

Communication and Information technologies

New tools for DISASTER management

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Abstract

Major disasters or major events, which could have for origin natural phenomenon, terrorism attack, major explosion ... have for common characteristics to generate an important number of victims, transport and communication perturbations, major infrastructure damages, and can touch a very large geographic area with different cities and sometimes different regions or countries.

The traditional emergency responses are often inefficient and unsuitable for these major events and the authorities have to develop specific organisations and tools. The last communication and information technologies offer new possibilities for a better crises analysis by evaluation and measurement, and for rescue coordination and population information.

This presentation will try to present how these technologies could be used in the different steps of the crises management, information, preparedness and response.

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1 – Systems for population information and alert

In the disaster management, the population information is a major stake. It's fundamental for the authorities to be able to inform the population in real time at the different steps of the crises, from the event announcement and prevention recommendations transmission, to the people information of the rescue actions or infrastructure restoration progressions.

Actually, different systems can be use by the authorities to progress in the information's' population. We can separate active and passive systems. In the first one, the authorities record their messages in a specific recorder and people have to call an emergency number to get the information. But the new technologies make possible to develop passive systems in witch the information is directly send to a specific part of the population. With these systems, the service in charge of the people information can decide to select a specific geographic area and to send a vocal or written message to all the phones, fix or cell-phones. Theses messages will be sent to the mobiles connected to a relay and to the phones located in the area designed.

The same application can be use to send information to specific groups of population, like rescues teams, volunteers, local authorities, by a registration in specific list.

These information systems can be connected to different applications, like weather or transport centers or detection systems, for real-time and automatic information define with different alarm level. Communication technologies by internet are more and more used for the same application to send real-time information by email with specific mailing list.

2- Integrated systems for a better disaster management

Geographic Information System (GIS) and Communication Information Systems offer new possibilities and opportunities for the authorities for a better disaster management with new tools for Rescue teams and services coordination, event analysis and decision guidance. One on the major difficulties for the authorities is to have in real-time a permanent view of the event. Data are often available in the different public administration but not collected, analysed and integrated, information are large, sometimes contradictory and it's difficult to selected those who can be help the authorities to take the good decisions.

Disaster investigation, Rescue teams coordination

Different new tools are now available to facilitate the teams' investigations and organize their operation report. With some support like GPS, PDAs, Tablets PC, numeric cameras, and transmission systems like radio, GSM or satellite, it's now possible for the rescue and investigation teams to assure a real-time information report of their actions. When these tools are use in operations, the coordination centers have the capability to know in real-time the progression of their teams including exact position, reports (number and state of victims and infrastructures damage measurement), identifying and having a synthetic analyse of their difficulties and their needs. The same tools can be use to organize the operations' coordination by a direct order transmission to the teams for a deployment in a specific and priority area, or to define their priority actions and the reinforcements deployment. The work of the coordination centers is simplified by an information organisation and a data integration that can be use for better priorities identification and decision making.

Event analysis – information and data exchange

The management of the major disasters necessitate to have a transversal approach and to take in account various parameters, like numbers and state of victims, social and economic information, list and detail of strategic infrastructures impacted. Geographic Information Systems (GIS), offer new possibilities for the disaster characterization, evaluation and management. By their integration capabilities of different data, basic maps, hazard maps and real-time information, these tools can be use as veritable decision support systems.

One of the major difficulty is to integrate the information generated by the different governmental agencies and services, and measure and report systems. It necessitates defining common protocol for data exchange and interconnected the different data base developed by each agency. The data collected are various, and depend of the nature's event. It's interesting to integrate the data of the weather bureau (real-time meteorological data) and water agency (rivers' levels ...) to characterize natural disasters; transportation, communication and energy agencies to evaluate their impacts, emergency services for numbers of victim evaluation and rescue coordination.

In addition, the operational and emergency center can use the collected data to integrate it in a decision support system. This application, by production of real-time maps, presentation of actualized reports of the damages and victims, of available resources (rescue teams, transport...), with social, financial and economic information, help the authorities to take the right and efficient decisions.

Anticipation and modelling

The disasters are characterized by important impacts on the population, infrastructures and economy and by their suddenness. They need often the mobilization of all the resources of the country and sometimes an international help. The coordination of the teams, the public services, the agency, the NGOs and the driving of their actions is so complex that necessary need specific organisation and management systems.

One of the difficulties is to be able to anticipate the development and the evolution of the disasters to organise the response, information of the population, mobilization of the rescue teams and the resources. The disaster management organisation needs to have all the time a global and synthetic vision of the event and these possible evolutions.

In that way, It's begun very important for the emergency and operational centers to develop specific tools to help us when the disasters occur, by a simplification of their analyse task, modelling the disaster development and calculation of the impacts in the population, infrastructures and economy.

In complement of Geographic Information Systems, it's interesting to develop specific anticipation and modelling applications. There is now few models available for each natural event (earthquake, typhoon, flooding, forest fire, landslide), that, by integration of real-time data (seismic movements, river levels, radar detection, rainfall records...), by modelling the event progression and comparison of historic data, and by calculation of the impacts (inundation potential area, landscape and debris flow localisation, impact on the population), help the authorities to anticipate the disaster progression and evaluate the adapted response.

3 - Simulation and virtual reality, new tools for major disaster response training

In a disaster management system, preparedness and training is fundamental. The teams, the authorities, the population, the volunteers, have to be prepared to do their job by an important training and regular repetitions. But in the drill, it's often difficult to reproduce the disaster conditions (due to the difficulties to mobilize an important number of participants) and it's once more difficult to reproduce good exercise condition for the deciders and for the operational centers and to recreate the context of a real event and the interactions with the different services and the reality.

Virtual reality, develop at the beginning for fly simulators or for games, offer now new possibilities in the major disaster response training. These tools are very adapting to the deciders and to the command centers teams. It can be use by a virtual representation of a disaster to reproduce a specific crises atmosphere, by introducing data in the geographic information system the same information that in the reality, and by simulation the interactions with different services or emergency teams. The simulators can be adapted or connected directly to the systems that are in the operational center to offer the possibilities to the teams to be in their real working environment when they to use it in training. Furthermore, with the simulation it's possible to prepare a lot of different scenarios, to test and evaluate new organisations, systems and procedures, to repeat the exercises; to train an important number of teams and in different conditions and measure their performance.

The new communication and information technologies offer new tools for the disaster management systems. Virtual reality and simulation are very adapted for the deciders and command centres training by reproducing the crises conditions. Anticipation systems and modelling, integrated and geographical information systems can be use like decision support tools and permit for the authorities to have a monitoring and a global vision of the event, to anticipate the evolution and to have synthetic data for a decision making.