Introduction to the Communication and Information Systems Technology for Crisis and Disaster Management

Jose J Gonzalez
University of Agder
Centre for Integrated Emergency Management
josejg@uia.no

Murray Turoff
Information Systems Department
New Jersey Institute of Technology
murray.turoff@gmail.com

Julie Dugdale
University of Grenoble & Grenoble Informatics Laboratory (LIG)
&
University of Agder
Centre for Integrated Emergency Management
Julie.dugdale@imag.fr

Communication and Information System Technology is profoundly changing the management of disasters and emergencies. Mobile devices and social media are being used by citizens in innovative ways to help them manage the consequences of disasters for themselves, families, and communities. The trend of increasing traffic flow originating from affected citizens poses many research challenges.

The research challenges are huge and the needs are immense: The world spends annually between 16 and 23 billion US dollars in disaster assistance. In 2010 an estimated 373 natural disasters occurred, causing 296, 800 victims and affecting more than 207 million people. By 2050 the number of people living in areas especially prone to natural disasters will probably double (from 680 to 1500 million).

This minitrack was established in Spring 2012. It attracted a satisfactory number of submissions for HICSS-46, from which eight were selected to be presented at the conference. Last year, at HICSS-47 the minitrack got fewer submissions, in part owing to competition from two minitracks that were established in other HICSS tracks.

At HICSS-47 we conducted a mini-workshop reviewing the burning research issues in the area of communication and information system technology for disaster and emergency management. The intended outcome was to develop with the attendees a research agenda for the near future, hopefully leading to an increase in the number of submissions to the minitrack. Indeed, this happened and this time the minitrack attracted sixteen papers.

Eight papers were accepted, resulting in two sessions.

In “Engineering Crowdwork for Disaster Events: The Human-Centered Development of a Lost-and-Found Tasking Environment”, Mario Barrenechea, Ken Anderson, Leysia Palen and Joanne White argue that efforts to involve the public in disaster response human computation and crowdsourcing can create liabilities or even put the public at risk. The authors consider a strong candidate for human computation by “digital volunteers” to articulate the design decisions and software engineering problems faced in designing and developing a web-based crowdwork environment that supports a lost-and-found matching task.

In “Crowd-Sensing Meets Situation Awareness - A Research Roadmap for Crisis Management”, Andrea Salfinger, Sylva Girtelschmid, Brigit Pröll, Werner Retschitzegger and Wieland Schwinger derive evaluation criteria for human crowd-sensing to enhance situation awareness in disasters. The evaluation criteria are anchored in a reference architecture incorporating crowd-sensed disaster information into situation awareness systems. The authors apply the criteria to compare nine systems, so as to determine current capabilities and point directions for further research.

In “Integrating Computer Simulation and the Field to Discover Possible Alternatives for Tsunami Evacuation”, Fuko Nakai, Michinori Hatayama and Katsuya Yamori present an approach for tsunami evacuation combining computer simulation and fieldwork in terms of workshops and evacuation drills. The approach encourages residents potentially affected by tsunamis finding a practical and feasible way to evacuate. An important goal is also to mitigate pessimism toward tsunami dangers among the residents.

In “Disaster Evacuation Assistance System based on Multi-agent Cooperation”, Yasuki Iizuka and Kayo Iizuka propose a system based on multi-agent cooperation evacuation from dangerous situations. The system uses the mobile devices of evacuees and performs distributed calculations while assessing the locations of evacuees. To evaluate this system, an experiment was carried out using multi-agent simulation. The experiment showed that the evacuation

1530-1605/15 $31.00 © 2015 IEEE
DOI 10.1109/HICSS.2015.648

completion time for all evacuees could be improved by ten to thirty percent.

In “The Design of an Agent Based Model of Human Activities and Communications in Cardiac Resuscitation”, Lyuba Mancheva and Julie Dugdale show how verbal interactions between members of a resuscitation team may be categorized using an agent interaction protocol called FIPA. After analyzing and categorizing the communications of various resuscitation teams during real training exercises they identify good communication practices and those that are likely to lead to wasted time or medical mistakes. Following on from this, they describe the design of an agent based simulator that may be used to assess different communication protocols.

In “Insights from a Computer Simulation Model of a Landslide Disaster”, Leire Labaka, Ying Qian, Peter Lango and Jose J. Gonzalez present a computer simulation model of the management of a major landslide that occurred in Norway in 2007, provoked by outlier of the famous Katrina hurricane. The simulation model implements a disequilibrium-experimenting-emergence process suggested by complexity theory. Four important feedback loops are identified that play a key role in the dynamics of the management of the landslide disaster.

In “A Framework for Post-Crisis Business Continuity Planning”, Sharvari Kulkarni, Gezinus Hidding and Serhat Cicekoglu propose a general framework for post-crisis Business Continuity Planning The framework consists of multiple planning aspects, multiple phases and many detailed elements for business continuity plans.

In “Design Challenges/Solutions for Environments Supporting the Analysis of Social Media Data in Crisis Informatics Research”, Kenneth Anderson, Ahmet Aydin, Mario Barrenechea, Adam Cardenas, Mazin Hakeem and Sahar Jambi present an environment — EPIC Analyze —that supports researchers with the collection and analysis of social media data originating in the public’s response to mass emergency events. Their research has identified the types of components needed to ensure that these services are reliable, scalable, extensible, and efficient. The authors describe the design challenges encountered when building EPIC Analyze and discuss its scalability, performance, and functionality.