

# Telegram-Based Chatbot Application for Foreign People in Japan to Share Disaster-Related Information in Real-Time

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**Abstract**—When a disaster occurs, early evacuation of residents is one of the effective ways for the reduction of human damage. Then, the rapid collection and delivery of accurate disaster-related information are essential. In this study, we develop a chatbot application as an add-on to the Telegram platform interface. This chatbot provides emergency information to foreign people in Japan at the time of disasters. The information provided by the proposed application is, for example, the nearby evacuation points such as the evacuation centers and train stations, and the real-time disaster information based on the user's current location. People can also share disaster-related pictures via the proposed application. Such pictures may be useful not only for disaster-affected people but also for governmental agencies to gain a better understanding of current conditions and thus help them make informed decisions.

**Keywords**—*natural disaster; disaster-related information; Chatbot; telegram*

## I. INTRODUCTION

Various large-scale natural disasters occur every year in Japan. For example, more than 6,000 people died in the Great Hanshin-Awaji Earthquake of 1995 [1], and more than 15,000 people died in the Great East Japan Earthquake of 2011 [2][3]. Damages caused by typhoons, heavy rains, and heavy snows are also frequent. Evacuation information must be easy to understand to realize a quick and safe escape of people when a disaster occurs. However, at the time of a disaster in Japan, it is difficult for foreigners to obtain information about the disaster. This is because almost all information is written in Japanese [4]. Even though disaster-related information such as evacuation information is provided through mass media and smartphone applications, many foreigners cannot utilize it. Then, in this study, we develop a disaster-related information sharing chatbot application to help foreigners, especially those who have just arrived in Japan, to collect information in the event of a disaster. The system helps them to know, for example, how to evacuate from the disaster-affected area and find the nearest evacuation spots.

The google map is quite popular among modern technology users. Then the proposed chatbot uses Google Maps as a reference platform for the geographical information base map. It is pointed out in [5] that 77% of smartphone owners use navigation applications regularly,

and Google Maps is by far the most popular navigation applications. Therefore, this chatbot would be a handy and easy to use interface.

The proposed chatbot is developed as an add-on to the Telegram, one of the popular social network applications, and provide disaster-related information to foreigners trapped in disaster-affected areas. The proposed chatbot helps people to access the data on the nearest evacuation centers and nearest train stations (they can check the location of those on the Google map). The chatbot provides disaster-related information such as earthquakes, typhoons, torrential rains. Besides, users can receive local weather information based on their current location.

## II. PROPOSED SYSTEM

### A. Definition of the Problem

As mentioned earlier, disasters occur frequently in Japan. Mechanisms for providing disaster information via television, radio, and smartphone are in place. However, most information is in Japanese, and there is still room for improvement in the information provision mechanism for foreigners staying in Japan.

In this study, we construct a disaster information sharing system for foreigners staying in Japan. This system is implemented as a chatbot running on Telegram.

### B. Telegram

Telegram, initialized in August 2013 by the Russian-born entrepreneur Pavel Durov, is one of the popular messaging services that is based on the open-source platform and is completely free service without any payments [6]. Telegram applications can transmit various kinds of information such as pictures, video, audio, location to users. According to the survey of Statista [7], the number of telegram users is increasing year by year, and the number of monthly active users in March 2019 was about 200 million. That is, Telegram can be regarded as one of the most popular messaging services in the world. Then, we decided to use this platform in this study.

### C. Basic Concept of the System

Because the Japanese language is a difficult one to learn and speak in a short time, and even if someone learns to speak, still it would be difficult for his/her to read Japanese

properly, we have decided to conduct this study to help those who are in need of the disaster information with this handy tool. The Ministry of Foreign Affairs of Japan (MOFA) [8] said that more than 3.66 million people in 137 countries and regions study Japanese. However, many foreign people who come to Japan have little knowledge of Japanese.



Figure 1. Functions of the proposed chatbot.

