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Osamu Uchida, Sachi Tajima, Yoshitaka Kajita, Keisuke Utsu, Yuji Murakami, Sanetoshi Yamada

HAL Id: hal-03374237
https://inria.hal.science/hal-03374237

Submitted on 12 Oct 2021

Workshop Program on Disaster Prevention and Mitigation for Young Generation Utilizing Disaster Information Tweeting and Mapping System

Osamu Uchida[1], Sachi Tajima[2], Yoshitaka Kajita[3], Keisuke Utsu[4], Yuji Murakami[5], and Sanetoshi Yamada[6]

[1] Dept. Human and Information Science, Tokai University, Hiratsuka, Kanagawa, Japan
[2] Center for Liberal Arts, Tokai University, Hiratsuka, Kanagawa, Japan
[3] Dept. Civil Engineering, Tokai University, Hiratsuka, Kanagawa, Japan
[4] Dept. Communication and Network Engineering, Tokai University, Minato, Tokyo, Japan
[5] Dept. Electrical Engineering and Computer Science, Tokai University, Kumamoto, Japan
[6] Research and Information Center, Tokai University, Hiratsuka, Kanagawa, Japan
o-uchida@tokai.ac.jp, stajima@tokai-u.jp, yokaji@tokai-u.jp,
utsu@utsuken.net, my072539@tsc.u-tokai.ac.jp,
S.Yamada@star.tokai-u.jp

Abstract. Various large-scale natural disasters occur every year in Japan. Then, various disaster education is conducted at schools and in local communities for alleviating the damage caused by such natural disasters. However, according to various surveys, disaster prevention awareness among young people is known to be lower than in other age groups in Japan. Therefore, we worked with Kanagawa Prefecture, Japan, on establishing a program of workshops on disaster prevention and mitigation utilizing ICT equipment such as smartphones or tablet PCs to raise awareness of disaster prevention and mitigation among young people. The program is based on town watching and group discussion using DITS and DIMS (disaster information tweeting and mapping system) proposed in the previous studies. In this paper, we introduce the contents of the developed workshop program using DITS/DIMS. Moreover, we report on the results of the workshops for disaster prevention and mitigation using this program at several junior high and high schools. The results of the post-questionnaire show that many participants of the workshops had a positive impression on the disaster prevention and mitigation workshops using DIST/DIMS.

Keywords: Disaster Prevention and Mitigation, Disaster Information, Town Watching, Social Media, Twitter

1   Introduction

Various large-scale natural disasters occur every year in Japan [1]. For example, more than 6,000 people died in the Great Hanshin-Awaji Earthquake of 1995 [2], and more than 15,000 people died in the Great East Japan Earthquake occurred in 2011 [3][4]. Damages caused by typhoons, heavy rains, and heavy snows are also frequent. Then,

various education on disaster prevention and mitigation has been conducted at schools and local communities for alleviating the damage caused by such natural disasters [5][6]. In the Great East Japan Earthquake, there was a school where students could take appropriate evacuation behaviors due to the results of daily disaster education [7][8]. Therefore, the effect of disaster prevention education attracts a great deal of attention recently. However, according to various surveys, disaster prevention awareness among young people is known to be lower than in other age groups in Japan. Therefore, we have worked with Kanagawa Prefecture, Japan, (http://www.pref.kanagawa.jp/english/) on establishing a program of workshops on disaster prevention and mitigation utilizing ICT equipment such as smartphones or tablet PCs to raise awareness of disaster prevention among young people, especially junior high and high school students. The reason why we tried to utilize ICT equipment for disaster prevention education is mainly due to the following two reasons:

- It is becoming common to utilize social media in the event of a disaster [9][10][11].
- The generality of junior high school and high school students have a smartphone and use it actively in Japan.

The established program is based on town watching and discussion using DITS and DIMS (disaster information tweeting and mapping system) proposed by us in the previous studies [12][13]. In this paper, we introduce the contents of the established program of workshops on disaster prevention and mitigation. Moreover, we report on the results of the workshops for disaster prevention and mitigation using this program at several junior high and high schools.

2 Utilization of Twitter at the Time of Disaster

To minimize damage in case of large-scale disasters, it is important to collect and distribute information quickly and accurately. Therefore, the potential for the use of social media, especially Twitter, during disasters has attracted worldwide attention [9][10][11]. In recent large-scale natural disasters, Twitter has actively been used as a communication tool; during the Great East Japan Earthquake on March 11, 2011, for example, many people used Twitter to find information about the tsunami, shelters, the state of public transportation services, and so on [14][15][16]. When Hurricane Sandy hit the U.S. East Coast in 2012, many people used Twitter to share disaster-related information; more than 20 million tweets that included the words "sandy," "hurricane," "#sandy," and "#hurricane" were posted between October 27 and November 1, 2012 (https://twitter.com/Twitter/status/264408082958934016). Over a quarter million tweets were posted in the first 72 hours after Typhoon Haiyan destroyed large areas of the Philippines [17], and a crisis map was made using crowdsourcing [11]. During the 10 minutes from 8 o'clock immediately after the 2018 Osaka Northern Earthquake occurred, more than 275,000 tweets including the word "地震" (earthquake, in Japanese) were posted [18]. Nishikawa et al. [19] showed that many tweets including the hashtag #救助 (救助 means rescue) were posted fore rescue request in 2018 Japan Floods.

