



Figure 5: Views of the user component in TweetXplorer.

that one of the most highly-retweeted tweets is a tweet mentioning the availability of pet shelters in evacuation areas. Looking at the geotagged tweets produced during this epoch we observe that tweets contain general hashtags and topics of conversation. As the storm nears we see people move towards terms describing specific issues, such as “rumors”, “damage”, and “subway”, shown in Figure 4(c).

3.3 Landfall

Hurricane Sandy made landfall on Oct 29, 2012 at 20:00 EST⁵. First reports of flooding start to arrive around this time, accompanying links to images of flooding. As the storm progresses, we observe several reports of power outage from NYC and nearby areas. Due to the power outage, we discover reports of hospitals which were forced to evacuate their patients. In Figure 3, we can see two clusters of users connected by common retweeters discussing this. In Figure 6(a), one can observe that @CNN’s tweets claim that more than 5.5 million people were without power in the region. More interestingly, most of @CNN’s retweets came from their tweet reporting the flooded NYC subway tunnels, which was retweeted 678 times. Reports from the NYC area paint a similar picture, with top hashtags discussing power outages and flooded subway tunnels. At the same time, false rumors were also spreading on Twitter. As seen in Figure 6(b), there were several reports of flooding of the NYSE building. Agencies such as @weatherchannel tweeted this information and later retracted it, as it was discovered to be false.

3.4 Recovery

While analyzing the Twitter activity after the storm we notice that the most prominent tweet during this time discusses repair resources. Also, the discussion in NYC focuses on the words “damage”, “power”, and “flood”, indicating an attention shift towards post-storm topics. Supporting images are available on our supplemental web page.

4. RELATED WORK

Visualization of events has helped bring increased situational awareness to first responders in crisis scenarios. [8] uses keyword-based search to bring situational awareness to rescue crews in flood and fire scenarios. [4] assists high-ranking commanders in battlefield scenarios through the use of map layers and textures.

Geographical visualization is central to our system. In [3] the authors’ mapping system utilizes a map’s legend to show statistical properties of the data. In [7] the authors present a tool designed to gather situational awareness from tweets.

⁵<http://www.nhc.noaa.gov/archive/2012/a118/a1182012>

Network visualizations can play an important role in the analysis of large datasets. Many systems have been proposed to visualize large networks, such as Gephi [1].

5. FUTURE WORK

In this work we have demonstrated TweetXplorer, a visual analytics system that can help a user gradually obtain deeper insight into Twitter data. Going forward we will create new modules for TweetXplorer, which focus on other forms of information including sentiment analysis and detecting dynamic communities. We will extend the keyword grouping interface to help the user discover keywords and hashtags central to an event, and the network component to show different types of networks in Twitter, such as hashtag co-occurrence, and Twitter friendship network.

6. ACKNOWLEDGEMENTS

This work is sponsored by Office of Naval Research grants N000141010091 and N000141110527.

7. REFERENCES

- [1] M. Bastian, S. Heymann, and M. Jacomy. Gephi: An Open Source Software for Exploring and Manipulating Networks. In *ICWSM*, volume 2, 2009.
- [2] E. Dumbill. What is Big Data? <http://radar.oreilly.com/2012/01/what-is-big-data.html>, January 2012.
- [3] J. Dykes, J. Wood, and A. Slingsby. Rethinking Map Legends with Visualization. *Visualization and Computer Graphics, IEEE Transactions on*, 16(6):890–899, 2010.
- [4] E. Feibush, N. Gagvani, and D. Williams. Visualization for Situational Awareness. *CG&A, IEEE*, 20(5):38–45, 2000.
- [5] T. Fruchterman and E. Reingold. Graph Drawing by Force-Directed Placement. *Software: Practice and experience*, 21(11):1129–1164, 1991.
- [6] S. Kumar, G. Barbier, M. A. Abbasi, and H. Liu. TweetTracker: An Analysis Tool for Humanitarian and Disaster Relief. In *ICWSM*, 2011.
- [7] A. MacEachren, A. Jaiswal, A. Robinson, S. Pezanowski, A. Savelyev, P. Mitra, X. Zhang, and J. Blanford. SensePlace2: GeoTwitter analytics support for situational awareness. In *IEEE VAST*, pages 181–190, oct. 2011.
- [8] S. Vieweg, A. L. Hughes, K. Starbird, and L. Palen. Microblogging During Two Natural Hazards Events: What Twitter may Contribute to Situational Awareness. *CHI ’10*, pages 1079–1088, 2010.
- [9] H. Whitney. *Data Insights: New Ways to Visualize and Make Sense of Data*. Morgan Kaufmann, 2012.