the Timpstamp section. After the delay has occurred (amount of time between first tweet's timestamp and current timestamp) the data from a particular tweet is converted into a JSON format and sent to the endpoint. Any tools connected to that endpoint would then be responsible for processing the data.

Output data

The output data is sent via a connected socket. The simulator begins by opening a listening port and then sends the processed data to any applications connected to that socket for the given tweet's timeline. The format of the output of the simulator uses Javascript Object Notation (JSON). This entails that any application wishing to leverage the simulator should be capable of handling this format. However, this format could be replaced or additional formats added in future releases.

TWITTER SIMULATOR USE CASE

In order to test the effectiveness of our Twitter simulator we deployed a simple prototype in an active 911 public service answering point (PSAP). This center was located in a city with a population over 100,000 people. The first visit took place in May of 2018, with the primary goal on initial discovery. That is, during this visit we were interested in gaining a better understanding of how 911 centers operate and if social media could provide value to the existing processes. The primary goals of the first visit was to conduct observational research, interviews and workshops in order to discover what tasks and procedures were used. In addition, we also investigated how social media is currently used, and the possible future avenues of its use within the 911 environment. Lastly, challenges involving communicating data obtain from social media and potential other sources were discussed. These interviews shed light on how the data from social media should be displayed and presented for use by the center. It also helped us understand the importance of specific pieces of information, in particular the following categories emerged: what was the location or "where" was the person making the tweet, what was the timeline of the incident or "when" did it occur, "who" was involved in the incident, "what" was the nature of the incident, where there "weapons" or use of weapons mentioned and "why" had the incident occurred. These information points were referred to as the 6w's.

We then conducted an in person, informal workshop. This involved simulating data using the 2013 airport shootings in Los Angeles USA dataset found in the CrisisLexT26 dataset from crisislex.org (Olteanu, Vieweg, and Castillo n.d.). As the airport shooting occurred at 9:24 am only the hours of 8am – 12pm were used. A timescale of 15 was used meaning that the total simulation took 16 minutes. The first reference to LAX and shooting did not occur until the fifth minute of the simulation. This was used across three different participant groups. In addition to monitoring and examining how the prototype was used, we also observed the interaction between the participants to determine how the data from social media may be integrated into the existing process and if any disruptions had occurred.

In order to mimic the PSAP's existing procedures, sets of three participants were used, one as a traditional call taker, one as a social media analysist and one as a dispatcher. Each of these participants were 911 professionals working in the call center with multiple years' experience. All participants had access to the social media prototype interface user interface.

The social media prototype GUI was built on the ELK stack. The ELK stack is an open source software platform consisting of three primary components (https://www.elastic.co/). The first is a mechanism to import data from one format into another. In our case this was the role of the simulator tool, which imported data from the T26 LAX shooting dataset into the stack. The second mechanism is the elastic search analytics engine, which performs similar to a database. The third component was Kibana which is a user interface designed to display information from the elastic search environment. This allows you to create custom dashboards and interfaces. An example of this interface can be seen in Figure 2.

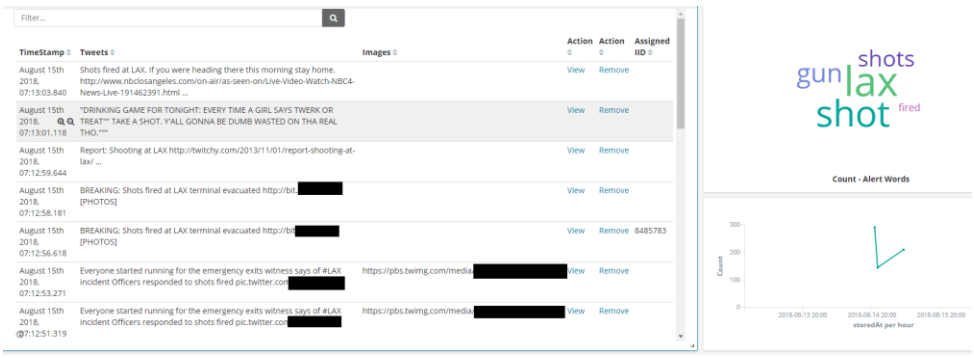

Figure 2 - Example Interface

well as accept input files in different formats besides the .csv datasets used. Likewise, datasets from social media platforms other than Twitter would need to be incorporated into the design depending on the availability of their APIs. Next, while intentionally left out of our design, incorporating filter methods could also be added for those wishing to use the simulator without needing to connect it to an existing application. Lastly, while we selected the JSON format as our output due to familiarity, additional output formats would be needed including; database connection, REST calls and raw file outputs.

REFERENCES

Abbasi, Ma, and Shamanth Kumar. 2012. "Lessons Learned in Using Social Media for Disaster Relief-ASU Crisis Response Game." *Social Computing, ...*: 282–89. http://link.springer.com/chapter/10.1007/978-3-642-29047-3_34.

