7th International Conference on Information Systems for Crisis Response and Management

Defining Crisis Management 3.0

PROCEEDINGS
Book of Abstracts

Edited by:

Simon French
Brian Tomaszewski
Christopher Zobel

ISCRAM

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Introduction

Welcome! Enjoy!! Debate!!!

The previous six ISCRAM conferences, ISCRAM workshops in China, ISCRAM Summer Schools, the ISCRAM discussion list, and ISCRAM Live have established a tradition and a momentum. We have a tradition of debate and discussion that is so vital to shaping a subject academically, professionally and in practice; and we have a tradition of enjoying ourselves. Although we are now a formal international association, we are more like friends with a mission. The momentum of our movement is strong: each conference bigger than the last. At ISCRAM2010 we have had to establish 5 parallel sessions on two of the days to ensure that our many submissions have sufficient time for exploration and critical discussion. So in welcoming you to ISCRAM2010, let us exhort you to maintain that ethos of discussion. Don't just listen at the sessions: contribute and comment. Ideally comment constructively; but destructive comments can be fun (!) and ultimately can lead to valuable changes of direction. Of course, you will not be able to attend all the presentations. Most of the papers in the proceedings you will only be able to read. Please don't do so passively: if you have comments, email the authors. We all value feedback and enjoy learning that others have taken time to reflect on our work.

As is always the case for an ISCRAM conference, the papers, tracks, and sessions are inherently multidisciplinary, drawing together perspectives from across all socio-technological domains. Human behaviours are as important to us as the technologies that enable us to share information and situation assessments quickly and in increasing volumes. So do not interpret the tracks as drawing hard boundaries between approaches and issues. They are little more than a classification of convenience.

A note on the refereeing process

This year ISCRAM sought to clarify and separate several types of submission to the conference. In doing this we faced a multitude of objectives – inevitably conflicting objectives. First and foremost, our aim was to create an exciting conference, one that continues our tradition of debate and discussion. We want to support doctoral students and early career researchers in developing their ideas; we want to draw practitioners and NGOs into our activities so that, on the one hand, academic researchers hear and respond to the imperatives that drive those dealing with crises and, on the other hand, those who are so often driven by the short term urgency of actual crisis response can see what might be available to help their work in the future. Meeting all of these objectives and serving as wide of a community as we possibly can is not easy. The demands on individuals from their various professions differ greatly in terms of their impact on publications and conference presentations. Academics need conferences and related publications to conform to certain standards – time consuming standards – of peer review; practitioners have far greater time pressures and often do not need such formal reviewing of their work for career progression.

Thus ISCRAM2010 has sought four types of submissions:

1. **Full research papers**. These report completed research.

2. **Work in progress papers**. These report the early stages of a study or a development and provide the authors with the opportunity to get feedback on their evolving thinking.

3. **Discussion papers**. These raise issues that the ISCRAM community need to address and debate.

4. **Practitioner papers**. These raise issues, examples and case studies, examples of best practices, improvements, and significant insights or examples that have arisen in practice.

Full research papers could be up to 10 pages long; the other three categories were limited to 5 pages. In many ways, much of the distinction between these different types of papers is cosmetic. Many of the submissions could be classified under two, three, or even all four of the headings. We made the distinctions as a way of speaking to our different audiences, encouraging all to submit their work. There is one distinction that does matter though. Full research papers were subject to the full rigour of academic reviewing. We assessed them against five criteria:

- Quality of Content: An assessment of the academic rigour and approach.
- Significance: An assessment of the contribution made to the literature?

- Originality: The timeliness and originality of the ideas in the paper.
- Relevance: The fit of the paper with ISCRAM2010 and ISCRAM objectives.
- Presentation: Clarity, quality of the writing and the ease with which non-specialists can follow the ideas.

Because so many academic disciplines are represented at ISCRAM we also expected reviewers to make a holistic judgement that reflected the standards they would expect in their home discipline. Overall we believe that we have reviewed these papers to the standards and characteristics expected in academic journals. Works in progress, discussion papers, and practitioner reports were reviewed against the three criteria of relevance, significance and clarity only. We reminded reviewers that we were seeking papers that were relevant to ISCRAM, and significant in that they would stimulate timely discussion and offer the opportunity for feedback from the conference to shape further research, to improve and shape practice, and to provide an enjoyable, valuable presentation.

The designation of each paper is indicated in a footnote on its first page.

Almost all papers have been subject to two double blind reviews, and then a third assessment by a track chair. In a handful of cases, the anonymity of the authors was not preserved, simply because the content of the paper effectively identified them; and in the case of some later submissions, only one double blind review was obtained in the time available.

Acceptance rates

As should be clear, we have tried to design a reviewing process that meets the needs of ISCRAM and its members; but in doing so we have failed in one respect. We have paid no attention to the modern obsession with bibliometric statistics and in particular acceptance and rejection rates. There is a false belief that the numbers of papers rejected says something about the quality of a conference. Maybe it does, but perhaps it is on the quality of the location. HICSS has a high rejection rate and is an outstanding conference; but would its rejection rate be so high if it were held in Huddersfield, a pleasant but unassuming mill-town in the north of England, rather than Hawaii? The Valencia Bayesian Statistics Conferences have changed the face of statistics over the past 30 years, but their presentations are invited papers only and the huge contributed poster sessions have a very low rejection rate. There may be a correlation between higher rejection rates and high quality; but correlation, as we all know, does not imply causation.

But for those who want some numbers.

We had some 175 submissions in total (actually 177 but there were a couple of duplicates)

There were 84 submissions as full research papers of which 41 were accepted as such. Many of the 'rejected' full research papers were invited to resubmit as work-in-progress, discussion or practitioner papers. These joined the 91 submissions of such shorter work-in-progress, discussion or practitioner papers; in due course some 64 of these were accepted. Moreover, some 13 papers were accepted as posters.

Bibliometricians have fun!

Copyright Agreements

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Acknowledgements

There are many people who have helped in producing these proceedings. We mention the programme committee by name below, but there are also many who helped as reviewers and, of course, there are the authors themselves. Particular thanks are due to Teena Long, who checked and formatted all the submissions into their final form. To all thank you.

Programme Committee

Co-chairs: Simon French and Brian Tomaszewski

Student representative: Sophia Liu

Doctoral student and early career researcher programme: Julie Dugdale

Link with ISCRAM China 2010: Song Yan

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SASER Track: Jeff Kim

Response Information Systems Requirement Engineering and Evaluation: Benedikt Birkhäuser, Rui Chen, Panos Constantinides, Jens Pottebaum

Assessing crisis management operations and exercises: Bjorn Johansson, Peter Berggren, Jiri Trnka,

Studies of Command and Control Systems: Benedikt Birkhäuser, Johan Jenvald, Jiri Trnka, Peter Berggren

Virtual States: Connie White, Chris Johnson, Joel Aud

Information Credibility, Trust, Privacy and Security in IS for Emergency Management: Linda Plotnick, Eli Rohn, and Chamindra de Silva

Abstracts of Papers (listed by track)

Plenary Presentations

Alan M. MacEachren (GeoVISTA Center, Penn State, USA)

Geovisual Analytics for Crisis Management: Moving Beyond GIS

Abstract:

Location is fundamental to crisis management. Digital geographic information volumes are increasing exponentially, generated by an array of sources ranging from space and airborne sensors, through GPS and other ground-based devices, to statistical information about populations at risk and geographic descriptions extracted from news stories. These data present both an opportunity and a challenge for crisis management. They are an opportunity as sources for potentially critical information through which to assess and monitor rapidly changing situations in the planning and response stages of crises as well as to guide recovery and enable long term mitigation efforts to create resilient communities. Plus, the data being generated can support these tasks at a level of detail never before possible. The data are also a challenge because current information technology does not support rapid geographically-enabled foraging, sensemaking, and decision-making by individuals and groups, particularly with data volumes as large and with data forms as heterogeneous as faced by first responders, analysts, decision-makers and others today.

Geographic information systems (GIS) have become an important technology to support crisis management through their ability to organize, integrate, and transform geographic data. But current GIS just touch the tip of the iceberg for leveraging geographic data across the full range of crisis management functions. This presentation will introduce *Geovisual Analytics* as a domain of research, development, and practice with direct applicability to support of crisis management tasks well beyond those addressed by today's GIS. The roots of geovisual analytics in visual analytics generally and in GIScience, visualization, HCI, cognitive system engineering, and related domains will be outlined. Core sections of the presentation will outline a framework and strategy for research and development in geovisual analytics for crisis management, present examples of the potential applicability of geovisual analytics methods and tools, and articulate a set of interdisciplinary research and development challenges.

Joe Kielman (Science and Technology Directorate, US Department of Homeland Security)

Next Generation Precision Information Environments for Crisis Management Decision-Making

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Plenary Panel

Chair: George Fenton (Humanitarian & Emergency Affairs, World Vision International)

An NGO-led Plenary on Haiti

Track: Collaboration and Social Networking

Andrea Kavanaugh (Virginia Tech, USA), Steven D. Sheetz (Virginia Tech, USA), Francis Quek (Virginia Tech, USA), B. Joon Kim (Indiana University-Purdue University Fort Wayne, USA)

Cell Phone Use with Social Ties during Crises: The Case of the Virginia Tech Tragedy

Abstract:

Many proposed technological solutions to emergency response during disasters involve the use of cellular telephone technology. However, cell phone networks quickly become saturated during and/or immediately after a disaster and remain saturated for critical periods. In this study, we investigated cell phone use by Virginia Tech students, faculty and staff during the shootings on April 16, 2007 to identify patterns of communication with social network ties. We administered an online survey to a random sample from our pool to capture communications behavior with social ties during the day of these tragic events. The results show that cell phones were the most heavily used communication technology by a majority of respondents (both voice and text messaging). While text messaging makes more efficient use of bandwidth than voice, most communication on 4/16 was with parents, since the majority of the sample is students, who are less likely to use text messaging. Our findings should help in understanding how cell phone technologies may be utilized or modified for emergency situations in similar communities.

Link to pdf of full paper.

Mark Latonero (California State University, Fullerton, USA), Irina Shklovski (IT University of Copenhagen)

"Respectfully Yours in Safety and Service": Emergency Management & Social Media Evangelism

Abstract:

In this paper we consider how emergency response organizations utilize available social media technologies to communicate with the public in emergencies and to potentially collect valuable information using the public as sources of information on the ground. We discuss the use of public social media tools from the emergency management professionals‟ viewpoint with a particular focus on the use of Twitter. Little research has investigated Twitter usage in crisis situations from an organizational perspective. This paper contributes to our understanding of organizational innovation, risk communication, and technology adoption by emergency management. An in-depth case study of Public Information Officers of the Los Angeles Fire Department highlights the importance of the information evangelist within emergency management organizations and details the challenges those organizations face with an engagement with social media and Twitter. This article provides insights into practices and challenges of new media implementation for crisis and risk management organizations.

Link to pdf of full paper.

Sophia Liu (University of Colorado at Boulder, USA)

The Rise of Curated Crisis Content

Abstract:

In a networked world, we are increasingly inundated with information from online data streams especially from the social web. Curation has increasingly become the buzzword for managing this problem of information overload in the digital age. However, the applications and interpretations of curation by social web users are varied and often stray away from traditional curator roles. I present seven curatorial activities (i.e. collecting, organizing, preserving, filtering, crafting a story, displaying, and facilitating discussions) based on the analysis of 100 web artifacts. I introduce the concept, *socially-distributed curation*, to emphasize the distributed nature of this curatorial process emerging from the social web. Lastly, I present seven case

studies to illustrate preliminary examples of curated crisis content for four crises. These findings are to inform future designs and developments of crisis management tools that could benefit from curated crisis content.

Link to pdf of full paper.

Jeannette Sutton (University of Colorado at Colorado Springs, USA)

Twittering Tennessee: Distributed Networks and Collaboration Following a Technological Disaster

Abstract:

Informal communication channels are often the primary means by which time-sensitive hazard information first reaches members of the public. The capacity for informal communications has been recently transformed by the widespread adoption of social media technologies, such as the micro-blogging service Twitter, which allows individuals to interact with a broad audience over great distances. During a disaster or crisis event, this networked communication mechanism provides a means to communicate information and facilitate collaboration both locally and among distributed networks. This paper examines the use of Twitter following a technological disaster, showing how geographically dispersed individuals broadcast information about the impact of the disaster and its long-term effects, in contrast with the dearth of participation among public officials and industry representatives. Non-local users challenged authoritative accounts of the disaster and corrected misinformation. Conclusions are provided for policy makers and suggestions are offered for further research.

Link to pdf of full paper.

Kate Starbird (University of Colorado, USA), Leysia Palen (University of Colorado, USA)

Pass It On?: Retweeting in Mass Emergency

Abstract:

We examine microblogged information generated during two different co-occurring natural hazards events in Spring 2009. Due to its rapid and widespread adoption, microblogging in emergency response is a place for serious consideration and experimentation for future application. Because microblogging is comprised of a set of practices shaped by a number of forces, it is important to measure and describe the diffuse, multi-party information exchange behaviors to anticipate how emergency governance might best play a role. Here we direct consideration toward information propagation properties in the Twitterverse, describing features of information redistribution related to the retweet (RT @) convention. Our analysis shows that during an emergency, for tweets authored by local users and tweets that contain emergency-related search terms, retweets are more likely than non-retweets to be about the event. We note that users are more likely to retweet information originally distributed through Twitter accounts run by media, especially the local media, and traditional service organizations. Comparing local users to the broader audience, we also find that tweet-based information redistribution is different for those who are local to an emergency event.

Link to pdf of full paper.

Kate Starbird (University of Colorado, USA), Jeannie Stamberger (Carnegie Mellon Silicon Valley, USA)

Tweak the Tweet: Leveraging Microblogging Proliferation with a Prescriptive Syntax to Support Citizen Reporting

Abstract:

In this paper, we propose a low-tech solution for use by microbloggers that could enhance their ability to rapidly produce parsable, crisis-relevant information in mass emergencies. We build upon existing research on the use of social media during mass emergencies and disasters. Our proposed intervention aims to leverage the affordances of mobile microblogging and the drive to support citizen reporting within current behavioral Twitter-based microblogging practice. We introduce a prescriptive, tweet-based syntax that could increase the utility of information generated during emergencies by gently reshaping current behavioral

practice. This offering is grounded in an understanding of current trends in norm evolution of Twitter use, an evolution that has progressed quickly but appears to be stabilizing around specific textual conventions.

