

Multilingual Disaster Information for Mobile Phones in Japan

Masaru Miyao^{1,4}, Kumi Sato², Satoshi Hasegawa^{3,4}, Kazuhiro Fujikake⁴,
Shozo Tanaka⁴, and Kohei Okamoto⁵

¹ Information Technology Center, Nagoya University, Chikusa-ku Nagoya, Japan
mmiyao@med.nagoya-u.ac.jp

² Graduate School of International Development, Nagoya University, Nagoya, Japan
avenues@sato.email.ne.jp

³ Department of Information Culture, Nagoya Bunri University, Inazawa Aichi, Japan
hasegawa@nagoya-bunri.ac.jp

⁴ Graduate School of Information Science, Nagoya University, Nagoya, Japan
s.tanaka@tc.kawai-juku.ac.jp

⁵ Graduate School of Environmental Studies, Nagoya University, Nagoya, Japan
miyao@itc.nagoya-u.ac.jp

Abstract. A multilingual disaster information system (MLDI) has been developed to overcome the language barrier during times of natural disaster. MLDI is a web-based system that includes templates in nine languages so that translated texts can be made available immediately. Mobile phone e-mail with graphic text is a useful tool for delivering multilingual disaster information. We assessed the performance of the translation system and the multilingual graphical characters, and found that they are sufficiently useable. We discussed the usage of mobile phones for multilingual disaster information delivery system including Early Earthquake Warning system. Multilingual mobile information and measures is useful for a safe and barrier-free society.

1 Introduction

There are more than 2 million foreign residents from more than 180 countries in Japan. Disaster information or other important information must be made available to all people in a country, including foreign residents and travelers who cannot understand the native language of the country. However, it is not easy to translate various information into various languages rapidly and accurately in times of emergency. We introduce a multilingual disaster information system (MLDI) that translates a range of information on natural disasters, including earthquakes, and tsunami (tidal waves), quickly and accurately into four languages. And we are now developing graphical character short message services (SMS) for Chinese and Korean characters.

2 Template Translation for Multilingual Disaster Information

Although automatic translation systems have been studied and developed, complete translation of natural languages into other languages is difficult. In the case of disaster information, correct translation is essential. Fortunately, most disaster-related

information can be expressed in short sentences with fixed form (Fig. 1). Template translation is one possible means to produce multilingual information quickly and accurately.

Disaster information needs to be sent to all disaster victims including foreign residents, and to be made available to travelers in a language they understand. Such information should immediately reach victims no matter where they are. Reports from residents in disaster spots about traffic conditions or other local information for daily

