

# The Structure and Evaluation of an Information Kiosk with a Sign-Language Recognition System

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## ABSTRACT

An information kiosk with a JSL (Japanese sign language) recognition system was designed and set up for testing in a government office. The system allows hearing-impaired people to easily search for various kinds of information and services. This kiosk system was favorably received by most of its users.

## Keywords

Hearing impaired, sign language, recognition, information kiosk

## INTRODUCTION

We have developed a recognition system for translating Japanese sign language (JSL) into spoken Japanese to support communications between hearing-impaired people and hearing people [1, 2]. This system recognizes each signed word from an input sentence in sign language. We have now designed an information kiosk around the JSL recognition system. It allows hearing-impaired people to use JSL in searching for information. We have tested this kiosk by installing it in a government office and surveyed users' impressions.

## JSL RECOGNITION SYSTEM

The operation of the JSL recognition system is as shown in Figure 1.

In our system, the hand gestures of JSL are input to a computer by using a glove-based input device such as the CyberGlove [3] and a magnetic sensor device such as the FASTRAK [4].

Each signed-word represented in input gestures is recognized in the word-recognition step. The words are identified by combining such gestural primitives as hand shape, palm direction, and linear motion [2].

The boundaries between signed words are detected and the input gestures are divided into several segments in the

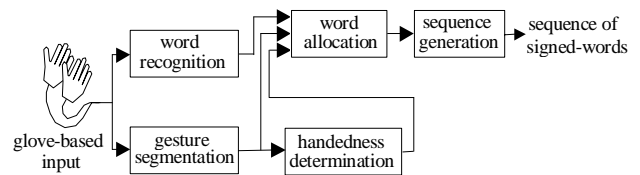


Figure 1. Sign-language recognition system

gesture-segmentation step. Whether the gesture in each segment is one- or two-handed is determined in the handedness-determination step [3]. The relationship between the recognized signed-words and the segments is analyzed, then the words are assigned to the segments in the word-allocation step. Finally, the recognized signed-words are combined to generate a sequence of words in the sequence-generation step.

## AN INFORMATION KIOSK WITH JSL RECOGNITION

The structure of the information kiosk is shown in Figure 2. This kiosk provides information on public services in Nagasaki, Sasebo, and Isahaya Cities in Nagasaki Prefecture. Hearing-impaired people can use JSL gestures to search for information about these areas. Responses to the input gestures appear on a screen as JSL in an animated form and as Japanese text. Figure 3 shows the appearance of the system.

The JSL recognition system in the kiosk can recognize 268 JSL words and 52 kinds of JSL sentences. The system can also accept the two types of signed gesture as described

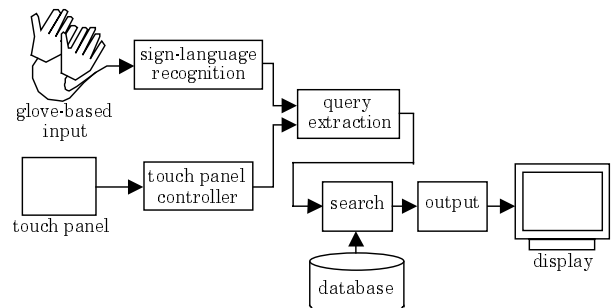


Figure 2. Structure of the information kiosk

<sup>1</sup> CyberGlove is a trademark of Virtual Technologies.

<sup>2</sup> FASTRAK is a trademark of Polhemus Inc.



**Figure 3. Appearance of the kiosk**

below.

(1) Words written on buttons on the kiosk's console

A user can input signed gestures that represent words written on buttons. The user can thus operate the system by using JSL rather than by touching the buttons.

(2) Sentences in JSL

A user can make direct inquiries regarding the information that he/she wants by expressing sentences in JSL. For example, the kiosk can accept JSL gesture sequences which represent the following sentences.

- (a) Please tell me about restaurants in Nagasaki City.
- (b) I want to know about restaurants in Nagasaki City.

**TEST-RUN FOR THE INFORMATION KIOSK**

The information kiosk was tested for three months in the Isahaya City Office in Nagasaki Prefecture. During the test-run, users who visited the city office were given free access to the kiosk system.

To confirm whether this information kiosk with its JSL recognition system will be of use to hearing-impaired people, we surveyed the impressions of its users. The questions for users were as follows.

- (1) Is such a kiosk system necessary in the world?
- (2) What do you think about representing JSL gestures wearing the glove-based input device?

We were able to collect the impressions of 32 users (9 hearing-impaired people and 23 hearing-people). The answers to each question are summarized in Tables 1 and 2.

**DISCUSSION**

As shown in Table 1, 22 of the users accepted the value of this kind of system. This result indicates that the method of recognizing JSL gestures is significant not only for the support of communications between hearing-impaired people and hearing people, but also in that it allows hearing-impaired people to interact with information equipment. However, many users did not regard such a

kiosk system as indispensable. This is because most young hearing-impaired people can read sentences in Japanese. The answers to question 2 from hearing-impaired people were clearly different to those from hearing people. Most hearing-impaired people accepted the glove-based device, while many hearing people gave negative answers. However, the kiosk system with a glove-based input device will be accepted because hearing-impaired people are intended to be the main users of the system.

**CONCLUSIONS**

We designed an information kiosk with a JSL recognition system and tested it in a government office. The system was received favorably by most users. We are planning to improve the design of this kiosk and develop a more practical information kiosk for hearing-impaired people.

**ACKNOWLEDGEMENT**

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**Table 1. Answers to question 1**

| Answer          | Hearing-Impaired People | Hearing People | Total |
|-----------------|-------------------------|----------------|-------|
| Necessary       | 2                       | 4              | 6     |
| Better to exist | 5                       | 11             | 16    |
| Not necessary   | 0                       | 1              | 1     |
| I don't know    | 1                       | 2              | 3     |
| No answer       | 1                       | 5              | 6     |

**Table 2. Answers to question 2**

| Answer                           | Hearing-Impaired people | Hearing People | Total |
|----------------------------------|-------------------------|----------------|-------|
| No problem                       | 4                       | 1              | 5     |
| A little tight<br>But no problem | 3                       | 6              | 9     |
| A little hard                    | 2                       | 3              | 5     |
| Much hard                        | 0                       | 10             | 10    |
| Impossible                       | 0                       | 1              | 1     |
| No answer                        | 0                       | 2              | 2     |