Ensayo: A Virtual Emergency Operations Center Simulator for Training and Research

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Introduction

Hurricane Katrina was one of the most expensive and devastating natural disasters in American history. Over half a million people were affected by the hurricane, and the US energy infrastructure was severely damaged. Hurricane Katrina and other natural disasters clearly show the need for improvements in crisis management, especially in training and collaboration among federal, state, and local governments.

Stemming from this need, in 2007, the National Exercise Division within FEMA's National Preparedness Directorate introduced and implemented the National Exercise Program. In our work, we are creating a socio-cognitive technical simulator and training facility for upper level emergency managers and a tool for cognitive scientists to study the decision making process under emergency conditions. Specifically, in our research, we are creating a virtual Emergency Operations Center (EOC).

An Emergency Operations Center (EOC) is a secure location in which upper-level emergency managers and various elected officials gather together to prepare for, manage, and coordinate recovery activities in response to an emergency situation (e.g. hurricane, earthquake, tsunami).

Background

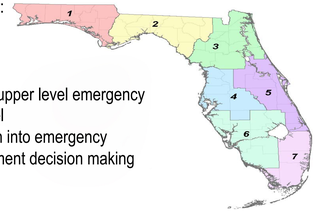
Training and exercise are critical to the success of emergency management at the EOC: "Building essential response capabilities nationwide requires a systematic program to train individual teams and organizations – to include governmental, nongovernmental, private-sector, and voluntary organizations – to meet a common baseline of performance and certification standards. Professionalism and experience are the foundation upon which successful response is built. Rigorous, ongoing training is thus imperative." (National Response Framework 2008)

Face-to-Face Training

In the current crisis management arena, much of the training is conducted via live or face-to-face exercises. There are a number of limitations, however, to current training solutions. First, crises, by definition, are rare events, and therefore they do not enable extensive training. Moreover, in the middle of a crisis, few organizations have the time or resources to train new personnel; Their foremost concern is on stabilizing the crisis, not on training individuals. Another limitation of face-to-face solutions is that there are few experts available, and each expert is inherently constrained by limited time, experience, and perspective. In addition, there is the difficulty of training teams, training selective components of the incident command hierarchy, and training upper-level managers. In fact, while there are multiple computer-based solutions available for first responders, current research identifies a general lack of computer-based training that targets upper-level emergency managers. Moreover, the training that does take place can be ineffective because most instructors use subjective measures and usually end up emphasizing outcomes over decision management processes. Finally, in face-to-face and instructor-centric solutions, there are usually inherent time delays in the feedback as experts analyze the student's progress, compare the student's actions and outcomes to the expected actions and outcomes, and tailor the feedback to the individual.

Project Ensayo

In our research, we are working with Miami-Dade County, FL, to build a simulator for:

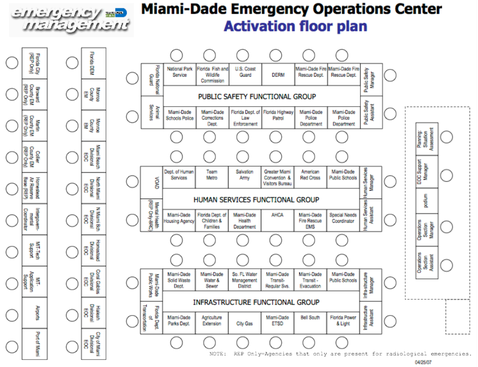


- Training upper level emergency personnel
- Research into emergency management decision making

modified from http://www.deep.med.miami.edu/x439.xml

Inside the Miami-Dade EOC

The Miami-Dade EOC is organized in an Incident Command System (ICS). There are four main branches in accordance with ICS: Operations, Planning, Logistics, and Finance/Administration. Operations is further organized into four branches: Public Safety, Human Services, Infrastructure, and Municipal. Planning consists of Geographic Information Systems (GIS), the 311 Public Information Call Center, and three units to aid in incident planning and documentation. Finally, Logistics is divided into EOC Support and Disaster Resources.



Design Methodologies

There are three main design methodologies that we employ in creating this system. The basic software design methodology is the spiral software development model. This is a set of software engineering methodologies based on iterative design, in which we incorporate feedback from the previous design cycle into the current cycle. Another design methodology we employ is the use of mental models. Mental models are a tool to aid in user-centered design and a way to ensure that all functionality in our system maps to a genuine user need. Finally, we also use content, functionality, aesthetics, and usability design methodologies in our application design.

Key Features

This virtual simulator has several key elements. First, it offers a secure environment in which upper-level emergency managers can train. Next, it offers many collaboration tools for emergency managers to simulate the software and practices of an actual EOC. These include various status boards, position logs, reports, links to external websites that are of use, status indicators, an artificially intelligent interactive advisor, a chat client, and an email client.

Main Components

The main components are an Exercise Developer, Exercise Simulator, Decision Making Aides, Remote Login and Participation, Logging and Analysis Tools, Player Reports and Evaluation, and Artificial Agents.

Technologies Employed

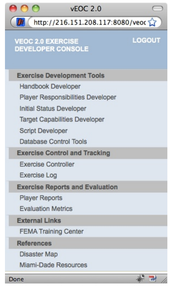
Client: XHTML, CSS, JavaScript, Ajax, Reverse Ajax
Server: PHP, MySQL, Jetty, Dojo, Google Maps
Interactive Advisor: Program O
Testing: Selenium, Twill
Development: all development and deployment is being accomplished in virtual machines

vEOC So Far

3 User Consoles
- Exercise Developer, Exercise Controller
- Trainee Console
- Researcher Console

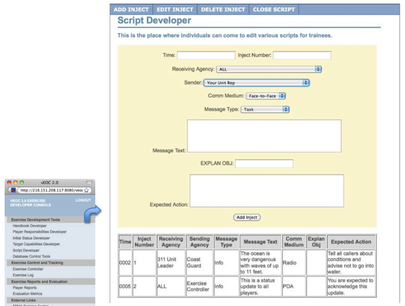
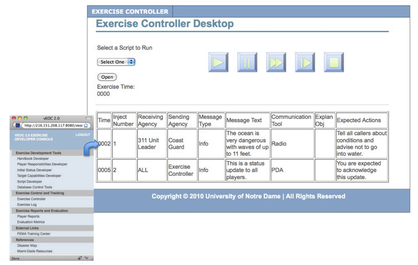
Exercise Controller, Developer Architecture

Exercise Controller, Developer Console



- Exercise Development Tools
- Exercise Control and Tracking
- Reports and Evaluation
- Database Control
- Exercise Logs
- External Links
- References

Exercise Development



Exercise Control