COMPUTATION SOCIAL SCIENCE

Crowds flow like rivers

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Credit: PCN Photography/Alamy Stock Photo

Crowds form easily and can often be rowdy, so accurate models of crowd motion are essential for maintaining safety. Such models of collective motion usually rely either on local interaction rules between individuals or on large-scale flows of activity. However, quantitative experiments to test these models have been lacking.

Nicolas Bain and Denis Bartolo observed the behaviour of Chicago marathon runners as they advanced to the starting line. Based on their observation of these runners' behaviours, they proposed a hydrodynamic theory of polarized crowds. This model predicts that speed information propagates through the crowd in linear waves, which begin at the front. Fluctuations in orientation, in contrast, are suppressed locally and so do not propagate. Queuing crowds in Chicago and Atlanta show that these predictions are correct.

Describing crowds in this way provides guidelines for managing crowds effectively: perturbations at the side boundaries are inefficient, so crowds should be guided from the front. Moreover, the only way to change the direction of a crowd is to give cues to everybody. By providing a description of a crowd as a continua, this model provides potential ways in which to avoid potentially hazardous crowd dynamics.

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