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# Digital Volunteerism During Disaster: Crowdsourcing Information Processing

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## ABSTRACT

This paper describes some of the recent efforts to use crowdsourcing for various information processing tasks during disasters and mass emergencies. It highlights several projects that were deployed during the early aftermath of the Haiti earthquake, including one that my colleagues and I helped to launch, Tweak the Tweet. I relate how our deployment efforts and subsequent research on Tweak the Tweet revealed the presence of digital volunteers acting as a layer of human computation in an ad-hoc response community. I discuss the motivations of digital volunteers during disaster, which mirror long-recognized phenomena in human social behavior, and may differ from crowdsourcing efforts in other domains.

## Author Keywords

Crisis informatics, crowdsourcing, social media, Twitter, microblogging

## ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

## INTRODUCTION: CROWDSOURCING DURING CRISES IN 2010

Over the past 12 months, the potential (and actuality) of crowdsourcing information aggregation and processing during disasters and mass emergencies has received a great deal of attention in the media [2,9,15]. This was especially true in the aftermath of the Haiti earthquake, when several “crowdsourcing” projects were deployed into action to assist in the massive response, relief, and recovery efforts related to that catastrophic event. Ushahidi’s crowdmap [17], perhaps the most visible of these efforts, became a shared resource for responders and relief agencies.

Ushahidi’s crowdmaps are people powered, and can be described as using two different types of “crowdsourcing.” During the aftermath of the Haiti quake, individuals on the ground were able to send SMS messages with reports of trapped persons, medical events, needs of shelter and food,

etc. In this way, Ushahidi leveraged the knowledge of a geographically dispersed “crowd” of affected people to provide raw information to their system. These SMS messages were then processed by a remote, virtual “crowd” of volunteers who verified the information and plotted it onto their publicly available crowdmap.

Ushahidi was not the only example of crowdsourcing disaster response during the early aftermath of the Haiti earthquake. CrisisCommons, a consortium of disaster experts, researchers, responders, and other practitioners, held a series of CrisisCamps where on-site volunteers in multiple cities could assist in technical (and some non-technical) projects to aid in the relief efforts. CrisisCamps illuminate the overlap between crowdsourcing and the open source movement, which has leveraged crowdsourcing since long before the phrase was coined [6]. Some CrisisCamp volunteers linked up with the Ushahidi project. Others connected with the OpenStreetMap [11] effort that united volunteers across the world to generate a more accurate map of Haiti. There were many other projects that attempted to integrate some form of crowdsourced assistance into a technology platform, including WeHaveWeNeed [18], which developed an online forum for matching needs to offers of assistance, and SwiftRiver [16] which offered opportunities to help with the coding of that platform which seeks to leverage both machine and human computation to do information filtering and classification. Our research group at the University of Colorado worked with CrisisCommons on another project, Tweak the Tweet, which attempted to leverage Twitter as a tool for aggregating actionable information.

In the 12 months after the Haiti earthquake, the role and potential role of crowdsourcing information processing during crises became even more prominent, garnering attention not only from researchers and NGOs, but from formal response agencies like the American Red Cross and FEMA [1]. Ushahidi’s crowdmaps were deployed for dozens of events, including the Deepwater Horizon Oil Spill, the Pakistan floods, and several winter snowstorms in the Northeast United States. At the University of Colorado, we worked to deploy Tweak the Tweet instances for several events, including wildfires that hit close to home in September 2010. Meanwhile, the CrisisCommons and CrisisMapper communities continue to grow and activate

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during crisis events of all sizes. The latter community has spawned a Standby Task force, which maintains a standing reserve of crisis mapper volunteers who can be mobilized during disasters [7].

### **CROWDSOURCING AND DISASTER VOLUNTEERISM**

Reading the media stories surrounding these efforts, one might think the phenomenon of crowdsourcing during disaster emerged from out of nowhere (from a latent morality in the adolescent soul of technology) to “save the day.” On that latter point, we can imagine that the role has been at least mildly overblown, a blend of reality, technological utopianism and feel-good media sensationalism. Regarding the former point, crowdsourcing during disasters did not quite emerge out of nowhere, but resulted from the unavoidable collision of two forces: one technological, the virtual networks and internet and mobile technologies that allow people to move information and to connect and work together; the other social, a phenomenon from the sociology of disaster, often referred to as *convergence*.