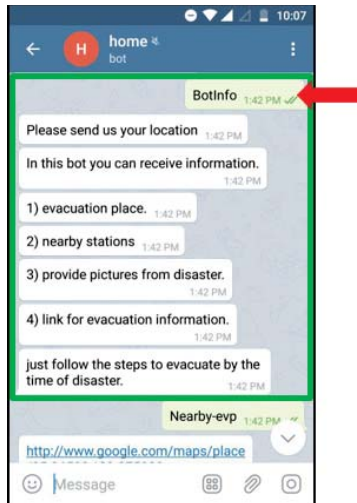


Figure 2. Basic chatbot information.

In this study, we focus on the following three points; usefulness, reliableness, and ease of use. In [9], Clyne and Sharifian state that 380 million people have English as a first language and more than a billion people use it as a second (or additional) language. Then, to realize the first point, we decided to deliver information in English. To realize the second point, we use various kinds of official information offered by public institutions, such as the prefectural governments. Moreover, a chatbot is adopted as a means of

providing information to realize the third point. Information that users want to obtain can be easily gotten only by selecting the button on the menu (Fig. 1).

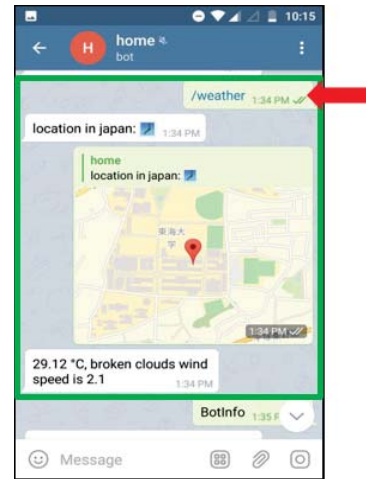


Figure 3. Basic chatbot information.



Figure 4. Google maps links to the three nearby evacuation centers.

#### D. System Details

The proposed system is implemented as a telegram chatbot application. The system uses the Telegram API to send and receive real-time information.

Figure 2 shows the basic information on how to use this chatbot. As shown in Fig. 3, the bot provides weather information on the user's current location using the Weather API of OpenWeather [10].

Figure 4 shows an example that the chatbot provides three nearby evacuation centers from the user's current location. Figure 5 shows an example of providing the names of the evacuation centers. Almost all evacuation centers are schools and public places in Japan. Figure 6 shows an example of providing three nearby railway stations. The station information is provided as the links to the Google map.

As shown in Fig. 7, users can send messages to the chatbot (our system records all messages sent by users). Figure 8 shows an example that the system sends a user the link to a prefectural government Web site that provides disaster information. (In the current version of the system, the links only to the websites of Kanagawa Prefecture, Japan [11] can be provided.) If the user sends the current location information to this bot, he/she can receive the latest disaster-related information of the current location.

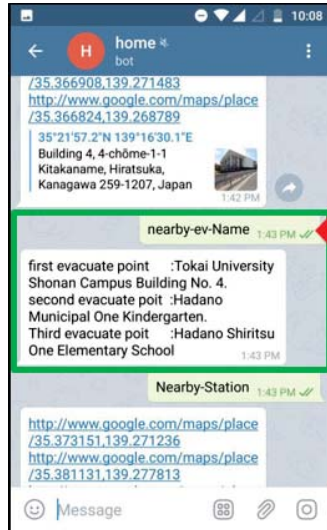


Figure 5. Names of the three nearby evacuation centers.

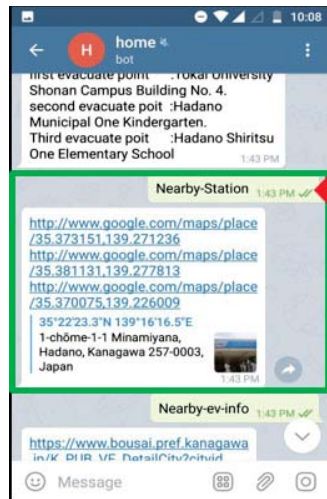


Figure 6. Google maps links to the three nearby railway stations.

