Media Mediate Sentiments: 
Exploratory Analysis of Tweets Posted Before, During, and After the Great East Japan Earthquake

Naohiro Matsumura, Osaka University, Toyonaka, Japan
Asako Miura, Kwansei Gakuin University, Nishinomiya, Japan
Masashi Komori, Osaka Electro-Communication University, Neyagawa, Japan
Kai Hiraishi, Keio University, Minatoku, Japan

ABSTRACT
When the Great East Japan Earthquake occurred, Twitter was used as an infrastructure for sharing information carried by other media. In other words, Twitter is considered as a “meta medium.” Earthquake-related tweets included information that was of questionable veracity, contained vicious rumors, and propagated matters of controversy that often gave rise to various discussions and arguments. In this research, the authors analyzed 89,351,242 tweets posted from December 11, 2010 to April 16, 2012. They then extracted 9,816,625 URLs and classified the top 100 domains of these URLs into 19 media categories. The emotional reactions of Twitter users were investigated by counting the terms conveying positive and negative emotions included in the body of tweets along with the media URLs. The authors’ findings revealed differences in terms of the frequency with which terms expressing emotions were evoked and differences in the patterns of their surges, across the various media. The authors also considered the usage of various terms appearing in tweets concurrently with the terms expressing emotion.

KEYWORDS
Emotional Reaction, Great East Japan Earthquake, Media, Sentiment Analysis, Twitter

1. INTRODUCTION
The Great East Japan Earthquake struck at 14:46:24 JST (5:46:24 UTC) on March 11, 2011. The magnitude was 9.0, the fourth-largest earthquake in the recorded history of the world. The earthquake unleashed a powerful tsunami exceeding 10 meters in height, which in turn caused nuclear accidents at the Fukushima nuclear power plants, and resulted in terrible tragedies: 15,890 deaths and 2,589 missing as of March 6, 2015. There remain vast areas in which the Government of Japan has prohibited people from living and other areas for which they have recommended evacuation because of the high level of nuclear contamination. In addition, many people lost their jobs and have had to move for the sake of their livelihood. Even on January 29, 2016, nearly five years since the earthquake, 177,866 inhabitants, who were evacuated from the disaster area, are still living in temporary housing (Reconstruction Agency, 2016). The damage to surrounding areas remains and people have to face recovering and reconstructing their lives.

Around the time the earthquake struck, the Twitter microblogging service on the Internet was utilized as an infrastructure for gaining instant information. Twitter enables users to post messages
of up to 140 characters in length and it can serve as a medium to share information originating with the users themselves and also as a “meta medium” for sharing information carried by other media. Earthquake-related information (posts relating to the Great East Japan Earthquake) included information that was of questionable veracity, as well as vicious rumors, and matters of controversy that could be interpreted either positively or negatively depending on the reader’s viewpoint, which often gave rise to various discussions and arguments. Negative information was found to explicitly or implicitly affect consumer preferences for products, such as agricultural crops, meat, fish, and seafood, and resulted in a reduction in sales.

The term media is widely used in a collective sense, but it comprises many different types and contents, in forms such as newspapers and TV “mass media,” Twitter, Facebook, and other “social media” websites, personal websites, blogs, and other “personal media,” photos, videos, and other “image media.” Some categories of media are suited to conveying facts objectively, and others for promoting consideration from different angles. In this study, we analyze the emotions of contributors to Twitter who were induced by the media to post messages concerning the Great East Japan Earthquake, as a means of examining the psychological effects of the media on the contributors.

2. RELATED WORK

Social media usage during disasters has previously been analyzed to understand people’s online behavior (Savage, 2011). Sakaki et al. (2010) and Earle et al. (2010) showed that Twitter could be used for earthquake detection because people play the role of a social sensor when an earthquake occurs. Mendoza et al. (2010) analyzed the propagation of false rumors and confirmed news from tweets regarding the 2010 Chile earthquake. Oh et al. (2010) found that tweets from credible sources about the 2010 Haiti earthquake contributed to suppressing anxiety among the Twitter community. Qu et al. (2011) analyzed information relating to the 2010 Yushu earthquake available at Sina Weibo, a popular Chinese microblogging service, and revealed various aspects of information dynamics, for example, how messages were re-posted and spread. Miyabe et al. (2012) analyzed tweets related to the Great East Japan Earthquake and found that people outside the disaster area tended to retweet information coming from within the disaster area. Tanaka et al. (2014) concluded that posting URLs in earthquake-related tweets increased rumor-spreading behavior. Cohn et al. (2004) analyzed participants’ diary entries written prior to and after the September 11 attacks, and found that, for a short period after the attack, participants expressed more negative emotions, but that their moods returned to their baselines two weeks after the attack.

Sentiment analysis was applied to tweets to capture public moods for a specific event (Go et al., 2009; Agarwal et al., 2011). Sentiments prevailing in social media content also influence people’s information sharing behavior. Stieglitz and Dang-Xuan (2013) showed that emotional tweets tended to be retweeted more often and more quickly. Thelwall et al. (2011) found that sentiment in tweets about popular events was associated with an increase in negative sentiment. Doan et al. (2012) investigated how tweets about the 2011 Tohoku earthquake affected the awareness and anxiety levels among people in the Tokyo metropolitan district. Rimé (2009) showed that emotional experiences elicit a process of social sharing of emotion among people. Golder and Macy found that people wake up in a good mood that deteriorates as the day progresses. Back et al. (2010) investigated the timeline of negative emotions in response to the September 11 attacks and found that the expression of anger strongly increased with ongoing attacks, whereas anxiety was not related to time.

Although various aspects of people’s behavior and their sentiments in Twitter during disasters were studied, the relationship between sentiments and various types of “media” mediated by Twitter has not been studied yet.
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