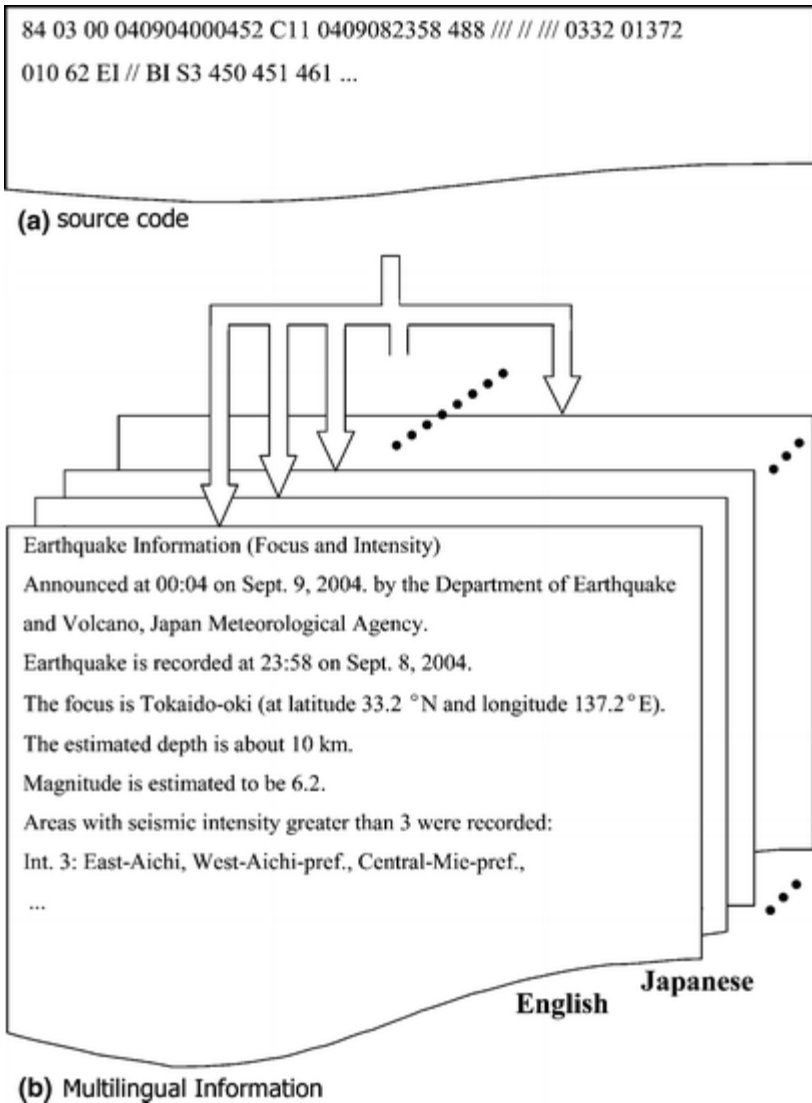


Fig. 1. Samples of graphic characters for experiment 1

life is also required so that victims can get survival goods or move on to appropriate shelter. Moreover, the true meaning of provided information is, in some cases, difficult to decipher by foreigners who have insufficient knowledge about the culture.

A template translation method would seem to be useful to provide appropriate information to foreigners who need additional explanations or special information.

The promising approach is to use multilingual templates prepared previously for both original and translated messages. Templates should be prepared in sufficient number and with sufficient contents in several languages including the original language. Once the user fills in the blanks in the template of his/her native language, multilingual information will be generated instantaneously. The MLDI was developed under this concept.

3 Multilingual Disaster Information System (MLDI)

The MLDI has been developed by the Multilingual Disaster Information System Consortium. The MLDI is a web-based system. This system has more than 1,100 different template sentences classified into 40 categories in 7 groups. Once a user fills in blanks in the Japanese template in the edit mode and pushes the translation button, translated sentences appear in five languages, Japanese, English, Korean, Chinese and Portuguese. Templates in the current version of MLDI are classified into the seven groups: (1) before the occurrence of an earthquake, (2) after earthquake occurrence, (3) damage and relief, (4) life information, (5) traffic and lifelines, (6) safety and consultation, and (7) full information.



Fig. 2. Template Translation System for Earthquake Information

4 How to Use MLDI

The categories of the templates can be selected by pushing a button (Fig. 2). The contents of the templates are limited to earthquake and living information for victims. A user can easily choose the appropriate template from the list displayed after the category is selected. The language used to edit the template is also limited to only Japanese in this prototype version. The blanks in the Japanese text can be filled with the numbers, Roman letters or Japanese characters representing the name of places, dates, times, telephone numbers, or other information. In this system, the edited Japanese templates are translated into complete texts in four languages, English, Korean, Chinese and Portuguese, just by pushing the Translate button.

Translated texts can be downloaded as texts coded in Unicode (UTF-8) so that the user can combine them or lay them out suitably using MS-Word or other editors

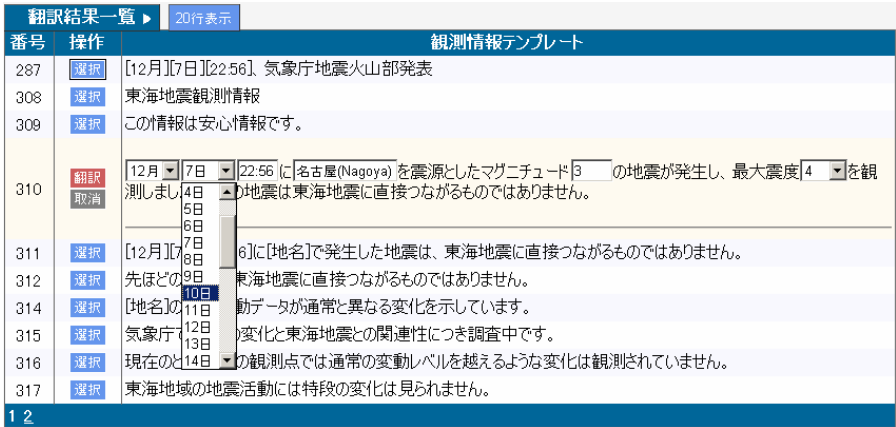


Fig. 3. Fill with the blanks in the Japanese text



Fig. 4. Translated texts can be downloaded as texts coded in Unicode (UTF-8). Japanese, English, Korean, Chinese and Portuguese sentences are shown. Blanks in the template are filled with the name of a location in Japanese and Roman letters.

supporting Unicode. This translated matter can be printed and distributed or put up as notices. The translations can also be sent by e-mail. Sending e-mails to mobile phones using graphical character e-mail on mobile phones is a particularly useful method to deliver disaster information.

5 Information Delivery

Although there are many possible methods to deliver multilingual disaster information, mobile phone (MP) e-mail is superior to methods such as distributing printed matter or e-mail sent via personal computers, in terms of its quickness and independence of the location or supply of electric power (Fig. 5).

