Tweak the Tweet: Leveraging Microblogging Proliferation with a Prescriptive Syntax to Support Citizen Reporting

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ABSTRACT

In this paper, we propose a low-tech solution for use by microbloggers that could enhance their ability to rapidly produce parsable, crisis-relevant information in mass emergencies. We build upon existing research on the use of social media during mass emergencies and disasters. Our proposed intervention aims to leverage the affordances of mobile microblogging and the drive to support citizen reporting within current behavioral Twitter-based microblogging practice. We introduce a prescriptive, tweet-based syntax that could increase the utility of information generated during emergencies by gently reshaping current behavioral practice. This offering is grounded in an understanding of current trends in norm evolution of Twitter use, an evolution that has progressed quickly but appears to be stabilizing around specific textual conventions.

Keywords

Collective Intelligence, Crisis informatics, Disasters, Emergency, Hazards, Information Convergence, Information Diffusion, Microblogging, Technology Diffusion

INTRODUCTION

Members of the public provide critical help for response to mass emergencies during warning, rescue, and response periods of events (Dynes, 1970; Tierney, Lindell, Perry 2001, Kendra and Wachtendorf, 2006). In recent years, the desire to help has extended to informational assistance provided through information and communication technologies (ICTs) and social media (Hughes, Palen, Sutton, Liu, and Vieweg, 2008). During mass emergencies affecting broad geographical regions, where damage to the built and social environment is extensive, hard to assess, and difficult to navigate, everyone—members of the public and emergency responders—suffers from a lack of information. Much attention in the emergency-management focused technology arena focuses on this very issue. Here, we consider how existing ubiquitous mobile devices and social media can support the reporting and distribution of information within and across community-supported social networks (Shklovski, Palen, Sutton, 2008).

One avenue for leveraging social media in emergency response and sense-making is to use citizens as data reporters. Citizen data reporting has been essential for collating massive observation datasets essential for critical research breakthroughs in biological science – annual observations by thousands of naturalist enthusiasts ("citizen scientists") enabled the initial detection of anthropogenic climate change impacts on species (Audubon Society Christmas Bird Count; Root, 1994) and continues to provide critical data on species response to climate change (e.g., Doughton, 2009). Shneiderman and Preece (2007) built upon the idea of using citizens as sensors in local emergencies, outlining possibilities for capitalizing on more advanced implementations of 911 using social media. Citizen reporting on mobile devices is a bottom-up and self-organizing process unguided by top-down standards and oversight. Such discretionary technology adoption models can be an effective way to support diffusion because they integrate with people's existing practices and incentive structures (Grudin, 2008; Palen & Grudin 2002). Small, informed interventions—*tweaks*—however, can move use and practice in intentional directions, and this is what we propose here.

TWITTER AS OPPORTUNITY: BACKGROUND & EMERGENT BEHAVIOR

Twitter is a popular microblogging platform that allows users to broadcast short, 140-character messages (tweets) through socially-networked channels of listeners. Twitterers subscribe to the tweet broadcasts of other Twitterers by "following" them. Broadcast tweets are sent out to followers in update streams and can be

accessed in real-time or stored for later viewing. Twitter can be accessed (tweets sent and received) through the Twitterer web portal, via SMS on a mobile phone, or through a variety of third-party web and mobile applications. This structure enables both static and mobile one-to-many broadcasting through user networks.

Significant to this study, all tweets generated by accounts designated "public" are also simultaneously posted to Twitter's public timeline. Twitter allows 3rd-party software applications to access, search, and retrieve data from the public timeline through the Twitter Search API. Third-party Twitter clients and hobbyist programmers alike can use the API to search and collect data, including tweet content, tweet meta-data and author profile information. This public access and searchability make Twitter a valuable potential resource for retrieving, processing, and redistributing user-reported information during an emergency event.

Twitter Conventions: Emergent Normative Behavior

In the three years since Twitter's launch, several linguistic conventions have emerged, spread, and normalized in tweet content. User handle designations, retweets, hashtags, and, to a lesser extent, "follow" recommendations have converged around specific patterns whose propagation through the system defines a Twitter-specific language or syntax. These user-driven practices both derive from adaptations of language to fit the constraints of the Twitter platform (especially the 140-character limit for each Tweet) and evolve from linguistic adjustments to the unique affordances of an interactive, searchable and socially-networked broadcasting platform.

