By Cynthia G. Wagner

Predicting Panic

When does a crowd become a mob? And what can public safety and security professionals do to predict, prevent, or control it? A geographer shows how motion and emotion mix.

TOM STORY / ARIZONA STATE UNIVERSITY

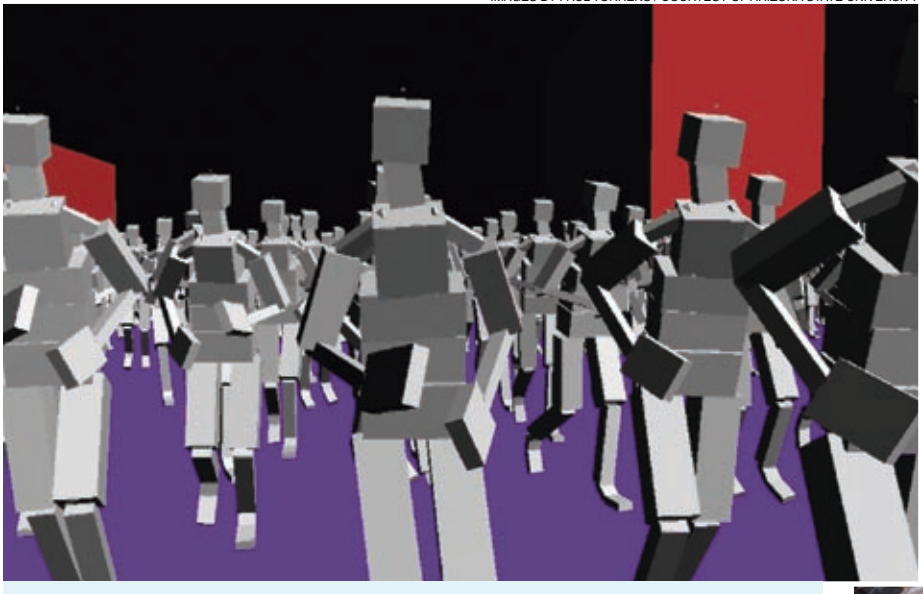
Mob modeler Paul Torrens poses with synthetic pedestrians.

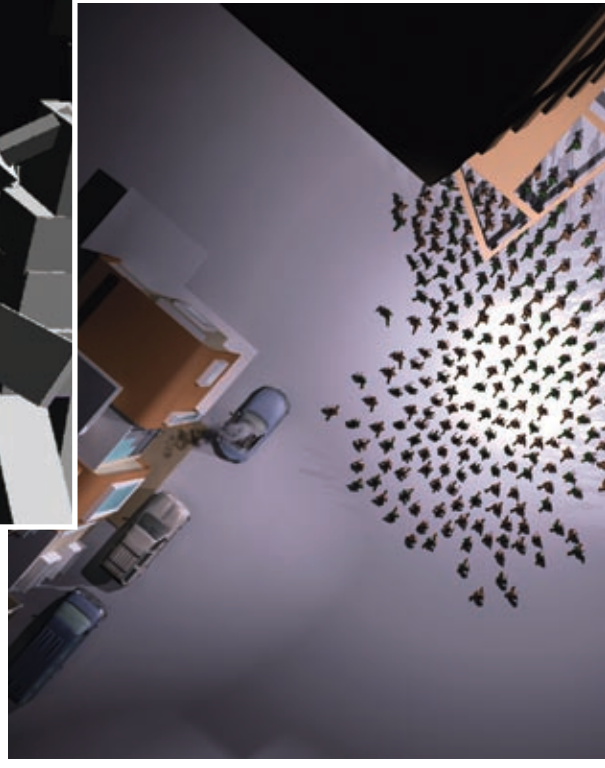
You're just standing on a corner, watching all the folks go by. Down the street, you hear a low, menacing voice blaring through a megaphone, and suddenly the friendly folks become an agitated crowd. Crash! A store window is broken; angry shouts turn into a cacophany, and your street corner passersby have become a frenzied mob.

Those rioting masses could be relatively benign (young ladies storming a department store for bargain-basement bridal gowns), uncontrollably frightened or injured (worshippers fleeing a firebombed church), or lethally enraged (unemployed gang members protesting a clerk's denial of service). These scenarios present different challenges to the public's safety and to the professionals sworn to uphold it.

Training public safety and security professionals is difficult because scenarios involving groups of people are extremely hard to simulate realistically, according to Paul M. Torrens, an assistant professor at Arizona State University's School of Geographical Sciences.

IMAGES BY PAUL TORRENS / COURTESY OF ARIZONA STATE UNIVERSITY





Tracing, anticipating crowd movement:
Series of still images from an interactive model simulating a crowd evacuation in a dense urban setting. The synthetic "agents" (people) are programmed with lifelike qualities and designed to behave autonomously. Selected agents are dropped into the city simulation and instructed to evacuate toward a single exit. Their unique responses illustrate how a crowd interacts with the built environment and creates dangerous congestion, leading to increased panic. The model was developed by Arizona State University geographer Paul Torrens.

"You couldn't stage a realistic rehearsal of an evacuation because people are not going to panic appropriately," Torrens says, "or you could never bulldoze large sections of the city to see how it affects pedestrian flow." And creating a riot in midtown for training purposes is obviously neither practical nor safe.

Torrens is now developing immersive, 3-D computational models to simulate pedestrian behavior and predict their movements. The goal is to help city planners, shopping center developers, safety and health workers, and even homeland security analysts to anticipate the dynamics of crowds.

The model infuses "agents" (virtual people) with individual variables (age, sex, size, health, and body language), and mixes in crowd features, such as panic, and characteristics of a specific environment, such as construction zones. The simulation will thus model both motion and emotion, says Torrens. A crowd of pedestrians running to catch a bus is different from a crowd running to avoid one.

"I can quantitatively and empirically benchmark what is normal behavior or what is a deviation from normal behavior and what could have caused somebody to panic in that situation," says Torrens. His goal is to incorporate hundreds of thousands of pedestrian agents and downtown areas in the model. "We can look quantitatively at the results of reconfiguring the urban environment, social environment, and ultimately human behavior, which is something you can never do in the real world." ❑

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