Disaster sociologists have long recognized that during disasters and mass emergencies people will spontaneously converge on the site of the event to offer assistance in warning, response, and relief efforts [3,4,8]. We know that this phenomenon extends to the ICT era, where people who are remote to an event will converge using ICTs and social media to seek and provide information and to offer assistance [12]. Goodchild and Glennon’s research [5] suggests a growing role for crowdsourcing in providing geographic information during disasters.

### **TWEAK THE TWEET**

Tweak the Tweet [14] is an idea for utilizing the Twitter platform for crowdsourcing information provision during disasters and mass emergency events. I originally co-presented this idea at the Random Hacks of Kindness barcamp in 2009, as a low-tech, user-side intervention that addresses the difficulty of purely machine-computational solutions for making sense of Twitter data in real-time. Taking advantage of emerging technology (social media and mobile devices) in combination with the social drive to provide information and offer help during crises, Tweak the Tweet asks users of the Twitter platform to incorporate special hashtags into their crisis-related tweets to make these tweets machine-readable. The idea leverages certain affordances of the Twitter platform (e.g. user-driven linguistic adaptations, the public searchability of tweets, etc.) in combination with the human social drive to provide information and offer help during crises, to create a special “channel” for crisis communications.

For example, a user wishing to tweet about road conditions during a flood event, could tweet:

```
#mytownfloods #road water on the road at #loc 3rd and Main #src @localnews
```

Using the Twitter Search API, a simple software program can identify this tweet as using TtT format. The program can then process the tweet using a simple parsing algorithm, and create a record of a #road report at location, 3rd and Main, from the source, @localnews. Over the past year, we have developed software that identifies TtT tweets, parses them into public spreadsheets<sup>1</sup>, and maps tweets with location information onto a public Google Map<sup>2</sup>.

### **“Voluntweeters”**

With the help of my many colleagues at the University of Colorado, Project EPIC, I deployed Tweak the Tweet for the first time during the early aftermath of the Haiti earthquake. We felt that there was a chance the syntax could be helpful to some of those affected or, more likely, early responders and relief agencies. Though the syntax did prove useful to some, the people who used it most were neither those directly affected nor relief workers on the ground. Our follow up study showed that while ten twitterers used Tweak the Tweet (TtT) syntax to tweet their own needs (four of these were in Haiti at the time), 74 twitterers acted to translate information from other sources into TtT [13] sending nearly 3000 unique TtT tweets.

Translation, in this case, consisted of reformatting the information using the TtT syntax: adding the correct tags in the right places to make the information machine-readable and making sure each tweet had the necessarily components to make it useful.

```
(2010-01-18 10:30:09) orphanage in urgent need of supplies in Laboule: Clairnise or Alberte 509-3400-9797
```

```
(2010-01-18 11:11:11) #haiti #need supplies #name orphanage #loc Laboule #contact clairnise or alberte 509.3400.9797 #rescuemehaiti
```

The example above contains a real example of a tweet that began as a non-TtT tweet and was later translated into TtT format by another twitterer. By adding the #haiti and #rescuemehaiti hashtags, the tweet was essentially routed to groups that were searching those tags for information. The #need, #name, #loc, and #contact tags enabled a record to be generated from the tweet.

The 74 TtT translators were part of a larger group of Twitterers, self-named “voluntweeters”, who were acting remotely to help process, verify, and direct information during the early aftermath of the quake. These individuals and ad hoc relief groups used the Twitter platform to connect to others who were doing similar work, creating a mesh of inter-connected volunteers from all over the world.

