

New multi-device system for handling emergencies with information from social networks

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Credit: Carlos III University of Madrid

Researchers from Universidad Carlos III de Madrid have presented a prototype of a multi-device system that can involve citizens in managing emergencies. The system, which can be used through a smart tabletop,

can identify individuals in the area of the hazard and communicate directly with them.

"The ability of the system to distinguish between different types of agents, more or less reliable and more or less prepared to act, can support decision-making at the [control center](#) and can be used to envision sustainable policies of service co-production," said Paloma Díaz, one of the authors of the study.

"Information about which citizens are in the area and what role they have is superimposed on the view operators have at the control center, so that they can know how to collaborate, from sending more detailed risk [information](#) to taking action," she explained. The basic principles on which this formula of citizen participation in [emergency management](#) is implemented have been recently published in open-access article in the journal *Future Internet*.

This new platform can also collect, filter and aggregate information from social networks such as Twitter to improve the response to emergencies like accidents, hurricanes and earthquakes. When an emergency occurs, the information that is posted on social networks can be very useful. As direct witnesses of the situation, people share photos, messages and videos about events that attract their attention. At an emergency operation center, this information can be collected and integrated into the management process to improve the general understanding of the situation and to improve the response operations.

The problem lies in making critical decisions taking into account the volume and quality of the information spontaneously posted in social networks. How can emergency operators understand it and verify it without wasting time? The answer is an intelligent tool that can compile, analyze and extract relevant information. "Our system addresses the relevance of the information via an innovative method based on

ontologies, which enables us to filter tweets and extract significant subjects according to their semantics," explained Teresa Onorati, another researcher from the UC3M Department of Computer Science. With this approach, they "separate the wheat from the chaff" in the deluge of content that circulates on social networks.

This smart system, developed at the UC3M Interactive Systems Group, can filter the most important data and represent them through different visualizations so that operators can make decisions more easily and quickly. There are already various monitoring and visual analysis tools that combine techniques of visualization and geographical maps, but which encounter difficulties in interpreting the language used in tweets, given that their content can be inaccurate or irrelevant. In this study, published as an open-access article in the journal *SpringerPlus*, a semantic categorization organizes tweets using relevant terms belonging to the following seven concepts: emergency, evacuation, media, hashtags, time, place and general. For example, the word "hurricane" would be related to the description of the emergency, while "New York" would be the place. "In this way," explained Dr. Onorati, "emergency operators can choose the subject they're most interested in or reach interesting conclusions about the flow of information."

Citizen Participation in the Handling of Catastrophes

This new intelligent tool can be integrated into an emergency center and become an effective basis for making decisions. "It prevents distracting operators and wasting resources and time, given that the visualizations represent how the situation is evolving," said Prof. Díaz. The next step is to test the system in real time so that civil protection agents can evaluate the performance of the tool. "We are currently exploring with official organizations how to use this technology for processes like early warning, where citizen participation can be integrated to collect information and involve groups with different levels of credibility. Our

approach to classifying participants and the intelligent filtering of information seems appropriate in this context," said Prof. Díaz.

Semantic categorization and visualizations are a key factor, because information can be interpreted according to the characteristics of the situation. "As shown in the two study cases (the Nepal earthquake and Hurricane Sandy), the visualization technique must be chosen depending on the volume of information generated and its semantic categorization," said Dr. Onorati. In fact, they are planning to test different visualizations with the same collections of data and compare the reaction times of emergency workers in operational centers to optimize their functioning.

The research, which is funded by the Ministry of Economy and Competitiveness, was carried out within the framework of the emerCien project (TIN2012-09687). This project aims to integrate technologies to promote citizen participation in emergency management. From a theoretical point of view, the semantic analysis is based on standard techniques of data mining, which would make the tool adaptable to other domains and applications, like politics or marketing. "Other researchers could apply our methodology based on ontologies, adequately changing the knowledge base to obtain significant subjects according to predefined criteria of relevance," said Dr. Onorati. Marco Romano, who is another researcher from the Interactive Systems Group and is working on updating the prototype, said, "With the goal of improving citizen participation, we're thinking about how to apply techniques of gamification to the prototypes that we have created."

More information: Paloma Díaz et al. Coproduction as an Approach to Technology-Mediated Citizen Participation in Emergency Management, *Future Internet* (2016). [DOI: 10.3390/fi8030041](https://doi.org/10.3390/fi8030041)

Teresa Onorati et al. Giving meaning to tweets in emergency situations: a semantic approach for filtering and visualizing social data, *SpringerPlus*

(2016). [DOI: 10.1186/s40064-016-3384-x](https://doi.org/10.1186/s40064-016-3384-x)

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