

Visual Analytics for Emergency Response Using Mobile Devices

Sungye Kim, Yun Jang, David S. Ebert
Purdue University

Project goal and scope

Using mobile devices for visualization provides a ubiquitous environment for accessing information and effective decision making. The motivation for our work is that mobile devices could be indispensable tools for emergency response if various relevant, selected information (e.g., images, 3D models, and sensor data streams) can be effectively visualized together on these devices that have varying capabilities and resolutions. With the advent of high-bandwidth wireless networks and rapidly growing computing capability, the current platform barrier for such visualization is now being removed. The purpose of our work is to develop a mobile visual analytic system for emergency response. In particular, we are interested in processing and displaying sensor network, location, and video data for the first responders to increase situational awareness and enable more effective response.

Recent progress

To date, we have focused on visual analytics on client mobile devices basing our system upon server-client architecture. Our tool presents efficient and interactive visual analytic methods for emergency response on mobile devices and provides visualization of various types of data. Our client visualization tool consists of four parts; visualization of 2D/3D environment, visualization of personnel location data, simulated sensor data, visual analytics, and user interfaces. For the scenario of The Station nightclub fire that took place on the February 20, 2003, our tool visualizes a distribution of temperature, smoke, CO₂, and CO from the fire simulation data as well as paths of movement and health conditions of the simulated evacuating agents at interactive rates. In addition, it displays helpful information for analysis, such as the number of evacuated agents at each exit, the rate of evacuation, the current health condition of a selected agent, and the number of agents in each condition (alive, unconscious and dead). For situations requiring rapid decisions, such as emergency response analysis and services, our system can be used as an efficient testbed and prototype. We have tested our application on a Dell Axim™ X51v that has Intel® PXA270 XScale 624MHz processor, the Intel® 2700G graphics accelerator with 16MB video RAM and 64MB RAM and on a Sprint PCS VisionSM Smart device PPC-6700, which uses Intel® PXA270 XScale 416MHz processor and 64MB RAM. However, our tool will be run on any mobile devices using the PocketPC environment with sufficient processing capabilities.

Future work

As future work, more analytic functions will allow us to understand emergency situations and support rapid decision making. For example, information visualization of specific agents selected by a user can improve analysis. Moreover, an extension using GPS for a client-centered visualization as well as 3D movement of agents for effective user observation through 3D navigation can provide a more meaningful visualization.