When a user sends his/her current location to our system (latitude and longitude), the system saves it. When nearby individuals who use the same chatbot, they can find out the user's location by the Google maps link, which will be provided automatically by the system, as shown in Fig. 9.

As shown in Fig. 10, users can share disaster-related pictures; that is, users of this system can upload and download pictures. Such pictures may be useful not only for

disaster-affected people but also for governmental agencies to gain a better understanding of current conditions and thus help them make informed decisions. This part can be one of the most useful parts of the proposed chatbot.

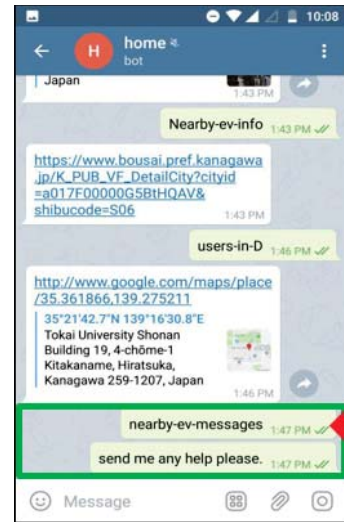


Figure 7. Sending message function.

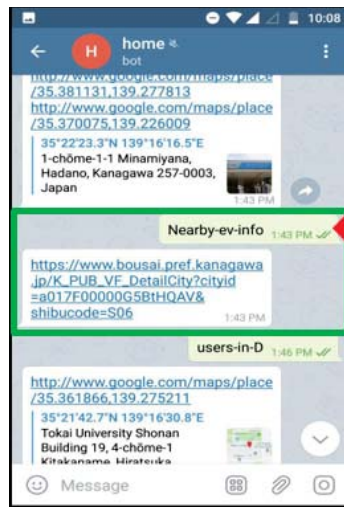


Figure 8. The link to a prefectural government Web site that provides disaster information.

### III. RELATED WORK

There are lots of disaster-related information providing and sharing system. For example, Uchida et al. developed a real-time Twitter-based disaster-related information sharing system that supports self-, mutual-, and public help in the aftermath of a disaster [12]. The system consists of two subsystems: the Disaster Information Tweeting System (DITS) and the Disaster Information Mapping System (DIMS). DITS is a Twitter client that adds geo-information such as the street address and a hashtag in the form “#(municipality name) disaster,” whereas DIMS plots tweets



posted via DITS on a digital map in real-time. Kosugi et al. improved the practicality of DITS/DIMS, for example, whereas the original DITS could only be used in Japan, the improved version is available around the world [13]. However, DITS/DIMS is mainly aimed at sharing information among ordinary citizens, then it is not suitable for use in acquiring weather and evacuation information.



Figure 9. Location information of nearby users.



Figure 10. The function of disaster-related picture sharing.

Safety tips, developed by RC Solution Co., is a smartphone application that notifies foreign people with earthquake early warnings, tsunami warnings, volcanic warnings, weather warnings, heat illness warnings, and civil protection information issued in Japan and is available in 12 languages [14]. However, this application does not have a function to share information (disaster-related pictures and location information of users).

#### IV. DISCUSSION

By using the proposed chatbot, foreigners staying in Japan can acquire the disaster-related information written in not Japanese but English easily. Moreover, they also share the disaster situation (disaster-related picture) in the vicinity. These functions have not been realized by various disaster information provision services deployed in Japan.

We plan to investigate what kind of information format is the best from the point that people can understand easily and act immediately after receiving disaster information.

#### V. CONCLUSION

In this study, we developed a Telegram-based chatbot application providing disaster-related information to the foreign people in areas affected by disasters such as earthquakes, tsunamis, and heavy rains. The proposed system uses the advantage of the Telegram application, one of the popular social network services, which can send information in real-time and enable users to access various kinds of information.

We will evaluate the usability of the proposed application. Furthermore, we have a plan to combine the proposed system with the Twitter-based disaster information sharing system proposed by Uchida et al. in the previous studies [12], [13], [15].

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