

# Urgent information presentation using listed sign language.

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## 1. Introduction

It is an important social issue for minimizing disaster damage that urgent information be surely and rapidly passed to the public when a disaster such as a large-scale earthquake occurs. For instance, what happened?, where should I take shelter?, what means do I have to move?, etc. Even if the announcement is just that train operation has become disrupted, the message may not be heard due to high background noise levels. This may prevent the public from taking the appropriate steps. Voice announcements are completely ineffective for the hearing impaired. To support the greatest number of people possible in public spaces, a universal information presentation system that uses sign language in addition to written expressions is needed. However, only a few people understand sign language, and there is individual variation in the proficiency of sign language. Moreover, there is individual variation in the understanding level of written expressions.

This paper proposes a listed sign language system that combines written expressions in table form with sign language fragments. The system generates urgent video style messages that offer rapid, sure, and easy understanding for environments such as railway carriages. We developed a prototype of the system and conducted an evaluation experiment. The results show that the system improves the level of understanding. Participants confirmed that the messages scored highly in terms of ease of understanding, high accuracy, rapid understanding, and sense of security.

## 2. Message generation by listed sign language

### 2.1 Design concepts of the listed sign language

The listed sign language aims at reducing the impact of personal variation on discernment of alert messages.

We aim to achieve an interface that can present an urgent message easily and promptly. The design concepts of the listed sign language are summarized by the following four points.

- (1) Present written expressions and sign language video images at the same time.
- (2) The written expressions are displayed in table form for conciseness and easy understanding.
- (3) All written expressions are shown from the beginning. As the sign language fragment is shown for each expression, the expression is highlighted in yellow.
- (4) The written expressions and the sign language fragments are displayed on the same screen.

### 2.2 Expression of sign language in fragmented form.

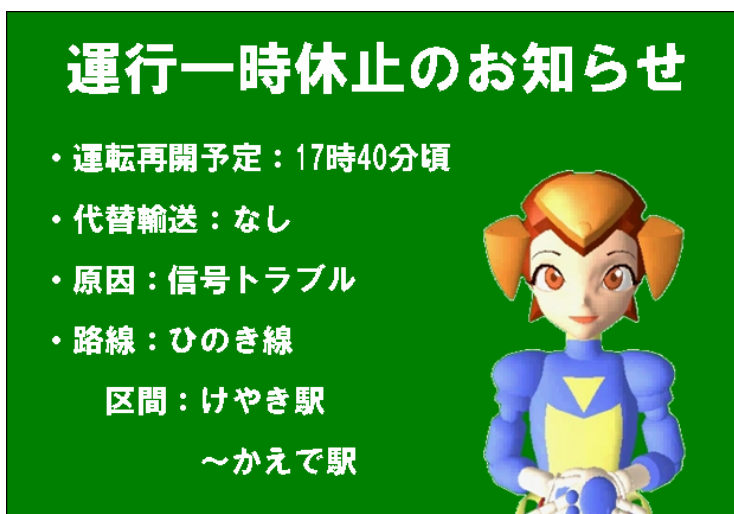


Fig. 1 An example of listed sign language message.

Figure 1 shows the example of a message based on the listed sign language. The sign language fragments for the five written expressions in Fig. 1 are shown below. H means the hand is in the home position, and P means

a temporary stop. Word inside the parenthesis is sign language expression.

H 〈 report 〉 〈 train 〉 〈 moment 〉 〈 stop 〉 H

H 〈 train 〉 〈 start 〉 〈 expectation 〉 P 〈 time 〉 〈 17 〉 〈 40 〉 H

H 〈 substitute 〉 〈 substitute 〉 〈 method 〉 P 〈 nothing 〉 H

H 〈 reason 〉 〈 why 〉 P 〈 shine 〉 〈 break 〉 H

H 〈 stop 〉 〈 section 〉 P 〈 from / to 〉 〈 HINOKI 〉 P 〈 train 〉 〈 station 〉 〈 name 〉 〈 KEYAKI 〉 〈 place 〉 〈 KAEDE 〉 〈 place 〉 〈 section 〉 H

### 3. Experiment

To verify the effectiveness of the listed sign language, an evaluation experiment was done. Eight messages on train status, generated by the proposed system and the straight sentence equivalents, were presented to 17 subjects who were mostly hearing impaired (used sign language in daily life); their subjective opinions were collected and evaluated. The subjective evaluation examined eight items (accuracy, promptness, ease of understanding, suitability for emergency use, and the sense of security, the sense of incongruity, irritation, and efficiency). Figure 2 shows the results of the evaluation. The participants thought that the listed sign language was superior in terms of "Accuracy", "Promptness", "ease of understanding", and "sense of security"; The difference was significant at the 1% level as confirmed by ANOVA. In addition, it was found that the listed sign language was highly rated for the presentation of urgent messages. The long sentences created more irritation and incongruity. Five participants were queried as to their understanding of the messages. Their average correct answer rates were 0.95 for the listed sign language messages and 0.80 for the long sentence messages. Therefore, the listed sign language messages could be well understood.

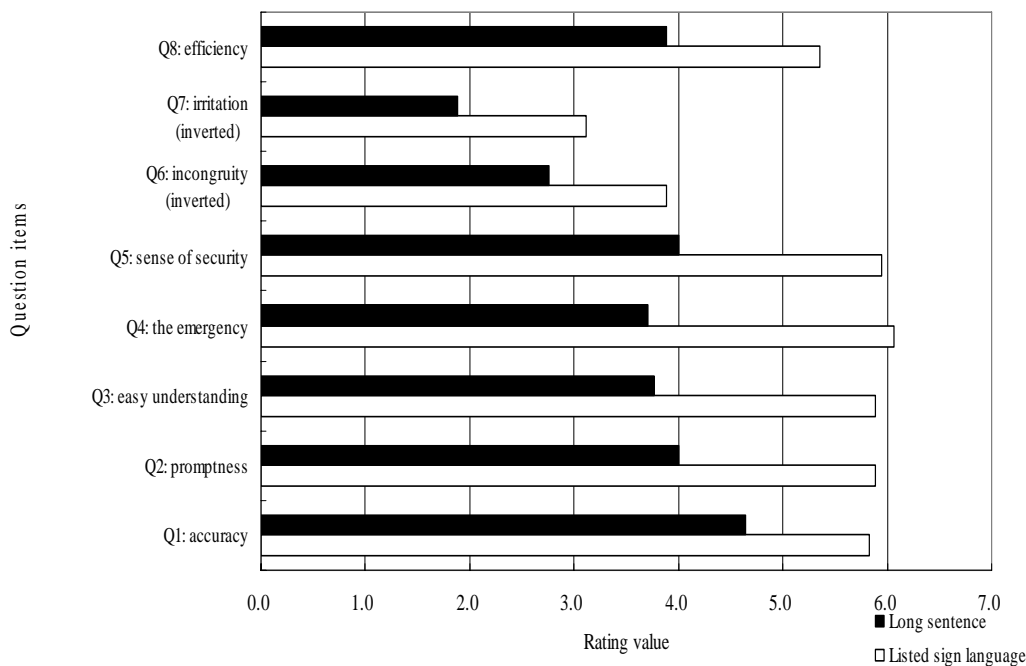


Fig.2 Results of the subjective evaluation by 17 participants.