Improving Large-Scale Disaster Response

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When disaster strikes, the interdependent complexity of the environment (utilities, transportation, communication infrastructures, homes, and office buildings) can result in a cascading effect that quickly exacerbates the crisis. Large-scale disasters, such as Hurricane Katrina and the earthquake in Haiti, have graphically demonstrated the need for reliable initial disaster preparedness, response, and recovery. In such cases, the immediate availability of critical real-time data is crucial to saving lives.

Feniosky Peña-Mora, dean of The Fu Foundation School of Engineering and Applied Science at Columbia, has developed a new disaster response framework—Collaborative Preparedness, Response, and Recovery (CP2R)—that makes a significant difference in the outcome of such disasters. As part of this framework, he and his research team have created a mobile workstation using an all-terrain, heavy-duty Segway personal transporter outfitted with a payload that can include a Tablet PC, infrared and thermal still and video cameras, Global Positioning System receivers, and other advanced data collection technology. These instruments can collect, archive, analyze, and report large quantities of data to provide better situation awareness of an emerging disaster response scenario, and automatically generate digital models that can be used for disaster response.

By deploying these modified chariots manned by civil engineers, real-time data from first responders can be transmitted to coordination centers by wireless voice and data communication infrastructures. “This new cohort of first responders will provide accurate, real-time information to support technically sound decision-making processes during both the initial disaster response and the recovery phases,” said Peña-Mora. “With a legion of mobile workstation chariots, we will be able to mitigate the dynamics of the disaster by improving the dynamics of the disaster response.”

Recent testing of the mobile chariot has shown the potential for its success in the field. Despite additional weight from mounted instruments, the unit retained its stability on uneven surfaces and in differing weather conditions. Using digital images collected at the disaster site, decision-makers in coordination centers can evaluate infrastructure stability, study how the first responders are reacting to changing situations, and collect data for future analysis.

Peña-Mora holds appointments as professor of civil engineering, computer science, and earth and environmental engineering, is the author or co-author of more than 150 scholarly publications, and holds five patents, one provisional patent, and one technology disclosure.

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