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<sup>1</sup> TtT spreadsheet for Deepwater Horizon Oil Spill: <http://bit.ly/oiltweetmap>

<sup>2</sup> TtT Map for Deepwater Horizon Oil Spill: [http://www.cs.colorado.edu/~starbird/oilreport\\_map\\_by\\_event.html](http://www.cs.colorado.edu/~starbird/oilreport_map_by_event.html)

They leveraged these connections to verify and relay information, challenge bad or untimely information, and support each other in their work. Collectively, they provided a self-activated, self-organized layer of human computation that provided a mechanism for searching and filtering Haiti-related information on social media. What Ushahidi was formalizing in their crowdmap, these voluntweeters were improvising using existing tools (Twitter, Facebook, and Skype).

### **Tweak the Tweet as Human Computation**

The discovery and subsequent analysis of the voluntweeters phenomenon led to a re-conceptualization of the TtT concept. Tweak the Tweet had initially intended to use crowdsourcing primarily for providing information. The original user scenario was an affected person tweeting her own needs or situation using the syntax. The emergence of volunteer translators created a second layer of crowdsourcing, that of processing information into a format that can then be utilized by computers.

We now envision a “system” of multiple, alternating layers of human and machine-computation, similar to the workflow of Ushahidi. The first layer is what Patrick Meier calls crowdfeeding [10], where the crowd provides information. After that, online social networks allow the information to be broadcast and people to connect and discuss it. In a second layer of human-computation, remote individuals process this information, adding structure so the next layer of machine-computation can filter, classify, sort and map the information.

One major difference between the Tweak the Tweet concept and other, more formalized crowdsourcing systems like Ushahidi, is that TtT operates completely within the existing functionality of a popular social media platform, Twitter. TtT activities are public and attached to a social media profile, which potentially increases the visibility of the format, and provides different incentives from other crowdsourcing platforms.

### **Tweak the Tweet – Incentive Structure**

Crowdsourcing during crises relies on different types of motivation for participation than other forms of crowdsourcing, especially the micro-payment incentive structure on sites like Amazon’s Mechanical Turk. The motivation for participation on crisis-related crowdsourcing platforms is imbedded in the social needs of individuals to help in the face of tragedy. Users of Tweak the Tweet receive rewards in fulfilling these social needs, as well as social capital and support from others during the event. These latter two rewards derive from the public nature of their volunteer activities, and the link between those activities and their online social media profile/persona.

### **OPEN QUESTIONS AND FUTURE DIRECTIONS**

Over the last year, crowdsourcing projects in the domain of disaster have received substantial attention in the media, motivated scores of volunteers to participate, and created

resources for affected people and responders during disasters. Though other forms of crowdsourcing projects outside the realm of disaster response cannot tap into the volunteerism related to crisis events, they may benefit from some of the things we are learning about leveraging the crowd during disaster.

One area for exploration may be establishing direct connections between crowdsourcing projects and existing social media. Related to that line of inquiry is incorporating personal profiles into crowdsourcing systems to tap into social capital incentive mechanisms and allow for communication, collaboration, and self-policing.

Another interesting area for exploration and one that I am now moving to investigate, are crowdsourcing activities that exist without a “system.” The voluntweeters we discovered filtering and relaying information during the Haiti event were a self-organized crowd, who used existing social media platforms and generated their own work processes and goals. How can we work to enable or encourage these informal crowdsourcing systems as well?

### **AUTHOR BIO**

Kate Starbird is a PhD student at the University of Colorado’s ATLAS Institute, working with Leysia Palen’s team of researchers in the area of *crisis informatics*. Kate focuses primarily on the use of Twitter during disasters, with a related interest in the self-organization of digital volunteers during these events. In November 2009, Kate co-presented the original Tweak the Tweet idea at a Random Hacks of Kindness barcamp event. In 2010, she led efforts at the University of Colorado to deploy Tweak the Tweet for nearly 20 events, including the Haiti earthquake, the Deepwater Horizon Oil Spill, and the Boulder Fires. She is investigating the potential role of Tweak the Tweet or another structured data reporting format for future disaster events. She is also looking at how digital volunteerism can be leveraged in conjunction with structured data reporting via social media to filter, verify, classify, and map information during crises.

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