments. By using data on the context of the user and the relation between cards, the system helps the user converse more fluently. Although the system was designed to facilitate the conversations of people with speech-language difficulties or impairments, it could also be useful for elderly people or people with a developmental disability

### 5. ACKNOWLEDGMENTS

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