Hashtags are one emergent linguistic norm that has experienced widespread adoption on Twitter. Hashtags are used by Twitterers to tag or mark up their tweets with searchable keywords, allowing other users who may not be followers of an account, but are interested in the same topic, to tune in to related tweets via Twitter's search capabilities. The following is a hashtag example used during the 2009 Red River Floods:

```
@xandrex: Everyone is leaving campus. I don't know what I'm going to do. I hope
they don't close I94 or else I'm screwed. #fargo #redriver #flood09
```

Twitter in Mass Emergency

Twitter activity and the nature of its use during mass emergencies have been the recent subject of both media attention and academic research (Starbird, Palen, Hughes, and Vieweg, 2010; Hughes and Palen, 2009; Vieweg, Hughes, Starbird and Palen, 2010). Though research is not yet able to show how many people in a given area turn to Twitter for crisis information, we know that Twitter information about an emergency spikes during the event (Starbird et al., 2010) and we should assume that, as a source, it is included in the array of informal sources that people might now access during crisis events to complement information they obtain from formal sources (Sorenson and Sorenson, 2006; Shklovski, Palen, Sutton, 2008; Sutton, Palen, Shklovski, 2008).

Mass emergency played a central role in the emergence and uptake of the hashtag convention. Hashtag genealogy is available in the blogoshere, which is perhaps the best channel for capturing the rapid diffusion and subsequent behavioral changes of a technology like Twitter. In his blog, Chris Messina, an early proponent of incorporating hashtags in tweets (Messina, 2007a) described how adoption of this convention began during the San Diego Wildfires in October 2007 (Messina, 2007b). In his description, the informational needs and desires of users during an emergency event contributed to the adoption (or rate of adoption) of a new convention. These findings align with Shklovski et al. (in press) and Hughes and Palen (2009), which suggest that ICT adoption increases during disaster situations. Hashtag use has since proliferated, and this existing mechanism for systemic self-organizing behavior is the behavioral basis for the socio-technical design solution offered here.

Microsyntaxes

A variety of other microsyntaxes have been proposed to increase the utility of the Twitter platform. Building off the success of the hashtag, Messina (2009) introduced the idea of slashtags, mark-ups intended to increase the amount of information that can be included in the 140-character tweet. Microsyntax.org is a website established to record microsyntax suggestions and encourage discussion around different types of innovations. The 'Tweak the Tweet' intervention fits within this larger microsyntax movement.

A LOW-TECH INTERVENTION ON A HIGH-TECH PLATFORM: CRISIS-SPECIFIC HASHTAG SYNTAX

From previous research, we know many members of the public seek to contribute during disasters, using the resources and technologies available (Hughes et al., 2008; Palen, Vieweg, Liu, & Hughes, 2009; Starbird et al., 2010). For locals in an emergency event, this act of helping extends from offering physical assistance (i.e., sandbagging in the Red River Floods) to using social media such as Twitter to distribute first-hand accounts of

the changing situation and to coordinate with others to assist the response. With the rapid widespread diffusion of Twitter and its increased accessibility through mobile phones and other mobile devices, people on the ground in an emergency event could potentially provide valuable information to the emergency response.

Due to the potentially high volume and noisy nature of this data, an important research direction concerns distilling the information to provide real-time aggregated accounts of the evolving situation (Palen, Anderson, Mark, Martin, Sicker, Palmer, & Grunwald, in press; Vieweg, Palen, Anderson, in prep). One potential tool involves training natural language processing and artificially intelligent computer algorithms to make sense of tweet content. Though that line of research shows potential, this paper approaches the sense-making problem from a complementary perspective. Instead of training computer algorithms to process and extract emergency-related information from tweets, we suggest an alternative route of "training" current Twitter users to craft their tweets into a machine-readable format.

We propose the introduction of a crisis-specific Twitter hashtag syntax allowing citizen sensors to purposefully upload information in machine-readable form. This would enable real-time processing of data generated both on the ground and in the surrounding areas. The training-intervention would be achieved through the platform, employing popular Twitterers, including the accounts of traditional emergency response organizations and local media (both valued Twitter channels during emergencies) to distribute tweets containing the desired format. The proposed syntax would extend hashtag use, a convention already used in many disaster-related tweets, to help label and chunk tweets into machine-digestible pieces.

Scenario Illustrating the Syntax and Its Use

We offer a scenario of a future emergency situation[1] to capture how such a socio-technical intervention might be used. This preliminary syntax is not necessarily an ideal one. We see this as an ongoing research question whose solution must arise in part from deployment and user-centered evolution from a preliminary syntax itself.

@Joe_32 is on the ground during a fire that has jumped the wildland-urban interface in his hometown of Lakewood. He is an active Twitterer and decides to post a couple of updates to let his followers know what he is going through and that he and his wife are both okay.

```
2:05pm @Joe_32: The fire is moving quickly, it's across the street now, but we're okay
#lakewoodfire
```

```
2:06pm @Joe_32: Fire's blocking the street up ahead, my wife and I heading south instead
#lakewoodfire
```

Research of Twitter behavior during emergency events suggests tweets originating from traditional sources of informational authority will get picked up, re-tweeted, and rapidly propagated through the Twitterverse (Starbird and Palen, 2010).