Link to pdf of full paper.

Thomas J. Heverin (Drexel University, USA), Lisl Zach (Drexel University, USA)

Microblogging for Crisis Communication: Examination of Twitter Use in Response to a 2009 Violent Crisis in the Seattle-Tacoma, Washington Area

Abstract:

This research-in-progress paper reports on the use of microblogging as a communication and information sharing resource during a recent violent crisis. The goal of the larger research effort is to investigate the role that microblogging plays in crisis communication during violent events. The shooting of four police officers and the subsequent 48-hour search for the suspect that took place in the Seattle-Tacoma area of Washington in late November 2009 is used as a case study. A stream of over 6,000 publically available messages on Twitter, a popular microblogging site, was collected and individual messages were categorized as information, opinion, technology, emotion, and action-related. The coding and statistical analyses of the messages suggest that citizens use microblogging as one method to organize and disseminate crisis-related information. Additional research is in progress to analyze the types of information transmitted, the sources of the information, and the temporal trends of information shared.

Link to pdf of full paper.

Bryan Semaan (University of California, Irvine, USA), Gloria Mark (University of California, Irvine, USA), Ban Al-Ani (University of California, Irvine, USA)

Developing Information Technologies for Citizens Experiencing Disruption: The Role of Trust and Context

Abstract:

This paper considers a subset of the technology-enabled communication that took place among citizen populations experiencing various disruptions, e.g. disaster and war. In the context of a disrupted environment, trust can erode where people no longer rely on institutions for support (i.e. the government), or where citizens do not trust other people. We argue that depending on what is taking place in the physical world, trust in people, information, and institutions can change – in this sense, trust is contextual. We then offer recommendations for designing new technologies for people who experience disruption, taking into account trust and context.

Link to pdf of full paper.

Lida Khalili Gheidary (London School of Economics, UK)

Social media and Iran's post-election crisis

Abstract:

In this research-in-progress paper, the role of social media during the two months of the Iranian post-election crisis in Summer 2009 has been studied. In search of emergent social phenomena, particular emphasis is given to online participation and collaboration throughout social network sites. This study demonstrates the extent to which such media can gain prominence and challenge traditional practices as well as challenging the next level of research and development of social media during crisis situations.

Link to pdf of full paper.

Kevin Fall (Intel Labs, Berkeley), Gianluca Iannaccone (Intel Labs, Berkeley), Jayanthkumar Kannan (University of California, Berkeley), Fernando Silveira (UPMC Paris Universitas), Nina Taft (Intel Labs, Berkeley)

A Disruption-Tolerant Architecture for Secure and Efficient Disaster Response Communications

Abstract:

We consider the problem of providing situational awareness when citizens in a disaster are willing to contribute their own devices, such as laptops and smart phones, to gather data (text, images, audio or video) and to help forward data gathered by others. A situational awareness service processes all received data and creates annotated maps to visualize a disaster site (e.g., the status of the disaster, such as fires or floods, the location of people, food, or water). We discuss the challenges imposed on such an application when 1) the communications infrastructure in the disaster area can only provide intermittent connectivity, 2) anxious victims generate large amounts of redundant content congesting the network, and 3) the sharing of personal devices creates security and privacy threats. We present an architecture that addresses the requirements to support such a service.

Link to pdf of full paper.

Andrea Bellucci (Universidad Carlos III de Madrid, Spain), Alessio Malizia (Universidad Carlos III de Madrid, Spain), Paloma Diaz (Universidad Carlos III de Madrid, Spain), Ignacio Aedo (Universidad Carlos III de Madrid, Spain)

Framing the design space for novel crisis-related mashups: the eStoryS example

Abstract:

Web 2.0 can be viewed as a platform where users can develop their own web applications. It is also characterized by a vast amount of user-generated contents presenting spatial and temporal components, by means of associated metadata. These metadata has been successfully exploited to generate map-based mashups (web applications gathering data from different sources) facing different kind of crisis situations, ranging from natural disasters (earthquakes, wildfires, floods...) to human-made disasters (terrorist attacks, school shootings, conflicts...). The social and collaborative dimensions of the Web 2.0 can be also exploited for managing crisis-related information. We present here a survey of current crisis-related mashups we employed to extract design dimensions and provide a conceptual framework that can be used: *a)* to understand current systems and; *b)* to design next generation of crisis-related mashups. We propose the eStoryS system as an example of application developed following the design principles presented in this paper. On the basis of our analysis, we believe that the design dimensions posited here provide useful insights for the design of novel web mashups in the emergency management domain.

Link to pdf of full paper.

Xiang Yao (New Jersey Institute of Technology, USA), Murray Turoff (New Jersey Institute of Technology, USA), Roxanne Hiltz (New Jersey Institute of Technology, USA)

A Field Trial of a Collaborative Online Scenario Creation System for Emergency Management

Abstract:

In Emergency Management and Business Continuity Planning, scenarios are a widely used tool. Existing scenario creation systems allow distributed groups to create scenarios together but have limited collaboration support. This study developed and evaluated a solution to provide various types of collaboration support around a knowledge structure at the core of a collaborative scenario creation system called Collario. Following the Design Science paradigm, it evolved through four iterations into a working prototype. Several evaluation methods, including protocol analysis and field study, were employed to evaluate the design effects and obtain user feedback. The results of the first field trial are described in this paper. They indicate that the system is useful to support creation and discussion of emergency scenarios in virtual teams and to share

knowledge and experiences among geographically distributed emergency professionals and researchers. It was also found that the system is not hard to learn and use.

Link to pdf of full paper.

Miao Jiang (The Pennsylvania State University, USA), William L. McGill (The Pennsylvania State University, USA)

Human-Centered Sensing for Crisis Response and Management Analysis Campaigns

Abstract:

Human-centered sensing (HCS) is an emerging research field that leverages mobile devices carried by people to collect useful information in support of myriad analytic activities. In this paper, we explore ways in which HCS can be applied to support a variety of analytic campaigns in the context of crisis response and management (CRM). We first summarize the concept of HCS and then investigate the potential advantages of complementing traditional sensing platforms and analytic tasks with an HCS system. By recognizing the potentials of HCS, we offer a scheme for classifying HCS systems and envision three application scenarios of HCS in CRM as well as a general architecture of HCS systems.

Link to pdf of full paper.

Track: Geo-Information Support

Thomas Bernoulli (Graz University of Technology, Austria), Gerald Glanzer (Graz University of Technology, Austria), Thomas Wießflecker (Graz University of Technology, Austria), Ulrich Walder (Graz University of Technology, Austria)

Infrastructurless Indoor Positioning System for First Responders

Abstract:

To overview the site of operation in case of an emergency is crucial for effective emergency management. This is a difficult task, in particular within large buildings or underground structures. Information about the whereabouts of the staff is a key element of effective disaster management. This paper presents an indoor positioning system which is able to track and locate people within buildings independent of any infrastructure (global navigation satellite system, WLAN installations, etc.). The system is based on inertial measurement units computing the track of its wearer and a component verifying this position estimates using floor plans of the building. This novel approach allows robust tracking and locating of action forces within buildings and underground structures.

Link to pdf of full paper.

Benjamin Schooley (Claremont Graduate University, USA), Brian Hilton (Claremont Graduate University, USA), Yoonmi Lee (Claremont Graduate University, USA), Rondalynne McClintock (Claremont Graduate University, USA), Samuel-Ojo Olusola (Claremont Graduate University, USA), Thomas Horan (Claremont Graduate University, USA)

CrashHelp: A GIS Tool for Managing Emergency Medical Responses to Motor Vehicle Crashes

Abstract:

This paper presents the research, design, and development of a comprehensive trauma information system inclusive of 911dispatch, Emergency Medical Services, and hospital trauma information. A proof-of-concept GIS based information system was designed and developed for use by trauma and emergency medical practitioners. Methods used include end-user focus group discussions, quantitative and qualitative data analysis, and an iterative system development process. A framework from prior research was utilized; a framework that considers the visualization of emergency medical events across an end-to-end continuum of

patient care. Analyses performed provided a multi-layered understanding of the practical and theoretical implications of using an end-to-end information schema for emergency response and trauma health systems.

Link to pdf of full paper.

Tim A. Majchrzak (University of Muenster, Germany), Philipp Neuhaus (University Hospital Muenster, Germany), Oliver Noack (University of Muenster, Germany), Frank Ückert (University Hospital Muenster, Germany), Herbert Kuchen (University of Muenster, Germany)

Towards a Decision Support System for the Allocation of Traumatized Patients

Abstract:

We present a decision support system for the allocation of traumatized patients. The assignment of patients to ve-hicles and hospitals is a task that requires detailed up-to-date information but has to be carried out quickly. We propose to support medical staff with an IT system. We especially encourage such a system to be used in cases of mass incidents as it is very problematic – yet essential – to provide all injured with adequate healthcare as fast as possible. Our proposal is a system based on business rules. In this paper we describe the development project's background as well as the system's requirements and some details of its implementation. Moreover, we explain an exemplary scenario to show strengths of our approach. Besides discussing related work, we draw an overview of future tasks.

Link to pdf of full paper.

Shubham Gupta (Information Sciences Institute, USA), Craig Knoblock (Information Sciences Institute, USA)

Building Geospatial Mashups to Visualize Information for Crisis Management

Abstract:

In time-sensitive environments such as disaster management, decision-making often requires rapidly gathering the information from diverse data sources and then visualizing the collected information to understand it. Thus, it is critical to reduce the overhead in data integration and visualization for efficient decision-making. Geospatial mashups can be an effective solution in such environments by providing an integrated approach to extract, integrate and view diverse information. Currently, mashup building tools exist for creating mashups, but none of them deal with the issue of data visualization. An improper visualization of the data could result in users wasting precious time to understand the data. In this paper, we introduce a programming-by-demonstration approach to data visualization in geospatial mashups that allows the users to customize the data visualization.

Link to pdf of full paper.

Anthony C. Robinson (The Pennsylvania State University, USA), Robert E. Roth (The Pennsylvania State University, USA), Alan M. MacEachren (The Pennsylvania State University, USA)

Challenges for Map Symbol Standardization in Crisis Management

Abstract:

A wide range of local, regional, and federal authorities will generate maps to help respond to and recover from a disaster. It is essential that map users in an emergency situation can readily understand what they are seeing on these maps. Standardizing map symbology is one mechanism for ensuring that geospatial information is interpretable during an emergency situation, but creating an effective map symbol standard is a complex and evolving task. Here we present preliminary results from research into the application of the ANSI 415-2006 INCITS Homeland Security Map Symbol Standard, a point symbol standard intended to support emergency management mapping for the U.S. Department of Homeland Security. This standard has so far not been widely adopted across the full range of DHS missions, and we elaborate on key issues and

challenges that should be accounted for when developing future map symbol standards for crisis management.

Link to pdf of full paper.

Martin Frassl (German Aerospace Center (DLR), Germany), Michael Lichtenstern (German Aerospace Center (DLR), Germany), Mohammed Khider (German Aerospace Center (DLR), Germany), Michael Angermann (German Aerospace Center (DLR), Germany)

Developing a System for Information Management in Disaster Relief - Methodology and Requirements

Abstract:

This paper discusses our ongoing work on a system for collecting, managing and distributing relevant information in disaster relief operations. It describes the background and conditions under which the system is being developed and employed. We present our methodology, the requirements and current functionality of the system and the lessons learned in exercises and training, involving a large number of international disaster management experts. We found that the viability of this kind of tool is determined by three main factors, namely reliability, usability and frugality. The system has gone through many prototype iterations and has matured towards becoming operational in a specific type of mission, i.e. assessment missions for large scale natural and man-made disasters. This paper aims at making a wider audience of disaster management experts aware of that system and the support it may provide to their work. Other researchers and developers may find our experience useful for creating systems in similar domains.

Link to pdf of full paper.

Jose Maria Nadal-Serrano (Ayuntamiento de Madrid, Spain)

Towards very simple, yet effective on-the-go incident response preplanning: using publicly-available GIS to improve firefighters' traditional approach

Abstract:

Incident response preplanning has an increasing importance in today's Fire Brigades incident response. This paper presents some concepts that could be easily applied, supplying the firefighters with a simple, yet reliable tool that can be configured to include data available at the time of resource activation. This early information and the route map to the incident can be of big help for firefighters if presented in a convenient way. Offline (paper) backup solutions and the need for APIs that may be used to exploit geographic data are also discussed. Finally, a proof of concept setup is developed using GoogleMaps™ for the case of the City of Madrid, Spain.

Link to pdf of full paper.

Suradej Intagorn (USC Information Sciences Institute, USA), Anon Plangprasopchok (USC Information Sciences Institute, USA), Kristina Lerman (USC Information Sciences Institute, USA)

Harvesting Geospatial Knowledge from Social Metadata

Abstract:

Up-to-date geospatial information can help crisis management community to coordinate its response. In addition to data that is created and curated by experts, there is an abundance of user-generated, user-curated data on Social Web sites such as Flickr, Delicious, and Google Earth, that can be used to harvest knowledge to solve real-world problems. User-generated, or social, metadata can be used to learn concepts and relations between them that can improve information discovery, and data integration and management. We describe a method that aggregates social metadata created by thousands of users of the social photo-sharing site Flickr to learn geospatial concepts and relations. Our method leverages geotagged data to represent and reason about places. We evaluate learned geospatial relations by comparing them to a

reference ontology provided by GeoNames.org. We show that our approach achieves good performance and also learns useful information that does not appear in the reference ontology.

Link to pdf of full paper.