The following text is an actual tweet posted after the 2016 Kumamoto Earthquake occurred: "There is no food or drink at Ubuyama Junior High School. The people there are really in trouble. Please send them food. Please help them. They need disposable diapers because there are many seniors" (original tweet is written in Japanese). Such tweets may be useful not only for disaster victims but also for governmental agencies to gain a better understanding of current conditions and thus help them make more informed decisions. For the reasons noted above, many Japanese national and local governmental agencies began to use Twitter to collect and distribute information during disasters. For example, the city government of Wako, Saitama Prefecture, Japan, decided that the hashtag "#和光市災害" (和光市 and 災害 mean Wako City and disaster, respectively, in Japanese) would be used as the official hashtag for posting disaster-related tweets. The use of hashtags with the form "#(municipality name) disaster" has been spreading to other municipalities in Japan in recent years.

3 DITS/DIMS: Disaster Information Tweeting and Mapping System

We give an overview of the disaster information tweeting and mapping system developed by Uchida et al. [12][13]

3.1 DITS: Disaster Information Tweeting System

DITS (Fig. 1) has the following features:

- The user's current geolocation information is acquired by using location specification functions, such as the Global Positioning System (GPS). Based on the acquired location information, the street address of the user's current location, the hashtag of the form "#(municipality name) disaster," and the Military Grid Reference System (MGRS) code [20] are automatically attached to the tweet.
- In cases when the user needs rescue, the hashtag #救助 (救助 means rescue) is also attached to the tweet.
- An image can be attached.
- When a tweet is posted, the following information is stored in a database: (i) username, (ii) screen name, (iii) tweet ID, (iv) tweet text, (v) date and time of tweet post, (vi) latitude, (vii) longitude, (ix) MGRS code, (x) address, (xi) presence of the rescue hashtag (``\#rescue"), and (xii) URL of the attached image (if any).
- Tweets are posted from the user's own Twitter account (Twitter authentication is conducted at the start of system use).

Because the information posted using DITS is also posted on Twitter as tweets from the user's Twitter account, it can be used not only by users of this system but also by other disaster victims and organizations.

Fig. 1. Tweet posting page of DITS (left) and an example of a tweet posted by DITS (right)

3.2   DIMS: Disaster Information Mapping System

DIMS has the following features:

- A Twitter account is not required to use this system.
- It displays a map with the most recent 30 tweets posted via DITS within 20 km of the user's location.
- The map is centered on the user's current position.
- The shape and color of the icon used to indicate the position of the tweet change, depending on whether the rescue hashtag (#救助) and an image are attached or not.
- The places of shelters within 2 km from the user's current location are displayed on the map. If user click (tap) a shelter icon, the shortest route from the current location of the user to the shelter is displayed.

Since the DIMS map displays centered on the user's current position, it is possible to obtain only nearby information efficiently.

4 Workshops on Disaster Prevention and Mitigation Utilizing DITS and DIMS

4.1 The Established Program

The established program of workshops on disaster prevention and mitigation is based on "town watching" using DITS and "group discussion" using DIMS. The main objectives of this disaster education program are as follows:

- to arouse awareness of disaster prevention through town watching,
- to learn the advantages and disadvantages of using Social Media at the time of disaster.

The schedule of this workshop program is as follows (in case that the total workshop time is 100 minutes):

1. Introduction: 15 min.
2. Town watching (using DITS): 45 min.
3. Group discussion (using DIMS): 20 min.
4. Report on group discussion: 10 min.
5. Summary: 5 min.
6. Questionnaire: 5 min.

In town watching, the participants post a tweet with a photo by DITS. DITS is originally a system to post disaster-related information such as damage situation and needs of victims in the event of a disaster. However, in this workshop program, DITS is used as a tool for getting the awareness of places and things in terms of disaster and disaster prevention. When the participants find an important site or thing from the viewpoint of disaster prevention and mitigation, for example, a dangerous site such as steep slope and a useful thing such as a fire extinguisher, in the town watching, they post a photo of such a place and a thing with a comment using DITS.

After the town watching, group discussion is conducted. In the discussion, the participants utilize DIMS to look back to the town watching. By using DIMS, the participants can browse the tweets posted by DITS in the town watching. The following subjects are given to the participants;

- Look back the tweets you posted. Explain what points you took notice of while showing the tweets you posted in the town watching. Moreover, describe your idea what kind of attention is needed in the event of a disaster.
- What kind of tweets do you think is useful at the time of disasters? What should we pay attention to when posting a tweet on disaster information? What should we pay attention to when receiving disaster information from Twitter?

After the group discussion, the representative of each group reports the conclusions obtained from the group discussion.

