Computer analysis of 911 calls from Calif. wildfires offers potential early warning system

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When confronted with emergencies or natural disasters, such as the wildfires that raged through San Diego and Los Angeles counties last October or the tornadoes that hit the southern U.S. last week, residents often dial 9-1-1 as their first course of action.

Now, UC San Diego researchers from the San Diego Supercomputer Center and Scripps Institution of Oceanography, using 9-1-1 data from these wildfires and other emergency situations, have devised a method to analyze and visually display these calls to detect specific patterns. Their ultimate goal: to assist in developing an early warning system and coordinate responses on a wider scale that could one day save lives and limit property damage.

“Because of the time-critical element within the first responder community, this research could assist emergency service providers and organizations in allocating appropriate levels of both human and financial resources as part of their overall planning,” said Chaitan Baru, SDSC Distinguished Scientist and one of the project’s principal investigators.

Baru, along with researchers from Scripps Oceanography, developed the pattern-detecting method - a computer algorithm - after analyzing nearly three years of 9-1-1 call data from the San Francisco Bay area, and more than 20 months of similar data from throughout San Diego County.

The data included time/date/length of the emergency calls, how quickly each call was answered, and phone type (i.e. business, residence or wireless). To protect privacy, the 9-1-1 call locations were converted into latitude and longitude coordinates and then dithered, or randomly blurred, so that the precise location could not be recovered.

By combining the call data with topographic images from Google Earth, researchers conducted a spatiotemporal analysis - relating both space and time together - of typical call activity in order to set parameters that would automatically alert viewers of abnormally high call rates. These 'hotspots', or clusters of activity within certain areas and within predetermined lengths of time, were then directly correlated to specific events in those areas such as an earthquake, explosion or fire.

While SDSC researchers have been doing only retrospective analyses based on collected data, it is a vital first step to creating visual analyses in real time and on a much larger geographic scale, which would require supercomputing resources for data storage and graphics.

“We think this kind of research could enable a command center at the state or county level to complement their current 9-1-1 system with advanced visualization techniques and advanced clustering techniques,” said Hector Jasso, a data mining specialist and SDSC co-researcher on the project, called “Spatiotemporal Analysis of 9-1-1 Call Stream Data.”

Currently, California’s 9-1-1 emergency phone system is overseen by the state’s Department of General Services. The DGS coordinates with phone services such as Verizon and AT&T to route the calls to a Public Safety Answering Point (PSAP), where an operator either provides direct assistance or redirects the call to an emergency service provider.

Despite a good level of coordination and emergency services response during the recent southern California wildfires, most PSAPs do not have

the capability to coordinate visually via computer- generated images with other PSAPs in their area, and there is no system currently in place to automatically reroute an emergency call to another PSAP if the initial point is overloaded. In addition, calls are often transferred multiple times depending on the type of emergency, which affects overall response times.

Baru believes the SDSC/Scripps Oceanography project could also be beneficial to local governments, many of which are wrestling with budget constraints while striving to provide high levels of emergency service. “It could also allow more efficient coordination of similar services across a greater area in the event of a larger scale disaster,” he said.

Moreover, the research may be useful in detecting the weaker links in any emergency response system such as dropped calls, or identifying areas that may be vulnerable to communication blackouts. “Creating some kind of load sharing strategy among the PSAPs certainly makes a lot of sense,” said William Hodgkiss, a Scripps Oceanography professor and co-PI on the project.

Source: University of California - San Diego