Rego Granlund (Linköping University, Sweden), Helena Granlund (Linköping University, Sweden), Nils Dahlbäck (Linköping University, Sweden), Björn Johansson (Swedish Defence Research Agency)

The Effect of a Geographical Information System on Communication in Professional Emergency Response Organizations

Abstract:

This paper describes the basic communication analysis performed in a research project with an ambition to investigate the impact of geographical information system (GIS) on crisis management organizations. The goal is to compare the communication between command and control teams that have access to a GIS with geographical position information (GPS) capability in its command post with teams that only have access to paper maps. The method used is controlled experiments using the C3Fire micro-world. A total of 108 professionals, forming 18 teams, participated in the study. The participating professionals were members of Swedish municipal crisis management organizations. The result shows that the communication pattern connected to giving orders have a different distribution depending on if the teams used GIS or paper maps. The result also shows that the communication volume is reduced if the teams use GIS.

Link to pdf of full paper.

Track: Humanitarian Challenges

Jörn Franke (Public Security, SAP Research Center (SRC) Sophia Antipolis, France), Francois Charoy (LORIA-INRIA, Nancy-Université, France), Cedric Ulmer (Public Security, SAP Research Center (SRC) Sophia Antipolis, France)

A Model for Temporal Coordination of Disaster Response Activities

Abstract:

One problem for public safety organizations in a disaster is the management of response activities and their dependencies on an intra-and inter-organizational level. Our interviews with end users have shown that current solutions for managing activities are complicated to use in the crisis by teams in the field and also in operation centers, when facing continuous unexpected events and cross-organizational activities. We propose an activity centric system for managing crisis response activities for such situations. We give an example how this system is used in a crisis within one organization and cross-organizations. Afterwards, we explain the evaluation of the solution. This research contributes not only to the crisis management domain, but also to the business process management domain by providing an alternative view on activities in highly dynamic scenarios.

Link to pdf of full paper.

Carleen Maitland (Penn State University, USA), Andrea Tapia (Penn State University, USA), Louis-Marie Tchouakeu (Penn State University, USA), Kang Zhao (Penn State University, USA), Edgar Maldonado (Penn State University, USA)

Sectoral coordination in humanitarian information management: The implications of professionalization

Abstract:

Sector wide collaboration in humanitarian information management will occur in a context defined by professionalization of information management more generally as well as evolving needs for data within the humanitarian relief sector. By accounting for these broader trends this research contributes to our

understanding of collaboration in the humanitarian relief sector. In particular, the research analyzes the desire for greater standardization within the sector as a function of both the process of professionalization for information management as well as greater specialization in information technology that is a response to technological change. Based on these insights, recommendations for future actions for the community are made.

Link to pdf of full paper.

Louis-Marie Ngamassi Tchouakeu (College of Information Sciences & Technology, Penn State, USA), Carleen Maitland (College of Information Sciences & Technology, Penn State, USA), Andrea Tapia (College of Information Sciences & Technology, Penn State, USA), Kang Zhao (College of Information Sciences & Technology, Penn State, USA), Kartikeya Bajpai (College of Information Sciences & Technology, Penn State, USA)

Assessing Humanitarian Inter-Organizational Network Effectiveness: The Case of GlobalSympoNet

Abstract:

This paper reports on research in progress. The objective of the study is to assess the effectiveness of multidimensional humanitarian inter-organizational networks. Especially, it investigates how organizational characteristics and network structure properties impact network effectiveness. To this end, the research develops a model of network effectiveness in the humanitarian field, using the case of GlobalSympoNet, a network of organizations/agencies engaged in humanitarian information management and exchange. Data for the research come from a series of three surveys and semi-structured interviews conducted among organizations/agencies members of GlobalSympoNet. Social network analyses are done using UCINET (Borgatti et al., 1999). Some preliminary results are presented here.

Link to pdf of full paper.

Gisli Rafn Olafsson (Microsoft Corporation, USA)

Effective Coordination of Disaster Response - The International Perspective

Abstract:

Humanitarian situations have gotten more and more complex. Climate change is increasing the intensity, the increased involvement of NGOs and the revolution of social media has changed disaster response. This paper starts with a discussion of the changes that have happened in the last 10 years and then discusses how technology plays an increasing role in solving some of the more complex issues that disaster coordinators face.

Link to pdf of full paper.

Soumia Ichoua (Johnson C. Smith University, USA)

Humanitarian Logistics Network Design for an Effective Disaster Response

Abstract:

In this paper we address the problem of pre-positioning emergency supplies prior to a disaster onset. The goal is to ensure a fast and effective response when the disaster strikes. Pre-positioning of emergency supplies is a strategic decision aimed at determining the number and location of local distribution centers as well as their inventory levels for emergency supplies. These decisions must be made in a highly disruption-prone environment where a timely response is vital and resources are scarce. We present and discuss a scenario-based model that integrates location, inventory and routing decisions.

Link to pdf of full paper.

Terence David Gibson (Global Network for Disaster Reduction, UK)

It's not just the data: participatory monitoring and the most significant change

Abstract:

Overlaying the technical aspects of participative communications and network design is the question 'how they can secure social change?' Social change is a political act. How can transnational networks gain political influence for local groupings at the national and international level? The Global Network for Disaster Reduction has undertaken a large scale 'participatory monitoring' project with the intended aim of using an activist 'social network' to create 'social demand': influencing policy and implementation within the UN's framework for disaster reduction. While the project achieved its intended goals, the unintended impacts of the project are argued to be at least as significant; revealing ways that networks can create 'political space' at the local level which can influence policy and access to resources at the national and international level. This paper is presented from a practitioner perspective, linking practice to theoretical work on transnational social movements and participative communications.

Link to pdf of full paper.

Willem Muhren (Tilburg University, The Netherlands), Damir Durbić (Tilburg University, The Netherlands), Bartel Van de Walle (Tilburg University, The Netherlands)

Exploring Decision-Relevant Information Pooling by Humanitarian Disaster Response Teams

Abstract:

It is a well-known fact that a lack of information will lead to suboptimal decisions. But even when actors jointly have all the information they need to make a well-informed decision, they may fail to find a superior alternative. This hidden profile paradigm would cause misrepresentations of crisis situations and lead to ineffective response. In this research-in-progress paper, we present the first stage of our experimental study on group decision making in humanitarian disaster response, in which we want to find out how teams can be supported to share more information, make better sense, and ultimately avoid such misrepresentations of crisis situations. First results reveal that humanitarian disaster response teams are able to share significantly more information if they would make use of more advanced information and communication systems. However, none of the teams in the experimental setup managed to find the optimal decision.

Link to pdf of full paper.

Track: Human-Computer Interaction

Teresa Onorati (Universidad Carlos III de Madrid, Spain), Alessio Malizia (Universidad Carlos III de Madrid, Spain), Paloma Diaz (Universidad Carlos III de Madrid, Spain), Ignacio Aedo (Universidad Carlos III de Madrid, Spain)

Interaction Design for Web Emergency Management Information Systems

Abstract:

The interaction design for web emergency management information systems (WEMIS) is an important aspect to keep in mind due to the criticality of the domain: decision making, updating available resources, defining a task list, trusting in proposed information. A common interaction design strategy for WEMIS seems to be needed but currently there are few references in literature. Our aim is to contribute to this lack with a set of interactive principles for WEMIS. From the emergency point of view, existing WEMIS have been analyzed to extract common features and to design interaction principles for emergency. Furthermore, we studied design principles extracted from the Turoff's model relating them to emergency phases and features. In particular, in this paper, we choose to follow the current trend in the definition of emergency life cycles. In our approach, referring to general policies in literature, the emergency management process is divided into two different sub cycles: back-end and front-end. From the interaction point of view, a formalization process based on the

interactive PIE model has been defined. The result we propose here is a set of design principles for supporting interactive properties for WEMIS.

Link to pdf of full paper.

Alexandra Krakovsky (USA)

The Role of Social Networks in Crisis Situations: Public Participation and Information Exchange

Abstract:

The goal of the paper is to discuss the framework for an interdisciplinary human-computer interactive technology that facilitates information and resource exchange and forms core groups for crisis management. The social net-works discussed here are designed to incorporate local knowledge and participation and to foster institutional and academic ties by modeling interrelationships among global communities and exploring policy options. Social interactions between individuals and organizations are explored especially in situations when directed responses are helpful in predicting the complex interplay between social, political, and technological systems and practices that result in a transfer of information and resources in disaster situations. In the future, such networks shall identify patterns through which groups interact in responding to critical issues and shall incorporate more complicated actions by individuals and organizations allowing them to move away from a rigid path to manage disasters via the most situationally appropriate routes.

Link to pdf of full paper.

Soussan Djamasbi (Worcester Polytechnic Institute, USA), Eleanor Loiacono (Worcester Polytechnic Institute, USA), Yitzhak Mendelson (Worcester Polytechnic Institute, USA)

Affect Feedback during Crisis and its Role in Improving IS Utilization

Abstract:

This research looks at a portion of a larger research question, which is **does including affect feedback into an existing 911 call taking process improve IS utilization**? The first step is to look at the impact of affect feedback in a controlled environment so that possible issues that could arise can be mitigated early on before actual implementation in a call center is performed. This paper focuses on the first step, a controlled laboratory experiment, which is explained in the methodology section of this paper.

Link to pdf of full paper.

José H. Canós (Technical University of Valencia, Spain), M. Carmen Penadés (Technical University of Valencia, Spain), Carlos Solís (University of Limerick, Ireland), Marcos R. S. Borges (Universidade Federal do rio de Janeiro, Brazil), Manuel Llavador (Technical University of Valencia, Spain)

Using Spatial Hypertext to Visualize Composite Knowledge in Emergency Responses

Abstract:

Having the right information at the right time is crucial to make decisions during emergency responses. To fulfill this requirement, emergency management systems must provide emergency managers with knowledge management and visualization tools. The goal is twofold: on one hand, to organize knowledge coming from different sources, mainly the emergency response plans (the formal knowledge) and the information extracted from the emergency development (the contextual knowledge); on the other hand, to enable effective access to information. Formal and contextual knowledge sets are mostly disjoint; however, there are cases in which a formal knowledge piece may be updated with some contextual information, constituting what we call the composite knowledge. In this paper, we extend a knowledge framework with the notion of composite knowledge, and use spatial hypertext to visualize this type of knowledge. We illustrate our

proposal with a case study on accessing to information during an emergency response in an underground transportation system.

Link to pdf of full paper.

Pablo Acuña (Universidad Carlos III de Madrid, Spain), Paloma Díaz (Universidad Carlos III de Madrid, Spain), Ignacio Aedo (Universidad Carlos III de Madrid, Spain)

Development of a Design Patterns Catalog for Web-based Emergency Management Systems

Abstract:

The design of Emergency Management Systems is an activity that requires knowledge from various related domains for providing a more complete and usable solution. In this context, design patterns including knowledge from previous experiences can be a useful source of information to support the development of this type of applications. In this paper, we introduce a catalog of design patterns for Web-based Emergency Management Systems collected from design principles, design patterns and existing implementations from involved areas, taking into account requirements particular to this domain.

Link to pdf of full paper.

Erkki Kurkinen (University of Jyväskylä, Finland), Helen Sullivan (Rider University, USA), Markku Häkkinen (University of Jyväskylä, Finland), Markku Lauttamus (University of Jyväskylä, Finland)

Optimizing Mobile Social Media Interfaces for Rapid Internal Communication by Emergency Services

Abstract:

Social media tools are seeing use in crisis situations. Authorities have recognized the value of such tools and are beginning to use services such as Facebook and Twitter to disseminate official information. However, the use of the social media concept as an internal, operational tool by emergency services is in its early stages. Current social media tools for mobile devices are of potential value, yet security concerns can render such systems unsuitable for operational use, and the user interface can hinder operational efficiency due to the inheritance of a text based model for input and display. The research to be described is examining interaction methods that may improve the efficiency and usability of mobile device-based social media for operational use by police services. A Twitter like model for police activity reports can provide a means for enhanced situational awareness for police command authorities, and for individual officers or patrol units engaged in the “professional” media interchanges. The proposed model, SUMO, is based on a hybrid symbolic and text interface to rapidly enter status, integrated with geolocation, and sensor-based data to automatically capture key information, and thereby minimizing the amount effort required create a complete status update.

Link to pdf of full paper.

Mohammadreza Khalilbeigi (Darmstadt University of Technology, Germany), Dirk Bradler (Darmstadt University of Technology, Germany), Immanuel Schweizer (Darmstadt University of Technology, Germany), Florian Probst (SAP Research CEC Darmstadt), Jürgen Steimle (Darmstadt University of Technology, Germany)

Towards Computer Support of Paper Workflows in Emergency Management

Abstract:

A crucial aspect for large-scale disaster management is an efficient technology support for communication and decision-making processes in command and control centers. Yet, experiences with the introduction of novel technologies in this setting show that field professionals tend to remain attached to traditional workflows and artifacts, such as pen and paper. We contribute the results of a comprehensive field study which analyzes how the information flow is currently performed within different units and persons in the command and control center. These findings provide insights into key aspects of current workflows which should be preserved by novel technological solutions. As our second contribution, by using a participatory

design approach and based on our findings, we present a novel approach for computer support in command and control centers. This relies on digital pens and paper and smoothly integrates traditional paper-based workflows with computing, thereby combining the advantages of paper and those of computers.

Link to pdf of full paper.

Elly Searle (University of Washington, Seattle, USA)

What is the Best Possible Design for All My Users?: A Single Question to Guide User-Centered Design in Low-Resource Environments

Abstract:

This paper discusses how methodological frameworks are often too cumbersome to be used in full by field workers in low-resource environments. When time, money, and political capital are scarce, there often isn't time to follow every prescribed step. This research looks at helping field workers incorporate user-centered design when creating technology solutions through a *single-question framework*. It follows the author's case study of considering different wording for the single question, and then describes her experience implementing the lightweight framework while redesigning an attendance system for Entity Green Training in Jordan. The method is promising as an efficient way to expand one's thinking during the design process, but needs more testing to validate its benefits for workers who lack training in user-centered design methods. This research is particularly valuable for people working in low-resource environments where they lack the time and money to iteratively fix problematic designs.

Link to pdf of full paper.