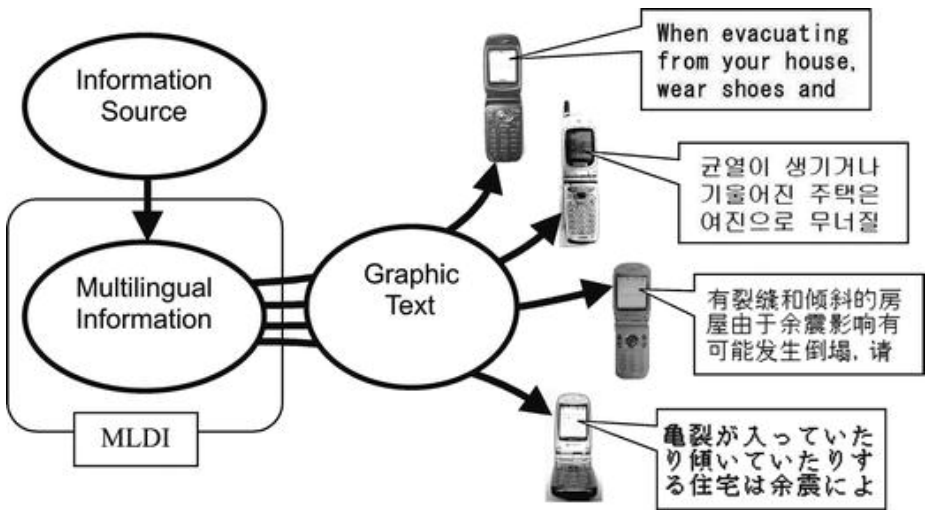


Fig. 5. Multilingual information delivery using graphic text for mobile phones

However, ordinary mobile phone models used in Japan do not support multilingual characters. They can only display alphanumeric characters, Japanese and several symbols. On the other hand, almost all of these mobile phones can display digital images in JPEG format. This function was originally used to display natural photo images such as scenery or portraits taken by the built-in cameras. Graphic text is useful to send multilingual short phrases to mobile phones that do not support the languages in question. Although the data size for graphic images attached to a single e-mail on mobile phones is limited, a small amount of image data is suitable for display on the small LCDs of the mobile phones, and is also suitable for the short phrases of multilingual disaster information generated by MLDI as shown in Fig. 6.

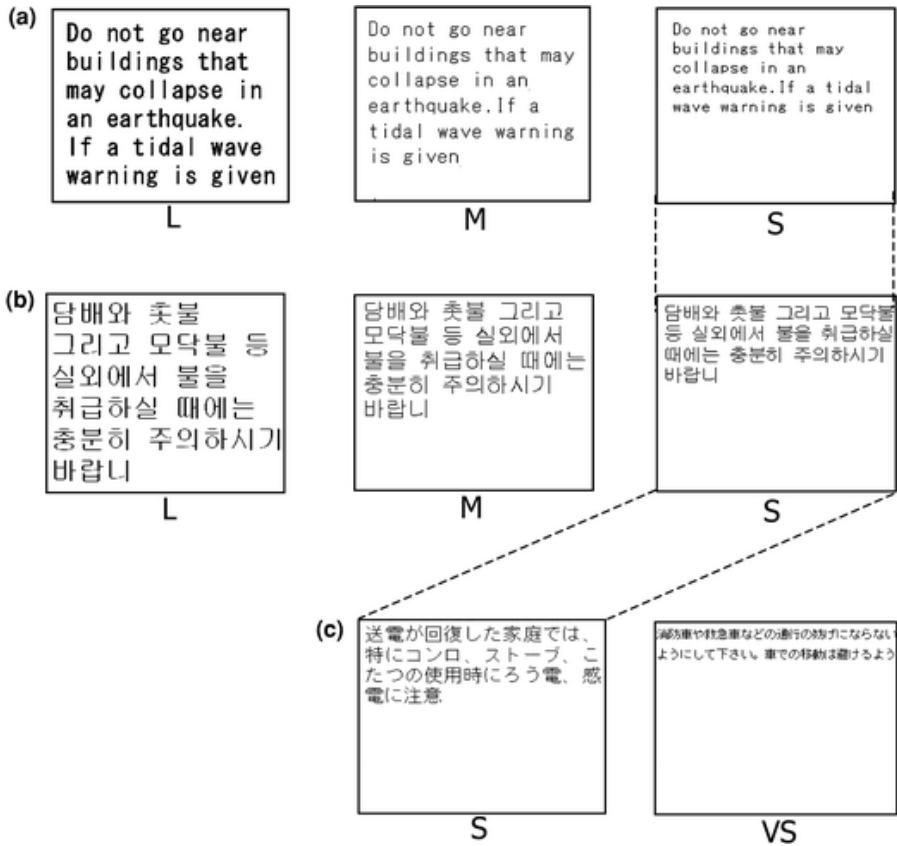


Fig. 6. Examples of graphic text. Short sentences are presented in the JPEG format. We checked the character size and font resolution.

