

Chapter 8.6

A Next Generation Technology Victim Location and Low Level Assessment Framework for Occupational Disasters Caused by Natural Hazards

Nik Bessis

University of Derby, UK

Eleana Asimakopoulou

University of Bedfordshire, UK

Peter Norrington

University of Bedfordshire, UK

Suresh Thomas

University of Bedfordshire, UK

Ravi Varaganti

University of Bedfordshire, UK

ABSTRACT

Much work is underway within the broad next generation technologies community on issues associated with the development of services to support interdisciplinary domains. Disaster reduction and emergency management are domains in which utilization of advanced information and communication technologies (ICT) are critical

for sustainable development and livelihoods. In this article, the authors aim to use an exemplar occupational disaster scenario in which advanced ICT utilization could present emergency managers with some collective computational intelligence in order to prioritize their decision making. To achieve this, they adapt concepts and practices from various next generation technologies including ad-hoc mobile networks, Web 2.0, wireless sensors, crowd sourcing and situated computing. On the implementation side, the authors

DOI: 10.4018/978-1-60960-818-7.ch8.6

developed a data mashup map, which highlights the criticality of victims at a location of interest. With this in mind, the article describes the service architecture in the form of data and process flows, its implementation and some simulation results.

INTRODUCTION

Phenomena such as earthquakes, hurricanes, storms, landslides, forest fires, heavy snow and others take place daily and are considered as natural phenomena and as such, ‘natural phenomena are normal and essential planetary actions’ (Asimakopoulou et al., 2006). It has been said that an extreme natural phenomenon may be characterized as catastrophic and hazardous by the scope of people in relation to their lives, property, as well as their environment. In managing disasters and in particular during the response phase, it is apparent that a number of teams and individuals from multiple, geographically distributed organizations are required to communicate, cooperate and collaborate in order to take appropriate decisions and actions (Graves, 2004; Otten et al., 2004).

Various technological developments over the last years have facilitated users with numerous tools to support various levels of enquiry within the environment of their organisation or community. Specifically, the use of computer-based collaborative technologies has evolved over the years through developments in distributed computational science in a manner, which provides improved applicable intelligence to their problem-solving capabilities.

In fact, most of these technologies have emerged with the view of producing frameworks and standards to fully or partially – yet purposefully – support seamless integration processes within heterogeneous distributed environments. Emerging paradigms and their associated concepts highlighting their benefits include but are not limited to Web Services, Web 2.0, Ad-hoc mobile networks using wireless sensors, Pervasive, Grid

and Cloud computing as well as Crowd sourcing and Situated computing. Their goal is to enable an approach relevant to collective resource utilization and thus, enhance multi-user participation in functioning as a coherent unit through the use of a Cyber Infrastructure (Bessis et al., 2010). That is, to purposefully work together, collaborate and solve a well-defined problem of mutual interest from a multi-user point of view. As such, they typically enable the provision of shared and often real-time access to, centralized or distributed resources, such as applications, data, models, toolkits and sensors.

Within this in mind, the article aims firstly to present an occupational hazard case scenario as a means to describe stakeholders functional requirements; secondly to elaborate the case scenario by offering a brief overview of how emerging technologies could be utilized to enable some improved intelligence in decision making; thirdly to describe the service architecture in the form of data and process flow diagrams followed by its implementation. Finally, we conclude by providing a simulation experiment.

An Exemplary Occupational Disaster Management Scenario

We present here a previously published (Bessis et al., 2010) fictional yet typical occupational hazard scenario, which is used throughout the remainder of our article as a point of reference.

In an urban area a major earthquake of some significant magnitude on the Richter scale has occurred. The area is highly populated and characterized by multi-storey buildings, such as blocks of offices, malls and other public buildings. The occurrence of the earthquake caused a disastrous situation, as some of the buildings have collapsed and some people have been injured and trapped. Further to this, a number of secondary phenomena follow the occurrence of the main hazard, such as electricity failures, fires and a series of aftershocks.

8 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/next-generation-technology-victim-location/56236

Related Content

ANFIS-Optimized Self-Isolated UWB 2x2 MIMO Circular Patch Antenna Design for High-Speed mmWave Applications at 28 GHz

Lahcen Sellak, Asma Khabba, Jamal Amadid, Samira Chabaa, Saida Ibnyaich, Atmane Baddouand Abdelouhab Zeroual (2025). *Advanced Computation Solutions for Energy Efficiency* (pp. 257-274).

www.irma-international.org/chapter/anfis-optimized-self-isolated-uw-2x2-mimo-circular-patch-antenna-design-for-high-speed-mmwave-applications-at-28-ghz/373112

Big Data Analytics Using Apache Hive to Analyze Health Data

Pavani Konagala (2019). *Nature-Inspired Algorithms for Big Data Frameworks* (pp. 358-372).

www.irma-international.org/chapter/big-data-analytics-using-apache-hive-to-analyze-health-data/213044

A Primer on Reinforcement Learning in the Brain: Psychological, Computational, and Neural Perspectives

Elliot A. Ludvig, Marc G. Bellemare and Keir G. Pearson (2011). *Computational Neuroscience for Advancing Artificial Intelligence: Models, Methods and Applications* (pp. 111-144).

www.irma-international.org/chapter/primer-reinforcement-learning-brain/49232

Empirical Inference of Numerical Information into Causal Strategy Models by Means of Artificial Intelligence

Christian Hillbrand (2012). *Machine Learning: Concepts, Methodologies, Tools and Applications* (pp. 283-303).

www.irma-international.org/chapter/empirical-inference-numerical-information-into/56147

Multi-Fractal Analysis for Feature Extraction from DNA Sequences

Witold Kinsner and Hong Zhang (2010). *International Journal of Software Science and Computational Intelligence* (pp. 1-18).

www.irma-international.org/article/multi-fractal-analysis-feature-extraction/43895