Gitte Lindgaard (Carleton University, Canada), Patrick Noonan (Carleton University, Canada), Devjani Sen (Carleton University, Canada), Cathy Dudek (Carleton University, Canada), Milica Stojmenovic (Carleton University, Canada), Bruce Tsuji (Carleton University, Canada), Sonny Lundahl (Amita Corporation, Canada), Donn MacMillan (Amita Corporation, Canada), Peter Seguin (Amita Corporation, Canada)

Deriving user requirements for a CBRNE support system

Abstract:

When an adverse event escalates into a criminal investigation, it becomes very difficult to control and combine information into a manageable format. The PROBE project addresses this problem by developing two generations of working prototypes capable of undergoing live field tests and evaluation by a wide-ranging community of CBRNE (Chemical, Biological, Radiological, Nuclear, Explosives) responders. The paper reports the derivation of preliminary user requirements for PROBE based on interviews and observations of a large-scale simulated CBRNE exercise. Five Human-Computer Interaction (HCI) researchers shadowed specialists representing different responder agencies (Emergency Medical Services, police, hazardous materials expert) during the three-hour exercise. Relying on cognitive ethnography, a variant of the concept of distributed cognition, video and audio recordings were merged with notes taken during the exercise and used to derive the preliminary user requirements. The study showed that these could be extracted from a relatively small set of behaviors and different types of utterances made by the active participants in the exercise. The paper concludes with a take-away message for researchers wishing to observe CBRNE exercises in which the command post event management team is collocated.

Link to pdf of full paper.

Track: Intelligent Systems

Alexander Smirnov (SPIIRAS, Russian Federation), Tatiana Levashova (SPIIRAS, Russian Federation), Nikolay Shilov (SPIIRAS, Russian Federation)

Ubiquitous Computing in Emergency: Profile-Based Situation Response

Abstract:

Ubiquitous computing opens new possibilities to various aspects of human activities. The paper proposes an approach to emergency situation response that benefits of the ubiquitous computing. The approach is based on utilizing profiles to facilitate the coordination of the activities of the emergency response operation members. The major idea behind the approach is to represent the operation members together with information sources as a network of services that can be configured via negotiation of participating parties. Such elements as profile structure, information source model and negotiation protocol are described in detail.

Link to pdf of full paper.

Oduor Erick Nelson Otieno (Chalmers Institute of Technology, Goteborg, Sweden), Nihal Siriwardanegea (Chalmers Institute of Technology, Goteborg, Sweden), Anna Gryszkiewicz (Chalmers Institute of Technology, Goteborg, Sweden), Fang Chen (Chalmers Institute of Technology, Goteborg, Sweden)

Concept for Intelligent Integrated System for Crisis Management

Abstract:

In this document, we describe the need for providing a uniform common picture that is missing in several crisis management decision support tools. Through research, we have reviewed some existing crisis management support systems in use and noted key user requirements that these tools are missing. A significant point of this research is to stress the importance of developing a decision support system that would improve the way an ideal support system would collect, analyze and disseminate necessary information to a crisis management decision maker. We also note the importance of ensuring that such a tool presents information to its user over a user friendly interface. The structure thus developed should be a standalone application that could be incorporated into existing platforms (Rinkineva, 2004) such as cell phones, PDAs and laptops.

Link to pdf of full paper.

Gerhard Wickler (University of Edinburgh, UK), Stephen Potter (University of Edinburgh, UK)

Standard Operating Procedures: Collaborative Development and Distributed Use

Abstract:

This paper describes a system that supports the distributed development and deployment of Standard Operating Procedures. The system is based on popular, open-source wiki software for the SOP development and the I-X task-centric agent framework for deployment. A preliminary evaluation using an SOP for virtual collaboration is described and shows the potential of the approach.

Link to pdf of full paper.

Tina Comes (Institute for Industrial Production, Karlsruhe Institute of Technology, Germany), Claudine Conrado (D-CIS Lab/Thales Research & Technology, The Netherlands), Michael Hiete (Institute for Industrial Production, Karlsruhe Institute of Technology, Germany), Michiel Kamermans (D-CIS Lab/Thales Research & Technology, The Netherlands), Gregor Pavlin (D-CIS Lab/Thales Research & Technology, The Netherlands), Niek Wijngaards (D-CIS Lab/Thales Research & Technology, The Netherlands)

An intelligent decision support system for decision making under uncertainty in distributed reasoning frameworks

Abstract:

This paper presents an intelligent system facilitating better-informed decision making under severe uncertainty as found in emergency management. The construction of decision-relevant scenarios, being coherent and plausible descriptions of a situation and its future development, is used as a rationale for collecting, organizing, filtering and processing information for decision making. The development of scenarios is geared to assessing decision alternatives, thus avoiding time-consuming analysis and processing of irrelevant information. The scenarios are constructed in a distributed setting allowing for a flexible adaptation of reasoning (principles and processes) to the problem at hand and the information available. This approach ensures that each decision can be founded on a coherent set of scenarios, which was constructed using the best expertise available within a limited timeframe. Our theoretical framework is demonstrated in a distributed decision support system by orchestrating both automated systems and human experts into workflows tailored to each specific problem.

Link to pdf of full paper.

Huizhang Shen (Department of Management Information Systems, Shanghai Jiao Tong University, China), Jidi Zhao (Department of Management Information Systems, Shanghai Jiao Tong University, China)

Decision-making Support Based on the Combination of CBR and Logic Reasoning

Abstract:

In recent years, various crises arise frequently and cause tremendous economic and life losses. Meanwhile, current emergency decision models and decision support systems still need further improvement. This paper first proposes a new emergency decision model based on the combination of a new case retrieval algorithm for Case-Based Reasoning (CBR) and logic reasoning, and then address a sample flood disaster emergency decision process to explain the application of the model in practice.

Link to pdf of full paper.

Track: Open Track

Marcus Vogt (Bond University, Australia), Kieth Hales (Bond University, Australia), Dieter Hertweck (Heilbronn University, Germany), Gavin Finnie (Bond University, Australia)

Strategic ICT Alignment in Emergency Management

Abstract:

This paper shows preliminary results of an ongoing research project on the benefits of Strategic ICT Alignment in the domain of disaster management. The research is based on current literature in that area, an observation of a multi-organizational pandemic exercise in a large German municipality and interviews with stakeholders of different emergency management organizations in Germany and Australia. The preliminary results show that emergency managers can feel overwhelmed by the complexity of ICT and are unable to estimate the value and impact of ICT on their processes. Consequently, the paper identifies a research gap in the area of ICT Governance and Emergency Management, which will guide the coming research stages in order to develop a Strategic ICT Alignment framework for emergency management organizations.

Link to pdf of full paper.

Nicolas Martín di Tada (InSTEDD), Timothy Large (Thomson Reuters Foundation)

Emergency Information System

Abstract:

This paper describes an information system designed to be deployed in emergencies caused by sudden onset natural disasters. The aim is to streamline the communication flow and collaboration between media, aid workers and government agencies with the affected population, to help the latter get verified, accurate and actionable information that will enable them to make decisions and recover from the disaster. The Emergency Information Service (EIS) system also provides means for affected population and field workers to channel vital data back up into aid response. This tool is part of a free information service run by Thomson Reuters Foundation to help survivors of natural disasters. It will serve the affected populations, local media and relief responders by providing fast, practical and verified information in local languages through the best means available.

Link to pdf of full paper.

Christopher W. Zobel (Virginia Polytechnic Institute and State University, USA)

Comparative Visualization of Predicted Disaster Resilience

Abstract:

The disaster resilience triangle is a simple but effective tool for illustrating the relationship between the initial impact of a disaster event and the subsequent time to recovery. This tool can also be expanded, however, to provide an *analytic* measure of the level of resilience exhibited by a particular entity in a given disaster situation. We build upon the previous work in this area by developing a new approach for visualizing and analyzing the tradeoffs between the two primary defining characteristics of the disaster resilience triangle. This new approach supports strategic decision making in a disaster planning environment by providing a straightforward means for directly comparing the relative predicted resilience of different critical facilities within an organization, with respect to both location and type of risk.

Link to pdf of full paper.

Helena Mitchell (Georgia Institute of Technology, USA), Jeremy Johnson (Georgia Institute of Technology, USA), Salimah LaForce (Georgia Institute of Technology, USA)

Wireless Emergency Alerts: An Accessibility Study

Abstract:

Since 2001, entities in the U.S. have produced studies which address issues regarding the progress of including people with disabilities in emergency planning at the Federal, state and local levels. There is general agreement among these stakeholders that there must be engagement of emergency personnel, robust, reliable and accessible emergency communications to ensure a high quality of public safety. A key step is the development of emergency communication technologies that serve emergency management and public safety personnel's ability to communicate with the public. It is critical that these next-generation warning systems be developed such that persons with disabilities are given equal access to emergency alerts. This paper discusses a research and development effort to identify the accommodations needed by people with disabilities in these next-generation, mobile emergency alerting systems. Prototyping mobile phone-based emergency alert systems are discussed and summative findings from field trials conducted with sensory challenged individuals are presented.

Link to pdf of full paper.

Jan Martin Jansen (Netherlands Defense Academy, The Netherlands), Bas Lijnse (Netherlands Defense Academy, The Netherlands), Rinus Plasmeijer (Radboud University Nijmegen, The Netherlands)

Towards Dynamic Workflow Support for Crisis Management

Abstract:

Current process support technology for crisis management is often limited to either sharing of information or hard-coded process support through dedicated systems. Workflow management systems have the potential to improve crisis response operations by automating coordination aspects. Unfortunately most contemporary systems can only support static workflows, hence yielding inflexible support systems. Recent work on the use of functional programming techniques for workflow modeling has led to the development of the iTask system. It uses function combination to model dynamic data-driven processes and generates executable workflow support systems. Because of its focus on dynamic processes it appears promising for development of flexible crisis response systems. In this paper we present an initial discussion of the potential of the iTask system for crisis management applications. We give an overview of the iTask system, and discuss to what extent it meets the requirements of the crisis management domain.

Link to pdf of full paper.

Mikael Asplund (Linköping University, Sweden), Trishan de Lanerolle (Trinity College, Hartford, CT, USA), Christopher Fei (Trinity College, Hartford, CT, USA), Prasanna Gautam (Trinity College, Hartford, CT, USA), Ralph Morelli (Trinity College, Hartford, CT, USA), Simin Nadjm-Tehrani (Linköping University, Sweden), Gustav Nykvist (Linköping University, Sweden)

Wireless Ad Hoc Dissemination for Search and Rescue

Abstract:

In search and rescue scenarios local information on victims and other finds needs to be disseminated rapidly to other rescue workers and team leaders. However, post disaster scenarios may imply the collapse of information infrastructure including cellular communication and Internet connectivity. Even if we consider wireless ad hoc communication as a means of information dissemination we should count on frequent loss of connectivity in the network due to unpredictable mobility and sparse network topologies. In this paper we present the realization of an existing manycast protocol (random walk gossip) on commodity handheld devices running the Android platform. This communication mode is used to demonstrate the potential for distributed information dissemination on victims and finds. The application layer is an adaptation of an existing surveying information tool (POSIT) which is now fully decentralized and relies on text communication to achieve energy efficiency.

Link to pdf of full paper.

Gary Fetter (Virginia Tech, USA), Mauro Falasca (Loyola University Maryland, USA), Christopher W. Zobel (Virginia Tech, USA), Terry R. Rakes (Virginia Tech, USA)

A multi-stage decision model for debris disposal operations

Abstract:

As shown by Hurricane Katrina, disposing of disaster-generated debris can be quite challenging. Extraordinary amounts of debris far exceeding typical annual amounts of solid waste are almost instantaneously deposited across a widespread area. Although the locations and amounts of debris can be easily summarized looking back after recovery activities have been completed, they are uncertain and difficult at best to estimate as debris operations begin to unfold. Further complicating matters is that the capacity of cleanup resources, which is dependent upon available equipment, labor, and subcontractors, can fluctuate during on-going cleanup operations. As a result, debris coordinators often modify initial resource assignments as more accurate debris estimates and more stable resource capacities become known. In this research, we develop a computer-based decision support system that incorporates a multi-stage programming model to assist decision makers with allocating debris cleanup resources immediately following

a crisis event and during ongoing operations as debris volumes and resource capacities become known with increasing certainty.

Link to pdf of full paper.

Heiko Roßnagel (Fraunhofer Institute for Industrial Engineering, Germany), Olaf Junker (Airport Research Center GmbH)

Evaluation of a Mobile Emergency Management System – A Simulation Approach

Abstract:

Large public events such as sporting events, concerts, fairs and street festivals are quite common in metropolitan areas. Because of the high frequency of such events and the increasing number of involved parties, those being responsible for the organization and execution have to cope with increasing complexity and shortening time frames for planning and preperation. Because of the high concentration of passengers, unplanned incidents that occur during these public events can have devastating effects and can lead to crises and disasters. Emergency management systems that utilize mobile communication infrastructures can provide prompt information delivery to save human lives. In this paper we propose a system design for mobile emergency management and outline our approach of evaluating this system design using multi-agent based simulation. To make our simulation of passenger movements as realistic as possible we gathered empirical data for a large event as well as for normal rush hour traffic.

Link to pdf of full paper.

Albert Y. Chen (University of Illinois, USA), Feniosky A. Peña-Mora (Columbia University, New York, USA), Saumil J. Mehta (University of Illinois, USA), Stuart Foltz (Construction Engineering Research Lab), Albert P. Plans (Universitat of Politècnica de Catalunya), Brian R. Brauer (Illinois Fire Service Institute), Scott Nacheman (Thornton Tomasetti)

A GIS Approach to Equipment Allocation for Structural Stabilization and Civilian Rescue

Abstract:

Efficient request and deployment of critical resources for urban search and rescue operations is vital to emergency response. This paper presents a RFID (Radio Frequency Identification) supported system for on-site data collection to communicate structural condition, to track search and rescue status, and to request and allocate appropriate resources. The system provides a unified interface for efficient posing, gathering, storing and sharing of building assessment information. Visualization and easy access of such information enables rescuers to response to the disaster with better situational awareness. Resource requests are sent to the GIS resource repository service that enables a visual disaster management environment for resource allocation. Request and deployment of critical resources through this system enables lifesaving efforts, with the appropriate equipment, operator, and materials, become more efficient and effective. System development at the Illinois Fire Service Institute has shown promising results.