6 Discussion on Disaster Information Delivery

Graphical texts as visible as text in the built-in font on LCDs in mobile phones. Short messages like the disaster information generated by MLDI can be sent by this method. However, the disaster information needed in an emergency varies. Urgent messages such as warnings for tsunami or tidal waves must reach people within a few minutes after an earthquake in some cases. On the other hand, living information such as the places of the shelters or the traffic conditions can be made available any time. Disaster information should be delivered to people who need it, at an appropriate time in an appropriate format, and in an appropriate language. We hope some media will be developed soon as a strong tool to deliver disaster information quickly and reliably in a calamity situation. Diversified media should be used to deal with various situations in times of calamity.

The Japanese Meteorological Agency (JMA) started delivering Earthquake Early Warning (EEW) since February, 2005. This system has been conducted involving the

latest progress in earthquake engineering with regard to estimation techniques on the hypocenter, fault and earthquake motion parameters and in information technologies. EEW system estimates 3 items: 1) hypocenter estimation (using single station method and network method), 2) magnitude estimation, and 3) seismic intensity estimation.

Dissemination Criteria of EEW is as follows:
 Over 3.5 for magnitude or 3 for JMA seismic intensity scale.

1. The first warning: The result using 2seconds waveform or onsite warning over 100cm/s/s (without hypocenter information)
2. The cancel report: There is no following P phase detection at the closest station.
3. The updated warnings: Threshold Change 0.2 degrees for latitude and longitude,
 - 20km for hypocentral depth,
 - +0.5, -1.0 for event magnitude
 - +0.5, -1.0 for maximum seismic intensity.
4. The final warning: when the estimated magnitude value converged, or when the pre-set time has passed after the first detection of the P phase.

EEW should be simple stereotyped information. MLDI is a web-based system that includes templates in five languages so that translated texts can be made available immediately. We think EEW is easy to be translated into foreign languages as templates. Mobile phone e-mail with graphic text is a useful tool for delivering EEW.

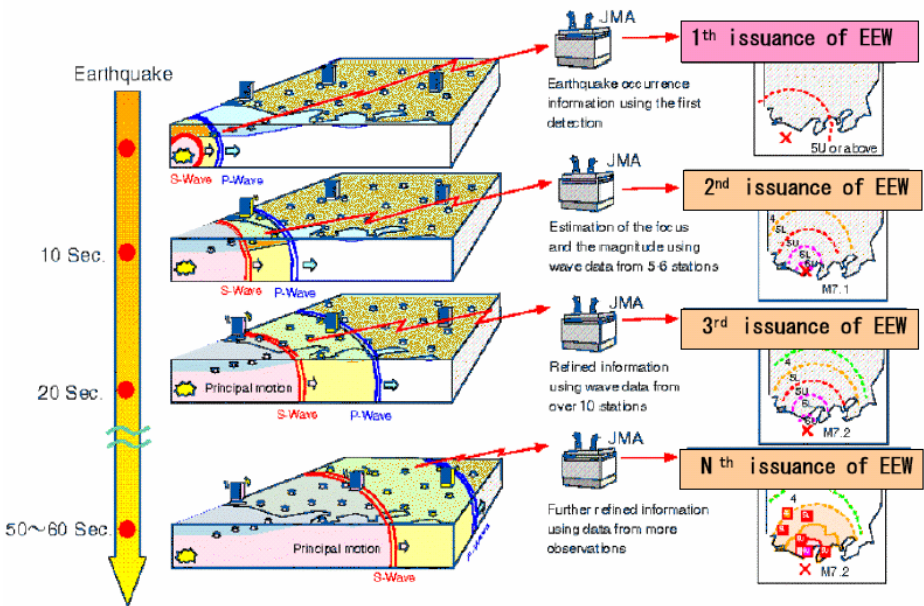


Fig. 7. Conceptual image of seismic wave propagation and Earthquake Early Warning Mitsuyuki HOSHIBA (2007) Earthquake Early Warning, -Information before strong ground motion -, Japan Meteorological Agency January 12, 2007.

7 Conclusion

A template translation technique and graphical character e-mail on mobile phones were used in this system. These techniques are essential to our MLDI system. Multilingual information will be helpful in creating a barrier-free society, including many foreign residents. We assessed the performance of the translation system and the multilingual graphical characters, and found that they are sufficiently useable. We discussed the usage of mobile phones for multilingual disaster information delivery system including Early Earthquake Warning system.

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