Emergency responders at both the local and state levels have identified the emergency hazard and begun their organized response. As part of this response, the local Red Cross, working in concert with other official emergency response agencies, distributes a series of tweets through their Twitter accounts, outlining the crisis-specific syntax that Twitterers can use to craft messages in machine-readable form. Because of the ephemeral and non-archival nature of the Twitter distribution platform, the syntax-distributing Twitter accounts will rebroadcast the series at regular intervals while the emergency event persists.

```
2:02pm @RedCrossLW: #lakewoodfire #lwfire use these tags for reporting, #fireline,
#line_down, #addy, #city, #X_streets
```

```
2:04pm @RedCrossLW: #lakewoodfire #lwfire more tag reporting: #wind, #visibility,
#road_close, #injury, #num, #comment
```

```
2:06pm @RedCrossLW: #lakewoodfire #lwfire use this format: #fire #city [city] #addy [address
or cross streets] #floor [floor]
```

```
2:08pm @RedCrossLW: #lakewoodfire #lwfire use this format: #imok [name] #city [city]
#location [place] #addy [address or cross streets]
```

```
2:10pm @RedCrossLW: #lakewoodfire #lwfire For those of you in Lakewood, TN, use the #lwfire
hashtag to report info.
```

Vieweg et al. (2010) outline several salient informational categories that emerged during the Red River Floods and Oklahoma Fires and key differences in informational categories between the two events. Though some

[1] Though this example is fictional, similar messages were tweeted by residents during the 2009 Spring Oklahoma fires and Red River floods (Vieweg et al, 2010).

information types remain important across all emergency events, many are specific to certain hazards. Because the Twitter syntax can be updated through additional broadcasts, it can adapt in nearly real-time to the salient categories of a specific event. Possibilities for uploaded information include (in this example) fire locations, injuries, road closures, wind and visibility conditions, and "I'm okay" reports. Continuing with the scenario:

Shortly after reading @Joe_32's tweet, @Bob, one of his followers, receives one of the @RedCrossLW retweets from another Twitterer that he follows. He decides to both retweet the information to his followers and to let @Joe_32 know directly by sending him a direct message.

```
2:12pm @Bob: RT @RedCrossLW #lakewoodfire use these tags for reporting, #fireline,
#line_down, #addy, #city

2:12pm @Bob: @Joe_32 see RT @RedCrossLW #lakewoodfire use these tags for reporting,
#fireline, #line_...
```

A few minutes later, @Joe_32 begins to use the prescriptive syntax to craft his messages into a machine-readable form. He also opts to follow @RedCrossLW for the remainder of the event, so he can receive the updates directly.

```
2:15pm @Joe_32: #lakewoodfire #fireline #city Lakewood #addy 245 Cresthill Ave

2:17pm @Joe_32: #lakewoodfire #road_close #street Cresthill #addy Cresthill & 3rd #comment
stay south

2:52pm @Joe_32: #lakewoodfire #imok Joe Smith #city North Lakewood #location Quik Stop #addy
58th & Spruce
```

As the event progresses, shelters are set up to accommodate those who have been evacuated from their homes. Taking advantage of the dynamic nature of the Twitter syntax, emergency organization can add a shelter category to their prescribed syntax broadcasts, enabling Twitterers to broadcast shelter locations and space availabilities.

```
6:22pm @RedCrossLW: #lakewoodfire use this format: #shelter [shelter name] #city [city]
#addy [address] #num [available]

8:20pm @Amy_Brine: #lakewoodfire #shelter Price Middle School #city Lakewood #addy 506
Lincoln Ave #num 200 #contact 555-555-5555
```

Enabling Good Samaritan Innovators

Because the information would be riding on public channels, it would be simultaneously available to both emergency responders and the public and could be valuable to both. Research shows that during large-scale emergencies, people with available resources seek to use their energies or skills to help (Kendra and Wachtendorf, 2006; Starbird et al. 2010). During the Red River event, several self-described techies opened Flood-Specific Twitter accounts and created computer programs to process online data provided by the USGS[2] and re-distribute that information over Twitter in regular intervals. Tweets from these accounts became popular and were retweeted heavily by locals and remote Twitterers alike. Information generated on Twitter using a crisis-specific syntax would be similarly available for these types of eager-to-help tech-savvy information distributors to collect, process, and redistribute in the form of Twitter updates, webpages or mashups.

POTENTIAL AND FUTURE DIRECTIONS

The syntactical rules outlined in this fictional scenario are intended as a description of a potential crisis-reporting syntax. The terms, keywords, and even the hashtags themselves may not represent the optimal syntax for crisis reporting. Our contribution here is to outline a model of citizen sensing allowing Twitter to act as crisis-reporting channel via user-structured messages that can be parsed, processed and re-distributed through a variety of sense-making tools in near-real time. The concept builds upon an emerging understanding of micro-blogging practice and digital convergence in the wake of disasters. Improvements on this proposed syntax, as well as other microsyntaxes for emergency, will need to aim to support usability and uptake.

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[2] http://waterdata.usgs.gov/nd/nwis/uv/%3fsite_no=?station=05054000

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