Link to pdf of full paper.

Matthew Guardascione (Monmouth University, USA), Allen E. Milewski (Monmouth University, USA)

Feedback Mechanisms in Automated Emergency Management Training

Abstract:

This study explored automated training for emergency managers and the effects of feedback on performance. A prototype emergency management training application was built to allow the usage of either immediate feedback or delayed, “hotwash” feedback. Users were split into two groups and asked to carry out two emergency management scenarios using one of the feedback mechanisms, and the difference in scores between each feedback type were analyzed There was a general increase in performance across sessions. Further, the improvements in scores between each feedback type showed that users performed significantly

better when using the hotwash feedback mechanism compared with the immediate feedback mechanism. In contrast to the performance data, preference data showed no overall differences between the two procedures, although each user had a strong preference for one or the other feedback mechanism. The implications for the design of training systems offering both procedures are discussed.

Link to pdf of full paper.

Kees Boersma (VU University Amsterdam, The Netherlands), Jeroen Wolbers (VU University Amsterdam, The Netherlands), Pieter Wagenaar (VU University Amsterdam, The Netherlands)

Organizing Emergent Safety Organizations: The travelling of the concept 'Netcentric Work' in the Dutch Safety sector

Abstract:

This paper is about the introduction of netcentric work in the public safety sector in the Netherlands. The idea behind netcentric work is that a common operational picture will help the professionals to overcome problems with sharing information during crisis. In this WIP paper we will pay attention to netcentric work principles and the dilemma of standardization of technologies versus local adaptation. In the Netherlands the government has chosen to introduce netcentric work via a Platform in which various options are discussed among members of Dutch safety regions. The outcome is a process of negotiation in what we call trading zones. In these trading zones netcentric work is (re)defined. Using theoretical concepts like soft-bureaucracy we show in this paper how netcentric work eventually is not about technology in the first place but a negotiated new way of working and organizing. Further research is needed to understand the full implications of netcentric work for the administration and organization of safety.

Link to pdf of full paper.

Babajide Osatuyi (New Jersey Institute of Technology, USA), Michael Chumer (New Jersey Institute of Technology, USA)

An Empirical Investigation of Alert Notifications: A Temporal Analysis Approach

Abstract:

As the deployment of situational awareness mechanisms such as geothermal sensors, use of social network sites, and information and communication technologies (e.g., cell phones) become increasingly widespread to emergency responders, the problem of alert analysis has become very important. Broadcast of large amounts of alerts sent back to command centers for processing may impair the ability of analysts to connect dots that may otherwise adequately enable them to make informed decisions in a timely fashion. This paper investigates trends and patterns embedded in alert notifications generated over a given period of time in order to uncover correlations that may exist in the data. Data for this study are obtained from the National Center for Crisis and Continuity Coordination (NC4). We employ classical time series analysis to understand, explain and predict trends and patterns in the data. This work presents results obtained thus far in the quest for the effect of passage of time on alert patterns. Implications of this work in practice and research are discussed.

Link to pdf of full paper.

Naveen Ashish (UC Irvine, USA), Sharad Mehrotra (UC Irvine, USA)

Community Driven Data Integration for Emergency Response

Abstract:

This paper describes our work in progress on an approach and technology for providing integrated data access in situational awareness applications – particularly for disaster and emergency response. The key new aspect of our work is an approach where information aggregation, processing, and integration capabilities are offered as a *service* to any new application builder. Further, we provide a framework for

possibly reusing prior information integration knowledge, the development of which demands the major fraction of time and complexity in a new application, in a *customized* fashion for new application. Our overall goal is to provide a framework where integrated access to critical data in an emergency response situation can be enabled very rapidly and by personnel with basic IT and data handling expertise. Our approach, while general purpose, is currently motivated by and grounded in the context of situational awareness systems for incident commander decision support in the fire response domain.

Link to pdf of full paper.

Wendy Edwards (Health Sciences Group, National Center for Supercomputing Applications, University of Illinois), Awais Vaid (Champaign-Urbana Public Health District), Ian Brooks (Health Sciences Group, National Center for Supercomputing Applications, University of Illinois)

INDICATOR: An Open-Source Cyberenvironment for Biosurveillance

Abstract:

In this paper, we discuss the architecture and implementation of INDICATOR, a free open source cyberenvironment for disease surveillance. Biosurveillance entails numerous tasks, including data acquisition and preparation, analysis, and reporting. These tasks can be modeled and executed as a workflow. Workflows encapsulate data, tools, and metadata. Cyberenvironments provide integrated, user-friendly sets of tools and services to marshal resources and help researchers analyze, visualize, and model their data. INDICATOR uses an Eclipse-based cyberenvironment that supports interactive workflow creation, connection to data and event streams, provenance tracking, and reuse of workflows and fragments to acquire, analyze, and visualize public health data.

Link to pdf of full paper.

Track: Planning, Foresight and/or Risk Analysis

Victor Amadeo Bañuls (Universidad Pablo de Olavide), Murray Turoff (New Jersey Institute of Technology), Joaquin Lopez (Universidad Pablo de Olavide)

Clustering Scenarios using Cross-Impact Analysis

Abstract:

Scenarios are frequently used in Emergency Planning and Preparedness. These scenarios are developed based on the hypothesis of occurrence or not of significant events. This is a complex process because of the interrelations between events. This fact, along with the uncertainty about the occurrence or non-occurrence of the events, makes the scenario generation process a challenging issue for emergency managers. In this work a new step-by-step model for clustering scenarios via cross-impact is proposed. The authors‟ proposal adds tools for detecting critical events and graphical representation to the previous scenario-generation methods based on Cross-Impact Analysis. Moreover, it allows working with large sets of events without using great computational infrastructures. These contributions are expected to be useful for supporting the analysis of critical events and risk assessment tasks in Emergency Planning and Preparedness. Operational issues and practical implications of the model are discussed by means of an example.

Link to pdf of full paper.

Arthur Henry Hendela (New Jersey Institute of Technology, USA), Murray Turoff (New Jersey Institute of Technology, USA), Roxanne Hiltz (New Jersey Institute of Technology, USA)

Cross Impact Security Analysis using the HACKING Game

Abstract:

Security of network assets is a high priority with little traditional return on investment. Increasingly, cyber attacks are being used by both terrorist and unfriendly government organizations. The HACKING Game, a Cross Impact Analysis planning tool, can be used to plan security resource allocation in computer networks. Cross Impact Analysis provides a mathematical basis to determine the interrelationships of one event with a set of other events. Output from the HACKING Game's Cross Impact Analysis model can be used to help justify security expenditures, with an added benefit of being a training tool for employees learning to protect networks. This paper presents details of the Hacking Game's design and its capabilities. Cross impact modeling can be used to develop games for any situation characterized by a set of offense and defense events to produce an individual or collaborative model for such things as natural and man-made disasters.

Link to pdf of full paper.

Elizabeth Sharon Veinott (ARA, USA), Gary A. Klein (ARA, USA), Sterling Wiggins (ARA, USA)

Evaluating the Effectiveness of the PreMortem Technique on Plan Confidence

Abstract:

One problem affecting crisis management planning teams is overconfidence– an inflated belief that a plan will be successful. In this paper we compared the effect of several different methods for reducing individual team member confidence levels and compared each to a baseline control condition. One hundred and seventy-eight people participated in one of five conditions to evaluate an H1N1 flu epidemic plan in a university context. Over the course of evaluating the plan, participants provided several ratings of confidence in the plan's success and their understanding. We compared several techniques commonly used, such as critique, Pro/Cons generation, Cons only generation and a newer technique, PreMortem, to a baseline condition. The Pro/Cons generation, Cons only generation and the PreMortem technique all reliably reduced confidence levels more than baseline condition. Furthermore, the Premortem method, imagining that a plan has failed and then generating reasons to explain why, reliably reduced confidence more than each of the other conditions, and therefore can be a useful tool for combating overconfidence in crisis management planning. We discuss the results in the context of sensemaking and decision making theory.

Link to pdf of full paper.

Annie Searle (ASA Risk Consultants, USA)

A Seat at the Table for Operational Risk

Abstract:

What role should operational risk leaders have in the executive suite? This paper argues that, when nervous CEOs ask "What can go wrong? How can we get ahead of the curve?", they should look to their operational risk leaders. Those leaders oversee corporate and information security as well as business continuity, crisis management and disaster recovery programs inside companies. That makes them ideally qualified to take the process of crisis management, including analysis of aggregate risk across all silos -- to the CEO and then into the boardroom when the need arises, before the corporate crisis is full-blown.

Link to pdf of full paper.

Susanne Jul (Amaryllis Consulting, LLC, USA)

You Get What You Plan For

Abstract:

This paper seeks to illustrate a few simple but common mistakes in exercise planning through a case study, in the hopes that readers may improve their use of exercises as a research and development tool.

Link to pdf of full paper.

Robin E. Mays (Unattached, humanitarian practitioner)

A Planning Approach to Humanitarian Logistics

Abstract:

In humanitarian events, logistics is traditionally considered at time of crisis, and at the tail-end of a project design with little to no strategical, logistical forethought applied. Introducing risk assessment and integrating logistics planning with program plans and training to these plans prior to disaster striking offers a more impactful response at time of disaster. This can be introduced in high risk countries through one on one training, simple templates, spreadsheets and standardized processes—a low to no technological, and highly relational method of building capacity and increasing the impact of an organization‟s response to beneficiaries.

Link to pdf of full paper.

Jennifer J. Mathieu (The MITRE Corporation, USA), Mark Pfaff (Indiana University - Purdue University, USA), Gary L. Klein (The MITRE Corporation, USA), Jill L. Drury (The MITRE Corporation, USA), Michael Geodecke (RTI International, USA), John H. James (The MITRE Corporation, USA), Paula J. Mahoney (The MITRE Corporation, USA), Georgiy Bobashev (RTI International, USA)

Tactical Robust Decision-Making Methodology: Effect of Disease Spread Model Fidelity on Option Awareness

Abstract:

We demonstrate a method of validating the utility of simpler, more agile models for supporting tactical robust decision making. The key is a focus on the decision space rather than the situation space in decision making under deep uncertainty. Whereas the situation space is characterized by facts about the operational environment, the decision space is characterized by a comparison of the options for action. To visualize the range of options available, we can use computer models to generate the distribution of plausible consequences for each decision option. If we can avoid needless detail in these models, we can save computational time and enable more tactical decision-making, which will in turn contribute to more efficient Information Technology systems. We show how simpler low fidelity, low precision models can be proved to be sufficient to support the decision maker. This is a pioneering application of exploratory modeling to address the human-computer integration requirements of tactical robust decision making.

Link to pdf of full paper.

Geoffrey Hoare (Florida Department of Health, USA), Mary Russell (Florida Department of Health, USA), Aaron Kite-Powell (Florida Department of Health, USA), Richard France (Florida Department of Health, USA

Developing H1N1 Hospital Surge “Dashboard” Indicators

Abstract:

Developing key state-wide indicators of Florida’s health care system’s public health capacity during the H1N1 Pandemic has been challenging. This demonstration outlines work to develop a key indicator of patient surge

caused by the H1N1 outbreak. Further work to calibrate this measure and relate it to surge in other health care organizations is outlined.

Link to pdf of full paper.

Nitesh Bharosa (Delft University of Technology, The Netherlands), Sebastiaan Meijer (Delft University of Technology, The Netherlands), Marijn Janssen (Delft University of Technology, The Netherlands), Fritjof Brave (Berenschot, The Netherlands)

Are we prepared? Experiences from developing dashboards for disaster preparation

Abstract:

Relief agency managers show growing interest in dashboards for assessing multi-agency disaster preparedness. Yet, there is a dearth of research on the development and use of dashboards for disaster preparation. Consequently, information system architects in the disaster management domain have little guidance in developing dashboards. Here, dashboards refer to digitalized visualizations of performance indicators. In this paper, we discuss the experiences gained from an action research project on the development of dashboards for assessing disaster preparedness. The objective of this paper is to discuss experiences and tradeoffs extracted from the development of dashboards in practice. We organized a two-day gaming-simulation with relief agency managers for the evaluation of the dashboards. While the relief agency managers acknowledged the usefulness of dashboards in the disaster preparation process and expressed their intention to use these in practice, they suggested that the formulation and clustering of performance indicators requires further research.

Link to pdf of full paper.

Robert Baksa (NJIT, USA), Murray Turoff (NJIT, USA)

The Current State of Continuous Auditing and Emergency Management's Valuable Contribution

Abstract:

Continuous Auditing systems require that human judgment be formalized and automated, which can be a complex, costly and computationally intensive endeavor. However, Continuous Auditing systems have similarities with Emergency Management and Response systems, which integrate Continuous Auditing's detection and alerting functions with the tracking of decisions and decision options for the situations that could be more effectively handled by human judgment. Emergency Management and Response systems could be an effective prototype to help overcome some of the implementation obstacles that are impeding Continuous Auditing systems' implementation rate. Continuous Auditing has the potential to transform the existing audit paradigm from periodic reviews of a few accounting transactions to a continuous review of all transactions, which thereby could vastly strengthen an organization's risk management and business processes. Although Continuous Auditing implementations are occurring, their adoption is slower than expected. With the goal of providing an empirical and methodological foundation for future Continuous Auditing systems and possibly inspiring additional investigation into merging the Continuous Auditing and Emergency Management streams of research, this paper provides several definitions of Continuous Auditing, suggests possible architectures for these systems, lists some common implementation challenges and highlights a few examples of how Emergency Management research could potentially overcome them.

Link to pdf of full paper.

