Guest Editorial Preface

Special Issue on Information and Communication Technologies for Disaster Management

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The growth and density of the human population significantly increased the impact of disasters, whether it was natural (e.g., climate global warming), accidental (e.g., industrial accidents or accidents in transportation), or even premeditated, like wars and terrorism.

Failing to prevent all disasters, predicting or handling correctly such events would certainly reduce their consequences. In this respect, several governmental and non-governmental organizations are active to more effectively treat the various phases of the disasters (i.e., pre-disaster, ongoing disaster and post-disaster). Particularly, the research community, from both academia and industry, is directing its efforts towards exploiting recent advances to optimize the catastrophe management. In this context, information and communications technologies have a major role to play in order to deal in the best possible way with these events by: (1) improving prediction techniques for enhanced disaster preparedness, (2) better managing the disaster as it occurs, (3) elaborating refined post-disaster strategies, and (4) exploiting the knowledge from past experiences to optimize the previous steps.

The aim of this special issue is to gather high-quality research and development results on the use of information and communication technologies for crisis and disaster management. The special issue shows the wide range of the existing techniques for the different phases of the disasters.

In the first article, Calcaterra et al. tackle the challenging problem of information abundance as generated by sensors in an IoT context. They provide tools to build inter-domain relationships, allowing the convergence of different knowledge domains, and organize them into corresponding ontologies. Such ontologies facilitate the development of monitoring tools and allow the characterization, sensing and detailing of the areas to be analyzed and secured. Two use case scenarios are presented for fire and flooding events. In these scenarios, the proposed tool is proved to be efficient in classifying the available sensors, thus helps Civil Protection teams facing natural disasters.

In order to tackle the problem of information exchange between the organizations involved in crisis and disaster management, Vorraber et al. provide an overview of the Austrian national research project INKA. The original approach puts forward an interdisciplinary research methodology that enables to design an interoperability platform for real-time or near real-time information exchange. The introduced design pattern is based on a four step approach including analysis, synthesis, design and evaluation. The authors present results based on a qualitative assessment of organization requirements. Precisely, detailed results of the research work from the synthesis phase of INKA as well as first results from our ongoing work in the design phase are provided.

In the third article, Ferrús et al. propose a framework and methodology to carry out the development of the security requirements for the interconnection of Protection and Disaster Relief (PPDR) networks, which is considered as one of the priorities at the European level. The authors made a tangible analysis of the security issues, identified the threats and proposed remedies in a systematic and comprehensive way. Moreover, the analysis of the proposed security architecture, which focus on the communications capabilities in terms of service interworking, is robust and certainly presents a practical value.

In the fourth article, Koumidis et al. focus on the use of current off-the-shelf mobile communication technologies for disaster situations. The authors introduce an alert message forwarding scheme built on Android devices and using WiFi-Direct. The networking solution proposed is shown to be both highly scalable, robust and energy efficient due to the distributed and purely local operation of all its functionalities.

In the last article, Carvalho et al. propose a methodological approach for flood monitoring through using open source geographic information system for watershed delimitation and characterization, which is particularly important to minimize the impact of extreme weather events. The proposed approach has several practical applications with potential impacts on many sectors. It is already operational in Brazil, where a thousand of watersheds have been identified to support early warnings' delivery.

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