Medical Xpress

Computer models that predict crowd behaviour could be used to prevent the spread of infections at mass gatherings

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(Medical Xpress) -- Computer models that provide accurate simulations of how crowds behave can be used to identify health and safety issues at MGs, and could be adapted to simulate the spread of infections and to test the potential of public health interventions to disrupt or prevent an outbreak, according to the fourth paper in The Lancet Infectious Diseases Series on mass gatherings health.

In the paper, Dr Anders Johansson from the University of Bristol's Department of Civil Engineering and colleagues review how crowd behaviour can be sensed, analysed, and modelled, and explain how this knowledge can be used to manage environments in which MGs take place to improve safety and security and lessen the risks of injury or death.

Large crowd disasters such as stampedes are major causes of death and injury at MGs, the inevitable result of extreme crowding. In 2010, ineffective crowd control and a poorly designed venue (the site was designed for 250 000 participants, but had 1.4 million) resulted in a stampede in a narrow tunnel during the Love Parade music festival in Germany, in which 21 people were crushed to death and 500 injured.

The authors observe that although the objective of mass gatherings is to bring people together, crowd management strategies aim to keep people separated (in time and space). To resolve this paradox requires environmental management to guide the appropriate movement and emotion of the crowd.

State-of-the-art agent-based computer models use fine-scale data from actual movements of individuals obtained by techniques such as detailed video recordings, Global Positioning System (GPS), or mobile phone tracking to identify points of congestion and overcrowding that are useful for crowd management.

Such models have already been used for the Notting Hill Carnival to simulate the ways crowds interact and disperse under different conditions of movement and congestion, and to assess alternative routes to reduce the number of accidents, delays in treatment, and public order offences.

Johansson and colleagues also describe how models of crowd movement can be adapted to take into account other scenarios, for example, how individuals in confined spaces might spread disease through their proximity.

This new modelling approach to the spread of epidemics incorporates population-level features typically used in epidemiological models, while also taking into account individual-level behaviour and features that could prevent the spread of disease (eg, immunisation, screening, and quarantine).

They conclude: "Such models would allow us to test various interventions on a virtual population with a computer and measure their success rates before testing them on real populations, possibly saving both resources and life."

Provided by University of Bristol