Alexander, David E. 2014. "Social Media in Disaster Risk Reduction and Crisis Management." *Science and Engineering Ethics* 20(3): 717–33.

Avvenuti, Marco et al. 2014. "EARS (Earthquake Alert and Report System): A Real Time Decision Support System for Earthquake Crisis Management." *Proceedings of the 20th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining*: 1749–58. http://doi.acm.org/10.1145/2623330.2623358.

Baumgart, Leigh A, Ellen J Bass, Brenda Philips, and Kevin Kloesel. 2006. "Emergency Management Decision-Making during Severe Weather." *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* 50(3): 381–85. http://pro.sagepub.com/cgi/content/abstract/50/3/381.

Bruns, Axel, and Yuxian Eugene Liang. 2012. "Tools and Methods for Capturing Twitter Data during Natural Disasters." *First Monday* 17(4): 1–17.

Caragea, Cornelia et al. 2011. "Classifying Text Messages for the Haiti Earthquake." *Proceedings of the 8th International ISCRAM Conference* (May): 1–10.

Chowdhury, Roy, Soudip Roy Chowdhury, and Carlos Castillo. 2013. "Tweet4act : Using Incident-Specific Profiles for Classifying Crisis-Related Messages." *Proceedings of the 10th International ISCRAM Conference* (May): 834–39.

Crooks, Andrew, Arie Croitoru, Anthony Stefanidis, and Jacek Radzikowski. 2013. "#Earthquake: Twitter as a Distributed Sensor System." *Transactions in GIS* 17(1): 124–47.

Halse, Shane E., Andrea H. Tapia, Anna C. Squicciarini, and C Caragea. 2016. "An Emotional Step Towards Automated Trust Detection in Crisis Social Media." *ISCRAM 2016 proceedings*.

Hampton, Andrew J et al. 2017. "Constructing Synthetic Social Media Stimuli for an Emergency Preparedness Functional Exercise."

Heldal, Ilona, and Cecilia Hammar Wijkmark. 2017. "Simulations and Serious Games for Firefighter Training : Users ' Perspective." (May): 868–78.

Jin, Y., B. F. Liu, and L. L. Austin. 2011. "Examining the Role of Social Media in Effective Crisis Management: The Effects of Crisis Origin, Information Form, and Source on Publics' Crisis Responses." *Communication Research* 41(1): 74–94. http://crx.sagepub.com/content/41/1/74.abstract.

Kavanaugh, Andrea L et al. 2012. "Social Media Use by Government : From the Routine to the Critical." *Government Information Quarterly* 29(4): 480–91. http://dx.doi.org/10.1016/j.giq.2012.06.002.

Kluckner, Sigmund, and Willi Wendt. 2014. "Designing for the User : Tailoring a Simulation Software Interface to the Needs of Crisis Managers." (May): 528–32.

Kumar, Shamanth, Geoffrey Barbier, Mohammad Ali Ali Abbasi, and Huan Liu. 2011. "TweetTracker: An Analysis Tool for Humanitarian and Disaster Relief." *Fifth International AAAI Conference on Weblogs and Social Media*: 661–62.

MacEachren, Alan M. et al. 2011. "SensePlace2: GeoTwitter Analytics Support for Situational Awareness." *VAST 2011 - IEEE Conference on Visual Analytics Science and Technology 2011, Proceedings*: 181–90.

Olteanu, Alexandra, Carlos Castillo, Fernando Diaz, and Sarah Vieweg. 2014. "CrisisLex: A Lexicon for Collecting and Filtering Microblogged Communications in Crises." *Proc. of the 8th International Conference on Weblogs and Social Media*: 376. http://www.aaai.org/ocs/index.php/ICWSM/ICWSM14/paper/download/8091/8138.

Olteanu, Alexandra, Sarah Vieweg, and Carlos Castillo. "What to Expect When the Unexpected Happens : Social

Media Communications Across Crises."

Palen, Leysia. 2008. "Online Social Media in Crisis Events." (3): 76–78.

Parush, Avi, Ruth Libkind, Shani Laendler, and Tal Solomon. 2016. "Simulator and Game-Based Multi-Level Training of Cognitive Skills and EMS Teamwork in Multi-Casualty Incident Management." (May 2016): 2016.

Sakaki, Takeshi, Makoto Okazaki, and Yutaka Matsuo. 2013. "Tweet Analysis for Real-Time Event Detection and Earthquake Reporting System Development." 25(4): 919–31.

Schaefer, K. E. et al. 2014. "A-Meta-Analysis-of-Factors-Influencing-the-Development-of-Trust-in-Automation-Implications-for-Human-Robot-Interaction.Pdf." *Human factors* 58(3): 377.

Walker, Warren E, and Jordan Giddings. 2011. "Training and Learning for Crisis Management Using a Virtual Simulation / Gaming Environment." : 163–73.