Josune Hernantes (TECNUN - University of Navarra, Spain), Jose Manuel Torres (TECNUN - University of Navarra, Spain), Ana Lauge (TECNUN - University of Navarra, Spain), Iztok Starc (Univesity of Ljubljana), Eva Zupancic (Univesity of Ljubljana), Denis Trcek (Univesity of Ljubljana), Jose Maria Sarriegi (TECNUN - University of Navarra, Spain)

Using GMB Methodology on a Large Crisis Model

Abstract:

Mitigating, detecting, evaluating, responding and recovering from crises are highly complex tasks that involve many decision makers (agents). As a consequence using collaborative methods that allow the cooperation among these agents during the crisis management strategy and procedures design is of significant importance. Group Model Building (GMB) is a robust collaborative methodology that has been successfully used for modelling several complex socio-technical problems, where different agents may have diverse perspectives or interests in the problem under analysis. Through the development of a series of exercises, GMB allows the integration of these initially fragmented perspectives. Modellers translate the knowledge elicited from experts during GMB workshops into simulation models that reproduce the behaviour of the problem. This paper presents the use and adaptation of the GMB methodology in a research project about large pan European crises due to outages in the electricity sector.

Link to pdf of full paper.

Björn Bjurling (Swedish Institute of Computer Science, Sweden)

Contracts for Resources in Crisis Management

Abstract:

Today, crisis management relies to an extent on the provisioning of required resources from third-party providers. The crisis management capability is thus dependent on the adherence to, and the consistency of, a set of contracts for resource provisions. We aim at formalizing contingency plans as sets of contracts and developing a computational model for assessing whether the contracts for resource provisioning yield an adequate crisis management capability, with respect to resource provisioning. This paper outlines ongoing research on how to enable an analysis of contingency plans with respect to resource provisioning using the contractual formalism under development. We outline the important issues and illustrate with an example how contracts can be used for resource sharing.

Link to pdf of full paper.

Track: Research Methods

Babajide Osatuyi (New Jersey Institute of Technology, USA), David Mendonça (New Jersey Institute of Technology, USA)

Requirements for Modeling Collaborative Information Foraging Behavior: An Application to Emergency Response Organizations

Abstract:

Collaborative information foraging refers to the collective activities of seeking and handling information in order to meet information needs. This paper delineates requirements for modeling salient factors that shape collaborative information foraging behavior of groups. Existing modeling approaches are assessed based on their adequacy for measuring identified salient factors that shape collaborative information foraging behavior. A view of information foraging behavior as a dynamic process is presented. Consequently, this paper purports that modeling methods employed to aid understanding of foraging behavior must allow for plausible explanation of the inherent dynamism in foraging activities. This work therefore provides an initial roadmap to defining salient factors that need to be addressed in order to adequately model collaborative information

foraging behavior within teams that operate in extreme environments. Implications of this work in practice and research are discussed.

Link to pdf of full paper.

Rianne Gouman (D-CIS Lab / Thales Research & Technology NL, The Netherlands), Masja Kempen (D-CIS Lab / Thales Research & Technology NL, The Netherlands), Niek Wijngaards (D-CIS Lab / Thales Research & Technology NL, The Netherlands)

Actor-Agent Team Experimentation in the Context of Incident Management

Abstract:

The collaboration between humans (actors) and artificial entities (agents) can be a potential performance boost. Agents, as complementary artificial intelligent entities, can alleviate actors from certain activities, while enlarging the collective effectiveness. This paper describes our approach for experimentation with actors, agents and their interaction. This approach is based on a principled combination of existing empirical research methods and is illustrated by a small experiment which assesses the performance of a specific actor-agent team in comparison with an actor-only team in an incident management context. The REsearch and Simulation toolKit (RESK) is instrumental for controlled and repeatable experimentation. The indicative findings show that the approach is viable and forms a basis for further data collection and comparative experiments. The approach supports applied actor-agent research to show its (dis)advantages as compared to actor-only solutions.

Link to pdf of full paper.

Jonas Landgren (University of Gothenburg, Sweden)

Principles of Radical Research in the area of Information Systems for Crisis Response

Abstract:

The paper outlines a set of principles for radical research in the field of information systems for crisis response and management. After every major disaster, there is a never-ending call for new solutions that could improve emergency and crisis response work. This paper presents confessional accounts from one research group on how design oriented research could adopt a design perspective and organize research that have substantial potential in improving emergency and response work through innovative design of information technology use.

Link to pdf of full paper.

Nitesh Bharosa (Delft University of Technology, The Netherlands), Marijn Janssen (Delft University of Technology, The Netherlands), Harry Bouwman (Delft University of Technology, The Netherlands)

Ex-ante evaluation of disaster information systems: a gaming-simulation approach framework

Abstract:

Failures in coordination and information sharing between relief agencies have increased the number of calls for innovative information system (IS) designs. While both the academic and the industrial communities have proposed many IS designs, methodologies for the ex-ante evaluation of such IS designs are scarce. Consequently, disaster IS architects are offered little guidance in the ex-ante evaluation process. Not only is it difficult to evaluate IS designs in practice, it is also difficult to include the conditions of disaster situations in the evaluation process. This paper explores the difficulties of ex-ante evaluation and discusses the suitability of the gaming-simulation methodology for the evaluation of principle-based IS designs. Gaming-simulation entails the use of professionals, scenarios and prototypes and can be adapted to a quasi-experimental form

enabling researchers to control contextual interferences and rule out alternative explanations. This paper concludes with some discussions on the advantages and pitfalls of employing gaming-simulation for IS evaluation.

Link to pdf of full paper.

Track: Safety and Security Education (SASER)

Jozef Ristvej (University of Žilina, Slovakia), Tomáš Loveček (University of Žilina, Slovakia), Katarína Kampová (University of Žilina, Slovakia)

eSEC - Competency Based e-portal of Security and Safety Engineering

Abstract:

The main focus of the preparing electronic portal "eSEC - Competency Based e-portal of Security and Safety Engineering" – eSEC-portal, is to establish web system, which would be new tool in process of learning for students and professionals in fields focusing on security studies, safety studies and crisis management. eSEC-portal aims on preparing connections among students, teachers, professionals and experts. This interface will bring qualitative improvement for learning process of students and we suppose more activities from them in professional and scientific work. Students will have possibility to compare actual questions and problems on other institutions, in scientific and professional environment. Teachers will be able to get feedback from professionals, colleagues and students. Through the e-portal will increase the employability of the e-portal users by directly linking competencies required by employers with competencies which are available for students on the e-portal and which are not a part of the educational system.

Link to pdf of full paper.

Robert Brigantic (Pacific Northwest National Laboratory, USA), David Ebert (Purdue University, USA), Courtney Corley (Pacific Northwest National Laboratory, USA), Ross Maciejewski (Purdue University, USA), George Muller (Pacific Northwest National Laboratory, USA), Aimee Taylor (Pacific Northwest National Laboratory, USA)

Development of a Quick Look Pandemic Influenza Modeling and Visualization Tool

Abstract:

Federal, State, and local decision makers and public health officials must prepare and exercise complex plans to contend with a variety of possible mass casualty events, such as pandemic influenza. Through the provision of quick look tools (QLTs) focused on mass casualty events, such planning can be done with higher accuracy and more realism through the combination of interactive simulation and visualization in these tools. If an event happens, the QLTs can then be employed to rapidly assess and execute alternative mitigation strategies, and thereby minimize casualties. This can be achieved by conducting numerous "what-if" assessments prior to any event in order to assess potential health impacts (e.g., number of sick individuals), required community resources (e.g., vaccinations and hospital beds), and optimal mitigative decision strategies (e.g., school closures) during the course of a pandemic. In this presentation, we overview and demonstrate a pandemic influenza QLT, discuss some of the modeling methods and construct and visual analytic components and interface, and outline additional development concepts. These include the incorporation of a user selectable infectious disease palette, simultaneous visualization of decision alternatives, additional resource elements associated with emergency response (e.g., first responders and medical professionals), and provisions for other potential disaster events.

Link to pdf of full paper.

Telmo Zarraonandia (Universidad Carlos III de Madrid, Spain), Mario Rafael Ruiz Vargas (Universidad Carlos III de Madrid, Spain), Paloma Díaz (Universidad Carlos III de Madrid, Spain), Ignacio Aedo (Universidad Carlos III de Madrid, Spain)

A game model for supporting children learning about emergency situations

Abstract:

Despite the undeniable value of computer games as educational resources for teaching children, its actual application in educational processes is hampered due the complexity of their design and the high cost of developing them. In order to foster their adoption for emergency training, we propose a model for describing the different elements of an educational game for this domain. The model might serve to support the game designing process as well as a communication tool between educators and game designers. This way, the educator can specify the requirements of the educational experience he aims to construct, and based on that information the game designer can propose a set of possible configurations of the game elements that can help to attain the specified objectives.

Link to pdf of full paper.

Track: Standardisation and Ontologies

Sukumar Dwarkanath (Touchstone Consulting Group, USA), Denis Gusty (US Department of Homeland Security)

Information Sharing: A Strategic Approach

Abstract:

The purpose of this paper is to provide and recommend a strategic approach for implementation of information sharing initiatives. While such an approach offers a number of benefits, as a primary benefit, it provides a way to measure and monitor the performance of such initiatives, irrespective of their scope, whether they are regional, state, or federal efforts. The first section of the paper presents a framework for alignment among information sharing initiatives; the second section builds on this framework and outlines a roadmap for an assessment methodology for such initiatives.

Link to pdf of full paper.

María Hernández (Universidad Carlos III de Madrid, Spain), Susana Montero (Universidad Carlos III de Madrid, Spain), David Díez (Universidad Carlos III de Madrid, Spain), Paloma Díaz (Universidad Carlos III de Madrid, Spain), Ignacio Aedo (Universidad Carlos III de Madrid, Spain)

A data transfer protocol for forest fire statistics: Achieving interoperability among independent agencies

Abstract:

The elaboration of statistics after a catastrophic situation allows us not only to analyze the economic, ecological and social impact of the event but also to improve the emergency management process. One compelling example of data collection for statistics is forest fires. The agencies involved in providing data have its own systems to collect data and mechanisms to send them, as well as, its data format for storing. Since such mechanisms are usually proprietary, and in order to normalize the exchange of data with statistics generating systems, a data transfer protocol should be used. In this paper we present a data transfer protocol called Forest Fire Statistics Protocol (FFSP). This protocol aims at transmitting consolidated forest fire data between independent agencies. The data transferred are based on the Forest Fire Report Data Model. Both mechanisms are based on open standards providing both technical interoperability and a solution that might be developed once and fit the needs of all. FFSP has been implemented as a web service over SOAP, SSL/TLS and TCP protocols.

Link to pdf of full paper.

Jens Pottebaum (University of Paderborn, Germany), Anna Maria Japs (University of Paderborn, Germany), Stephan Prödel (University of Paderborn, Germany), Rainer Koch (University of Paderborn, Germany)

Design and modeling of a domain ontology for fire protection

Abstract:

The semantics of things represent the central problem of the heterogeneous domain of emergency response. Both the communication between human actors and the interface between information systems face this hurdle with high impact on the efficiency in mission and time critical command and control processes. The integration of applications and information sharing based on semantic technologies promise added value for a solution to this problem. Therefore a model of the domain is essential; this paper contributes a domain ontology for fire protection. The scientific discussion as well as expert interviews built the basis for a new modeling approach. The selection of ontology languages is one of the important design issues presented in this paper.

Link to pdf of full paper.

Christian Paulus (Karlsruhe Institute of Technology, Germany), Stefan Moellmann (Karlsruhe Institute of Technology, Germany), Hagen Engelmann (Karlsruhe Institute of Technology, Germany)

Approach for an integrated interoperable system architecture for disaster management systems

Abstract:

In the field of information systems for disaster management there is a large variety of data formats, specifications and standards. Most of these standards only cover a specific part of this area, for example formats for geospatial data or message exchange. This diversity of isolated solutions, however, prevents those systems from interacting and exchanging data. To improve the interoperability in this sector there is a strong need for an integrated interoperable system architecture that is suitable for stand-alone systems as well as for the communication in a distributed heterogeneous system environment. This paper shows an approach for such a system architecture. It presents the Disaster Management Markup Language (DMML), which provides an architecture of data structures, services and service interfaces for crisis response systems. Furthermore, the Disaster Management Interoperability Framework (DMIF) is introduced, which supplies a software-engineering layout for DMML. Finally, the implementation of the DMMapML module is presented, which handles data involved in the situation report. The basic structure of this implementation is described and its potential contribution to the interoperability of crisis response systems.

Link to pdf of full paper.

Track: Technologies and Tools

Tuomas Peltonen (Radiation and Nuclear Safety Authority, Finland), Michael Ammann (Radiation and Nuclear Safety Authority, Finland), Juhani Lahtinen (Radiation and Nuclear Safety Authority, Finland), Kaj Vesterbacka (Radiation and Nuclear Safety Authority, Finland)

Operational experience with the Ketale Web application

Abstract:

Ketale is a collaborative data management system to share, manage and view the results of dispersion and dose calculations and other information related to nuclear or radiation accidents. Ketale was used the first time in an exercise in December 2008. User feedback led to a redesign of the system during 2009. The redesigned version improved the overall performance of the system and introduced some new features like a planning tool for countermeasure recommendations. The present report outlines operational aspects and user experiences of the Ketale system.

Link to pdf of full paper.

John Edmonds (University of Maryland, College Park, USA), Louiqa Raschid (University of Maryland, College Park, USA), Hassan Sayyadi (University of Maryland, College Park, USA), Shanchan Wu (University of Maryland, College Park, USA)

Exploiting Social Media to Provide Humanitarian Users with Event Search and Recommendations

Abstract:

Humanitarian decision makers rely on timely and accurate information for decision-making. Since satisfactory disaster response is key to building public trust and confidence, they need to monitor and track disaster related discourse to gauge public perception and to avert public relations disasters. Social media, e.g., the blogosphere, has empowered citizens to provide content and has increased information diversity. The challenge is to make sense of this diverse and noisy data and interpret results in context. For example, search results can be clustered around an event or occurrence at some geo-location and time. Personalization and recommendations can further filter content and focus on the most relevant and important data. We apply our research on event detection and recommendation to support event based search and apply it to a large blog collection (blog.spinn3r.com).

Link to pdf of full paper.

