Evacuating 70,000 sports fans in less than an hour?

April 9 2010

In the SportEvac simulation and training software, thousands of avatars are in motion at once, realistically representing the chaotic mix of sports fans, security staff, emergency responders and vehicles that interplay during a stadium evacuation. Credit: SERRI

What sports fan hasn't grumbled while waiting in a long, snaking lines to get into the stadium for the big game? It's enough to discourage even a diehard fan. But if you think it's a hassle getting into a sold-out game, imagine trying to get out after a bomb explodes -- or even to get out under a bomb threat, for that matter.

Let's start with the emergency lights failing. If you're thinking of feeling your way out by the light of your cell phone, join the crowd—they're right beside you, pushing fifty-across and a thousand-deep in a

stampede. It's everyone for himself.

Scenes like this may sound like a trailer for a Hollywood thriller (think Black Sunday), but their grim prospect is all-too-real. Last year, the Department of Homeland Security (DHS) and the FBI jointly warned of terrorist interest in attacking crowded stadiums. Small wonder: A bomb or noxious plume released over a throng of captive sports fans would cause major-league mayhem and terror.

Mindful of the threat, stadium sentinels have been laying plans to manage and minimize the anarchy that would follow such an attack. Just how would authorities whisk 70,000 people out the gates and onto the roads quickly and safely? For an evacuation on this scale, there are no dress rehearsals or practice drills—just simulation software.

Now, a new breed of simulation software—dubbed SportEvac—is being funded by the DHS Science and Technology Directorate (S&T) as part of the Southeast Region Research Initiative (SERRI), and developed and tested by the National Center for Spectator Sports Safety & Security (NCS4) at the University of Southern Mississippi.

"SportEvac isn't simply more realistic," says program manager Mike Matthews of S&T's Infrastructure and Geophysical Division. It will become a national standard."

Using blueprints from actual stadiums, the developers are creating virtual, 3D e stadiums, packed with as many as 70,000 avatars—animated human agents programmed to respond to threats as unpredictably as humans. Security planners will be able to see how 70,000 fans would behave—and misbehave—when spooked by a security threat.

But a SportEvac avatar need not be a sports fan. The simulation includes

make-believe stadium workers, first responders, even objects, such as a fire trucks or a fan's car. SportEvac tracks them all, accounting for scenarios both probable and improbable.

Simulating thousands of people and cars can impose a crushing load on software and hardware. That's why, unlike SportEvac, most evacuation software apps are unable to simulate a crowd much larger than 5,000. For a college or NFL football game, that's bush-league.

Beyond scaling problems, earlier simulators did not account for the myriad variations that make human behavior hard to predict and human structures hard to simulate. How adversely, for example, would an evacuation be impaired if an audible were called—a wet floor, a wheelchair, a stubborn aisle-seater, a fan fetching a forgotten bag, or an inebriated bleacher bum?

Conventional evacuation simulators couldn't say. SportEvac can. And like an open-source Web browser, the SportEvac software will get better and better because it's built on open, modular code. If your IT intern creates a module that can more accurately predict parking lot gridlock, just plug it in. This also means it can be customized for any sports arena.

By simulating how sports fans would behave in the minutes following an attack, SportEvac will help security experts across the country to plan and train and answer key questions, such as:

- How can my stadium be evacuated in the shortest time?
- How can civil emergency workers quickly get in as fans are dashing out?

- How can our stadium guards and ushers provide valuable information to civil responders and assist them as the evacuation unfolds?

"Interoperability is also a key goal," says Lou Marciani, NCS4 Director, who serves as the S&T project's principal investigator. Stadium security officers can use SportEvac to rehearse and refine procedures with civil responders. During a real evacuation, guards might use the same radios as the civil responders. And for every usher with a smartphone, a "SportEvac Lite" application will graphically show where fans or cars are bottlenecked.

Drawing on actual architectural CAD data, the Mississippi researchers are creating 3D virtual models of seven of the state's college sports stadiums. This year, in summits and workshops, security teams from the university athletic departments will test and refine SportEvac, with help from local police, Mississippi Homeland Security agents, the Mississippi Emergency Management Agency, and security specialists from pro sports. It will then be deployed to the seven state universities. Once the schools give it the green light, S&T will make the advanced version available to other universities, pro sports venues, and amateur sports organizations.

While not quite as immersive as the recent 3-D movie Avatar, SportEvac will create a safe, virtual stadium where security teams can practice guiding fans to safety, without risking life, limb, or lawsuit.

Provided by US Department of Homeland Security