4.2 Implementation of Workshops at Junior High and High Schools

We conducted workshops based on the established program at six schools (three junior high schools and three high schools) in Kanagawa Prefecture, Japan (Table 1). In town watching, we lent one tablet PC (HUAWEI MediaPad T3 LTE model) to each group (5 or 6 people/group) and asked the students to post a tweet by DITS (Fig. 2). Figure 3 shows examples of the tweet posted by DITS in the town watching. The left figure of Fig. 3 is a tweet on a storage warehouse for disaster prevention and mitigation. The right figure of Fig. 3 is a tweet on a sign indicating 4.7 m above sea level. Every student posted tweets at least twice. Figure 4 shows the group discussion using DIMS. Figure 5 shows an example of a tweet displaying on DIMS.

Table 1. Outline of workshops conducted at six schools

School City	Date and time	# of participants
Hadano High School Hadano City	July 9, 2018, 14:30~16:30	34
Minamigaoka Junior High School Hadano City	July 13, 2018, 8:45~12:35	109
Nishiikuta Junior High School Kawasaki City	July 17, 2018, 14:00~16:00	62
Hiratsuka Commercial High School Hiratsuka City	Sept. 10, 2018, 10:50~12:50	35
Kanazawa-Sogo High School Yokohama City	Oct. 29, 2018, 13:35~15:25	35
Fujino Junior High School Sagamihara City	Oct. 31, 2018, 13:40~15:30	51

Fig. 2. Tweet posting using DITS in town watching

Fig. 3. Examples of the tweet posted by DITS in the town watching

Fig. 4. Group discussion using DIMS

4.3   Summary of Post-questionnaire of Workshops

A post-questionnaire was carried out in each workshop (16 items). The results on several major questions are shown below (we ask students to evaluate each question item on a scale of one to four; 1: I do not think so at all., 2: I do not think so., 3: I slightly think so., 4: I strongly think so.).

— Q.3: Did you discover new things in the town watching from the viewpoint of disaster prevention?
— Q.4: Did you discover new things in the group discussion after the town watching from the viewpoint of disaster prevention?
— Q.5: Have you raised awareness of disaster prevention by receiving today's class?
— Q.6: Was today's class more interesting than previous disaster prevention drills and disaster prevention?

Fig. 5. An example of tweet displaying on DIMS

- Q.8: Do you want to participate in the disaster prevention workshop using ICT equipment again?
- Q.10: Do you think DITS/DIMS is easy to use?
- Q.11: Do you want to use DITS/DIMS yourself in the future?
- Q.12: Do you think DITS/DIMS will be useful in the event of a disaster?

Figure 6 shows the results of each question (reply rates for each scale). As shown in the figure, many participants of the workshops had a positive impression on the disaster prevention and mitigation workshops using DIST/DIMS. Below are some of the comments:

- This workshop was an opportunity to think about what I can do in the event of a disaster.
- I think it is very important to act while assuming the occurrence of a disaster from usual.
- I think this workshop should be done in other places.
- When posting information at the time of a disaster, I want to check the contents to post carefully.
- I want to use Social Media positively to protect the area where I live.

5   Conclusion

In this paper, we introduced the contents of the program of workshops on disaster prevention and mitigation established with Kanagawa Prefecture, Japan. Moreover, we reported on the results of the workshops for disaster prevention and mitigation using this program at several junior high and high schools. The results of the post-questionnaire show that many participants of the workshops had a positive impression on the disaster prevention and mitigation workshops using DIST/DIMS.
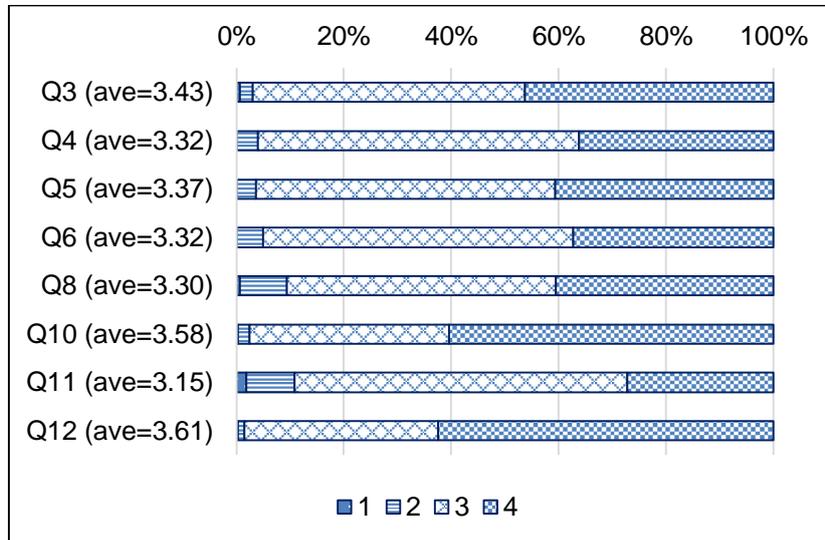
Fig. 6. The results of the questionnaire

In the future, we will examine which of the conventional workshops on disaster prevention and mitigation, that is, the one without using ICT equipment, and the proposed workshop program is better.

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