Christian Neuhaus (University Of Siegen, Institute for Media Research, Germany)

Using what is already there - Integrated Crisis Communication as a new approach in Crisis Management – Case Study and Suggestions

Abstract:

Communication plays a vital part in today's crisis management. Communication-channels and information systems in crisis management are often used separately. Our case study suggests an Integrated Crisis Communication (ICC) approach, which integrates all available communication-channels and information systems in one stakeholder oriented approach. The basis of this article is a case study of a 2-year research project with one of Germany's largest energy providers. The article starts with outlining the need for a communication-oriented crisis management. It presents results and findings from our research and explicates the main functionality the prototype we developed. Open questions and future research questions are outlined at the end.

Link to pdf of full paper.

Tiziana Catarci (SAPIENZA Università di Roma, Italy), Massimiliano de Leoni (SAPIENZA Università di Roma, Italy), Andrea Marrella (SAPIENZA Università di Roma, Italy), Massimo Mecella (SAPIENZA Università di Roma, Italy), Manfred Bortenschlager (Salzburg Research, Austria), Renate Steinmann (Salzburg Research, Austria)

The WORKPAD Project Experience: Improving the Disaster Response through Process Management and Geo Collaboration

Abstract:

In complex emergency/disaster scenarios teams from various emergency-response organizations collaborate with each other to achieve a common goal. In these scenarios the use of smart mobile devices and applications can improve the collaboration dynamically. The lack of basic interaction principles can be dangerous as it could increase the level of disaster or can make the efforts ineffective. The paper focuses on the description of the main results of the project WORKPAD finished in December 2009. WORKPAD worked on a two-level architecture to support rescue operators during emergency management. The use of a user-centered design methodology during the entire development cycle has guaranteed that the architecture and the resulting system meet the end-user requirements. The feasibility of its use in real emergencies is also proven by a demonstration showcased in July with real operators. The paper includes the qualitative and

quantitative showcase results and mentions some guidelines which can be useful for persons who want to develop emergency-management systems.

Link to pdf of full paper.

Jian Wang (University of Illinois, USA), Tim Yardley (University of Illinois, USA), Himanshu Khurana (University of Illinois, USA), Liying Wang (University of Illinois, USA)

LENS: Location-based Emergency Notification Service

Abstract:

University campuses and municipalities are currently spending large sums of money to acquire systems that allow dissemination of information in emergency situations. The majority of these are mass notification systems that first register multiple contacts for community residents (email, phone, pager, etc.) and then deliver information to those residents at the push of a button to leave a message. Motivated by the limitations of such approaches, in this work we explore the use of existing metropolitan network infrastructures to design a new Location-Based Emergency Notification Service (LENS). LENS selectively redirecting residents to safety information using existing communication channels (e.g., Web browsing over HTTP). LENS eliminates the need for registration, provides minimal interruption to users and involves a low-cost setup. We prototype LENS using off-the-shelf components and demonstrate efficiency and scalability for a 60,000 user campus environment.

Link to pdf of full paper.

Trishan Ralph de Lanerolle (Trinity College, USA), William Anderson (Case Commons, USA), Sam DeFabbia-Kane (Wesleyan University, USA), Eli Fox-Epstein (Wesleyan University, USA), Dimitar Gochev (Trinity College, USA), Ralph Morelli (Trinity College, USA)

Development of a virtual dashboard for event coordination between multiple groups

Abstract:

Collabbit is an open source web-based application that aims to increase emergency management efficiency through distributed asynchronous information sharing. The software is targeted to loosely coupled non-profit disaster relief agencies that coordinate response to and recovery from disasters. Disaster relief agencies create a common operating picture of an emergency incident through remotely posted *incident updates.* Individual users subscribe to topics of interest and receive near-instantaneous updates on those topics. Where information is lacking, users may access a topically organized contact registry. This report describes the development and deployment of the Collabbit project.

Link to pdf of full paper.

Special Session: Assessing Crisis Management Operations and Exercises

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Bruce Donald Campbell (University of Washington, USA), Konrad E. Schroder (University of Washington, USA), Chris E. Weaver (University of Oklahoma, USA)

RimSim Visualization: An Interactive Tool for Post-event Sense Making of a First Response Effort

Abstract:

Upon developing a software agent-based simulator for training roles in emergency response scenarios, the PARVAC team at the University of Washington has pursued building a tool for better investigative review and insight generation on the performance of an emergency response game session team. While our *RimSim Response* software included the opportunity to re-run a simulated team performance in order to review player and agent behavior, we did not provide our trainees the ability to visually query their performance outside of a sequential review of the emergency response effort. By integrating our RSR visualization components with

an existing visual query software package called *Improvise*, we were able to construct highly-coordinated visualizations of our data model for the ability to apply a sense making approach in the investigation of live player and software agent-based behavior – both as individual players and as combinations of players working on tasks associated with an emergency response scenario. The resultant tool is now our primary visualization tool for discussing first responder team performance and supports the overall RSR objective of training teams to make the most effective, recognition-primed decisions when a real emergency crisis occurs in their community. This paper reviews our visualization tool and demonstrates its use.

Link to pdf of full paper.

Kip Smith (Linköping University, Sweden), Ida Lindgren (Linköping University, Sweden)

Predicting Group Faultlines in Multinational Crisis Response Teams

Abstract:

Education in crisis response traditionally includes formal field exercises that attempt to replicate to some extent the chaos and complexity of an emergency situation. Part of the complexity facing multinational teams of crisis response professionals is diversity within the team itself. In this paper we discuss the group faultline model of diversity and its impact on team performance. Faultlines exist wherever there is diversity. When faultlines become active - and only when they become active - they form barriers to team cohesion and impediments to team performance. We propose that it is eminently feasible to develop a toolkit that managers of multinational crisis response teams can use to identify and span group faultlines. We identify two classes of tools. The first is a questionnaire that elicits information that can be used to (1) infer faultline length and to predict the relative likelihood of activation, and (2) identify (individual) team members who can span a ruptured faultline and facilitate team cohesion. The identification suggests appropriate actions that the instructor can take to help the team bridge the rift. The second tool in the kit is a checklist of defensive routines - policies and actions that attempt to save face - that can be used to identify faultline rupture. We are currently working at developing the tools in this toolkit.

Link to pdf of full paper.

Peter Berggren (FOI, Swedish Defence Research Agency, Sweden), Björn Johansson (FOI, Swedish Defence Research Agency, Sweden)

Developing an instrument for measuring shared understanding

Abstract:

The paper discusses the need for an easy-to-use, easy-to-administer measure that can capture shared understanding in a team of professionals working together towards a successful performance. In the paper the development of such a measure is described using two empirical studies. Command-and-Control tasks are complex and often dynamic, and a way of capturing the degree of which a team of individuals have a common understanding of priorities in such a task is imperative. Two studies are presented. In the first study students participated in a microworld experiment where they tried to rank order pre-determined factors in order to measure shared understanding. In the second study officers from the Swedish Armed Forces participated in an exercise where they rank ordered self-generated factors.

Link to pdf of full paper.

Fredrik Höglund (Linköping University, Sweden), Peter Berggren (Swedish Defence Research Agency, FOI)

Using Shared Priorities to Measure Shared Situation Awareness

Abstract:

Shared situation awareness is hard to measure, especially in operative environments such as crisis management. In this paper the purpose is to develop a novel method to measure to what extent the team has shared situation awareness that can be used in operations. 20 two person teams participated in a study

where a dynamic and evolving tactical decision-making task was solved. Shared situation awareness, shared priorities, and team performance were assessed. The results show that the shared priorities measure in this study did not relate to shared situation awareness. Several methodological concerns was identified which could have affected the results. The measure did relate to subjective ratings of cooperation which is very interesting and it is suggested that the measure captured aspects of teamwork. The shared priorities measure was easy to employ, required little preparation, and is a promising addition to team research.

Link to pdf of full paper.

Special Session: Information Credibility, Trust, Privacy and Security in Information Systems for Emergency Management

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Thomas Foulquier (Université de Sherbrooke, Canada - Geobusiness Group), Claude Caron (Université de Sherbrooke, Canada- Geobusiness Group)

Towards a formalization of interorganizational trust networks for crisis management

Abstract:

As the concept of trust has found its way into the crisis management literature, many questions remain to be addressed, among which that of its integration with information technology, and its relevance for improving collaboration in a crisis management environment. We propose in this paper that a sub category of social networks, interpersonal trust networks between organisations, may have a significant influence on the management of a crisis by organizations, and that their formalization by technology can help manage such networks and prepare for potential crises. Following a review of trust in the crisis management context, we link trust's organizing properties to crisis management case studies and present our rationale for formalizing trust networks in an information system. We consider the technological artifact produced before the crisis by formalizing interpersonal, interorganizational trust relationships will constitute an element for collective sensemaking by parties involved in the management of a crisis.

Link to pdf of full paper.

Matt Wolff (University of Hawaii, USA)

Unsupervised Methods for Detecting a Malicious Insider

Abstract:

One way a malicious insider can attack a network is by masquerading as a different user. Various algorithms have been proposed in an effort to detect when a user masquerade attack has occurred. In this paper, two unsupervised algorithms are proposed with the intended goal of detecting user masquerade attacks. The effectiveness of these two unsupervised algorithms is then compared against supervised algorithms.

Link to pdf of full paper.

Special Session: Puget Sound Regional Initiatives towards a Common Operating Environment

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Alena Benson (University of Washington, USA), Keith Biggers (Texas A&M University, USA), Jim Wall (Texas A&M University, USA), Mark Haselkorn (University of Washington, USA)

Adaptive Development of a Common Operating Environment for Crisis Response and Management

Abstract:

Complex information and communication systems present a special challenge to system designers because these are generally deployed as large, distributed systems with diverse user groups. Crisis response and

management organizations in particular expect systems to be interoperable, resilient, flexible and provide lasting benefit. Currently, systems such as Virtual USA (Department of Homeland Security) and WatchKeeper (United States Coast Guard) seek to create common situational awareness for all participating agencies in security and incident response operations. We propose *adaptive development* as a system development model to build upon the ideas of systems such as Virtual USA and WatchKeeper in order to create sustainable and adaptable systems. Adaptive development supports ongoing improvement through user-driven design and modification in the target environment. An internet-based dashboard demonstrated during a United States Coast Guard Sector Seattle incident response exercise serves as an emergent case study for the adaptive model.

Link to pdf of full paper.

Special Session: Response Information Systems Requirement Engineering and Evaluation

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Therese Friberg (University of Paderborn, Germany), Benedikt Birkhäuser (University of Paderborn, Germany), Jens Pottebaum (University of Paderborn, Germany), Rainer Koch (University of Paderborn, Germany)

Using Scenarios for the Identification of Real-World Events in an Event-Based System

Abstract:

This work focuses on the requirements engineering process of an event-based system in the domain of emergency management. The goal is to identify events which occur and have an effect on the actions and decision making during an operation. We outline a case study to apply scenario-based requirements engineering processes to describe and identify events. Under the special circumstances of the case study one important result is the need of integrating multiple sources into the scenario generation activities due to the singular characteristics of many operations.

Link to pdf of full paper.

Rui Chen (Ball State University, USA), Thirumurugan Thiyagarajan (State University of New York at Buffalo, USA), Raghav Rao (State University of New York at Buffalo, USA), Jin Kyu Lee (Oklahoma State University, USA)

Design of a FOSS System for Flood Disaster Management

Abstract:

In this paper we study how information technology solutions can be used when disasters strike. This research in progress focuses on flood disasters and it proposes the design for flood disaster management. To increase the utility of the disaster management information system, we follow the free and open source system (FOSS) concept. Informed by the management tasks of flood response, we elaborate the system requirements and key functionalities. The system has received preliminary evaluation by the domain experts and is currently under further development.

Link to pdf of full paper.

Gonçalo de Jesus (Laboratório Nacional de Engenharia Civil, Portugal), Anabela Oliveira (Laboratório Nacional de Engenharia Civil, Portugal), Maria A. Santos (Laboratório Nacional de Engenharia Civil, Portugal), João Palha-Fernandes (Laboratório Nacional de Engenharia Civil, Portugal)

Development of a Dam-break Flood Emergency Information System

Abstract:

This paper presents a new information system, SAGE-B, structured to support all fundamental data related to dams and the elements associated to an emergency in case of a dam-break flood. Data such as information

about the population located in the areas at risk or the vehicles available for rescue that are located in the areas impacted by the predicted flood are always changing. In order to support an effective update of the required information for emergency management, an emergency information system was conceived and proposed. This paper describes the motivation for this research and the basic requirements from an emergency management perspective. The platform has a modular architecture, developed in open and free technologies, which allows a continuous development and improvement. Examples of future developments include a multichannel emergency warning system, flood wave real-time forecast and dam-breaching real-time monitoring models.

Link to pdf of full paper.

Anna Gryszkiewicz (Chalmers University of Technology, Sweden), Fang Chen (Chalmers University of Technology, Sweden)

Design requirements for information sharing in a crisis management command and control centre

Abstract:

This paper presents a new information system, SAGE-B, structured to support all fundamental data related to dams and the elements associated to an emergency in case of a dam-break flood. Data such as information about the population located in the areas at risk or the vehicles available for rescue that are located in the areas impacted by the predicted flood are always changing. In order to support an effective update of the required information for emergency management, an emergency information system was conceived and proposed. This paper describes the motivation for this research and the basic requirements from an emergency management perspective. The platform has a modular architecture, developed in open and free technologies, which allows a continuous development and improvement. Examples of future developments include a multichannel emergency warning system, flood wave real-time forecast and dam-breaching real-time monitoring models.

Link to pdf of full paper.

Beibei Hu (Delft University of Technology, Netherlands), Jan Hidders (Delft University of Technology, Netherlands), Philipp Cimiano (Universität Bielefeld, Germany)

Towards Context-based Information Delivery to Police Officers: A Questionnaire-based Requirements Elicitation Study

Abstract:

In the area of information system design, the development of context-aware systems which can provide relevant information in a context-driven fashion to support mobile users in crisis management tasks represents a great challenge. Motivated by the fact that police officers are often overwhelmed by too much information, the goal of the MOSAIC project (a multi-officer system of agents for informed crisis control) is to support mobile police officers by a system which delivers contextualized information that is relevant to the task at hand. In order to elicit the information requirements of police officers who are involved in crisis situations, a questionnaire-based requirements elicitation study has been carried out in the context of the work described here. The results mainly shed light on the situation-specific information requirements of police officers in certain scenarios. The design requirements that follow from our study have clearly the potential to guide the design of context-based information delivery systems for users involved in critical situations such as the police officers we target. Our findings thus offer an important contribution to the field of information system design for crisis management.

Link to pdf of full paper.

Connie Marie White (Jacksonville State University, USA), Murray Turoff (New Jersey Institute of Technology, USA), Starr Roxanne Hiltz (New Jersey Institute of Technology, USA)

A Real Time Online Delphi Decision System, Version 2.0: Crisis Management Support during Extreme Events

Abstract:

The Delphi Decision Maker system has been designed to support the decision making needs of crisis managers, considering factors such as stress, time pressure, information overload, and uncertainty. It has been built as a module for the Sahana Disaster Management system, a free and open source system. The Design Science research paradigm was used in an iterative development process. Triangulation was employed in the evaluation, analyzing the system against the research questions using both qualitative and quantitative statistics as well as proof of concept. Modifications need to be made for real world use. A second version of the system is under development. Research findings and future research are outlined in this work in progress.

Link to pdf of full paper.

Special Session: Studies of Command and Control Systems

Tim Grant (Netherlands Defence Academy, The Netherlands), Gijs van den Heuvel (Netherlands Defence Academy, The Netherlands)

Modelling the Information Sharing Process in Military Coalitions: A work in progress

Abstract:

Coalition partners must share information to work together. Models of information sharing assume that it is a linear, one-way process. As part of a larger project, we studied information sharing in military coalitions. Interviews of 47 officers in NATO R&D organizations showed that one piece of information was often traded for another. This is characteristic of an information market. Security regulations make information a scarce resource, although trust may allow the regulations to be waived. Our observations have consequences for the military Network Enabled Capabilities community in their desire to migrate to a “need to share” security principle. Failing to find a suitable process model in the literature, we outline requirements and identify two possible starting points for modelling the information sharing process in military coalitions.

Link to pdf of full paper.

Special Session: Virtual States

Mark Prutsalis (Sahana Software Foundation), David Bitner (Sahana Software Foundation), Praneeth Boddulurl (Sahana Software Foundation), Francis Boon (Sahana Software Foundation), Chamindra de Silva (Sahana Software Foundation), Dominic König (Sahana Software Foundation), Gavin Treadgold (Sahana Software Foundation)

The Sahana Software Foundation response to the 2010 Haiti Earthquake: A New Standard for Free and Open Source Disaster Data Management Systems

Abstract:

On 12 January 2010 at 21:53 UTC / 4:53 PM local time, a 7.0 magnitude earthquake struck the poverty-stricken Caribbean nation of Haiti, just south of the densely populated capital city of Port-au-Prince. The impact of the earthquake was devastating, with large numbers of multi-storied concrete structures in the capital and surrounding municipalities collapsing, killing tens of thousands instantly, while injuring and trapping thousands of others beneath the rubble, and leaving millions homeless. The event occurred just weeks after the fifth anniversary of the Indian Ocean tsunami, the last major natural disaster of this scale,

and the last time the international community has been called on to respond to a disaster of this magnitude with a lifesaving search and rescue and emergency relief effort, under the coordination of the United Nations and foreign governments such as the US, who provided assistance on a massive scale utilizing its military assets as part of an international Humanitarian Assistance/Disaster Response (HA/DR) effort. It was therefore appropriate that the Sahana Software Foundation and its free and open source software (FOSS) project, which was created in Sri Lanka by the open source community to assist that country recover from the aftermath of the tsunami, played such a central role in helping to coordinate the relief efforts for Haiti.

Link to pdf of full paper.

Posters:

Christoph Michael Endres (German Research Center for Artificial Intelligence, DFKI GmbH, Germany), Andreas Wurz (Cologne Fire Department), Marcus Hoffmann (Fraunhofer Institute for Computer Graphics Research (IGD)), Alexander Behring (Darmstadt University of Technology)

A Task-based Messaging Approach To Facilitate Staff Work

Abstract:

A central part of the work in *Incident Commands (ICs)* deals with handling messages that contain relevant information. Classification schemes for messages can be exploited by command staff and assisting tools to support this work, given that a common understanding of the scheme is shared among participants. We present user studies on two such classifications, which imply some disagreement among participants. Interpretations of the studies and a revised scheme are presented. All users in our studies are highly trained experts and represent the state of the art in german IC work.

Link to pdf of full paper.

Yasir Javed (Institute of Information and Mathematical Sciences, Massey University Auckland New Zealand), Tony Norris (Institute of Information and Mathematical Sciences, Massey University Auckland New Zealand), David Johnston (Joint Centre of Disaster Research, Massey University Wellington New Zealand)

A Design Approach to an Emergency Decision Support System for Mass Evacuation

Abstract:

This paper is directed primarily to investigating the information needs of emergency managers following recognition of a risk of volcanic eruption. These needs include type of information required during the collection, integration, synthesis, presentation, and sharing of information. This will identify and model the processes underpinning the design of an emergency decision support system (EDSS). Exploration of the information needs, flows, and processes involved in emergency decision making can improve the design of EDSS both in terms of their content and the all-important human-system interfaces that determine their usability.The information attributes and flows then lead to the development of a prototype system that can be evaluated to test and refine the concepts.

Link to pdf of full paper.

Sebastien Tremblay (Université Laval, Canada), Daniel Lafond (Defence R&D Canada), Jean-François Gagnon (Université Laval, Canada), Vincent Rousseau (Université de Montréal, Canada), Rego Granlund (Santa Anna IT Research Institute, Sweden)

Extending the capabilities of the C3Fire microworld as a testing platform for research in emergency response management

Abstract:

The present paper describes the C³Fire microworld and the testing capabilities it provides for research in emergency response management. We start with a general description of C³Fire and report extensions that add a new subtask (search and rescue) relevant to the context of emergency response and a vocal communication system. We then describe how various organizational structures can be designed using this task environment and several metrics of major interest for research in crisis management, related to task performance, communication, coordination effectiveness, monitoring effectiveness, recovery from interruptions, detection of critical changes, and team adaptation. The microworld constitutes a highly flexible testing platform for research in team cognition, cognitive systems engineering and decision support for crisis management.

Link to pdf of full paper.

Syed Imran (University College Cork, Republic of Ireland), Ioannis Dokas (University College Cork, Republic of Ireland), Franclin Foping (University College Cork, Republic of Ireland), John Feehan (University College Cork, Republic of Ireland)

Towards Domain Specific Modeling Approach in Early Warning System

Abstract:

It is of practical significance and great value to design and develop a novel Early Warning System (EWS), which will be used by the personnel of institutions involved in the drinking water delivery governance model of Ireland. In order to help the users of our EWS in representing and codifying their knowledge on the complex coincidences that may drive Water Treatment Plants (WTP) to failures or to hazardous states we propose in this paper a novel approach of using Domain Specific Modeling (DSM) in the domain of EWS for Water Treatment Plants. The novelty of our DSM approach also lies in providing a standalone open source software application rendering profiling of the water utilities, early warning signals, monitoring mechanisms of signals along with capability of assessing the "tendency" of a WTP towards failure, given a set of observed early warning signals.

Link to pdf of full paper.

Lauren Landrigan (Monmouth University, USA), Allen Milewski (Monmouth University, USA), Jennifer Baker (Monmouth University, USA)

Determining Credible Sources During an Emergency Situation

Abstract:

An important aspect of working in an emergency operations center (EOC) is determining what information is credible and what actions to take based on that information. Information during an emergency may come from various sources and EOC workers may not know the information providers personally. Information may come from electronic sources where the exact source of the information may be unknown and credibility may be affected. For this study, we conducted ethnographic interviews with emergency management subject matter experts to gain insights on credibility. The interviews included a series of questions to learn about the current processes of an EOC, what sources generally provide information about the situation and what factors determine credibility. These interviews are ongoing and this paper provides a summary of the interviews completed at this point. The expected outcome of this study is a potential software system with features to enhance credibility despite weak source information.

Link to pdf of full paper.

David Díez (Universidad Carlos III de Madrid, Spain), Paloma Díaz (Universidad Carlos III de Madrid, Spain), Ignacio Aedo (Universidad Carlos III de Madrid, Spain)

Virtual Communities of Practice: Design Directions for Technology-mediated Collaboration in the Early Warning Activity

Abstract:

The performance of early warning activities involves the management of complex situations as uncertainty is common, information is frequently scattered and the number of stakeholders affected is large. In this context, the performance of early warning activities is distinguished by the significance of internalized experience as well as the generalized use of cultural knowledge, internalized domain knowledge and tacit knowledge. A suitable and well-known way to endorse the creation and exchange of this kind of knowledge –usually called soft knowledge- is the application of communities of practitioners. Based on the review of the communities of practice approach, its principles and rationale, this paper proposes a set of design guidelines aimed at addressing the technological design of technological platforms that support the creation, exchange and acquisition of soft knowledge for its application in early warning activities.

Link to pdf of full paper.

Rui Chen (Ball State University, USA), Raghav Rao (State University of New York at Buffalo, USA), Raj Sharman (State University of New York at Buffalo, USA), Shambhu Upadhyaya (State University of New York at Buffalo, USA), Catherine Cook-Cottone (State University of New York at Buffalo, USA)

Examination of Emergency Response from Knowledge and Psychology Perspectives

Abstract:

This research-in-progress examines the roles of technology and human systems in supporting emergency response management through the dual perspectives of knowledge and psychology. Task critical knowledge is linked to organizational effectiveness in delivering business value and psychological factors characterize the unique challenges of an emergency context. This exploratory research is among the first to develop a theoretical model based on these two important yet understudied theoretical aspects. The article contributes to the research development in emergency response information systems and sheds light on the organizational response management practice.

Link to pdf of full paper.

Jutta Hild (Fraunhofer IOSB, Germany), Jonathan Ott (Karlsruhe Institute of Technology, Germany), Yvonne Fischer (Karlsruhe Institute of Technology, Germany), Christian Glökler (Fraunhofer IOSB, Germany)

Markov Based Decision Support for Cost-Optimal Response in Security Management

Abstract:

In this contribution, we introduce a prototype of a decision support tool for cost-optimal response in security management. The threat situation of a closed infrastructure, exposed to multiple threats, and the corresponding response actions are modeled by a continuous-time Markov decision process (CMDP). Since the CMDP cannot be solved exactly for large infrastructures, the response actions are determined from a heuristic, based on an index rule. The decision support tool's user interface displays the infrastructure's current threat state and proposes the heuristic response actions to the decision maker. In this way, global situation awareness can be enhanced and the decision maker is able to initiate an almost cost-optimal response action in short time.

Link to pdf of full paper.

Björn Bjurling (SICS, Sweden), Preben Hansen (SICS, Sweden)

Contracts for Information Sharing in Collaborative Networks

Abstract:

In crisis management, units from different organizations collaborate for achieving a common goal. The success of such collaborations depends partly and not insignificantly on the composition of the network of collaborating units. In the initial phases of a crisis management operation, there is often a great deal of uncertainty about the nature and the extent of the crisis. The uncertainty may lead to contradictory and otherwise imperfect information sharing among the organizations and agencies that are responsible for engaging the crisis. This in turn, may lead to suboptimal and inefficient compositions of the collaborating network. This paper suggests the use of contracts for information sharing for ensuring that the information sharing indeed facilitates efficient formation of collaborating networks.

Link to pdf of full paper.

Cynthia Marie Nikolai (University of Notre Dame, USA), Troy Johnson (Miami-Dade Emergency Operations Center), Irma Becerra-Fernandez (Florida International University, USA), Gregory Madey (University of Notre Dame, USA)

Leveraging WebEOC in Support of the Haitian Relief Effort: Insights and Lessons Learned

Abstract:

The magnitude seven earthquake that rocked Haiti has been a devastating disaster for the small country (USGS 2010). They are not alone in this crisis, however. When the earthquake struck, thousands of US citizens responded by donating money, resources, people, and time to aid in the disaster relief. To respond to the incident and to create a secure information-sharing environment, the Florida Miami-Dade County and State Emergency Operations Centers (EOC) were activated. The main information system in use at the Miami-Dade EOC is WebEOC, a web-based crisis information management system that aids in secure coordination and collaboration among EOC staff, liaisons, and emergency managers. As a result of the earthquake response efforts using this system, we have identified seven main insights and lessons learned with respect to crisis information management software. In this paper, we discuss Miami-Dade's role in the Haitian relief efforts and how this lead to these insights and lessons learned.

Link to pdf of full paper.

Michael Ammann (Radiation and Nuclear Safety Authority, Finland), Tuomas Peltonen (Radiation and Nuclear Safety Authority, Finland), Juhani Lahtinen (Radiation and Nuclear Safety Authority, Finland), Kaj Vesterbacka (Radiation and Nuclear Safety Authority, Finland), Tuula Summanen (Finnish Meteorological Institute, Finland), Markku Seppänen (Finnish Meteorological Institute, Finland), Pilvi Siljamo (Finnish Meteorological Institute, Finland), Annakaisa Sarkanen (Finnish Meteorological Institute, Finland), Minna Rantamäki (Finnish Meteorological Institute, Finland)

KETALE Web application to improve collaborative emergency management

Abstract:

KETALE is a database and web application intended to improve the collaborative decision support of the Finnish Radiation and Nuclear Safety Authority (STUK) and of the Finnish Meteorological Institute (FMI). It integrates distributed modeling (weather forecasts and dispersion predictions by FMI, source term and dose assessments by STUK) and facilitates collaboration and sharing of information. It does so by providing functionalities for data acquisition, data management, data visualization, and data analysis. The report outlines the software development from requirement analysis to system design and implementation. Operational aspects and user experiences are presented in a separate report.

Link to pdf of full paper.
