Math Modeling of Crowd Dynamics

Benedetto Piccoli, Rutgers Discovery Informatics Institute

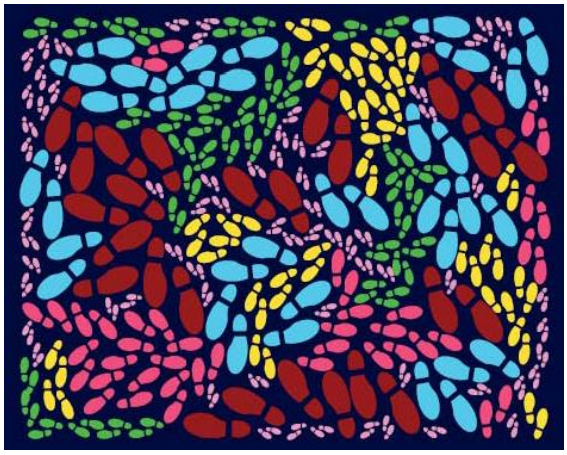
June 3, 10:00 – 12:15; 1:00 – 3:15 **Hosted by James Abello**

CoRE Building 431

Abstract

During the holiday shopping season, malls seem to be as crowded as busy city streets. It's a pedestrian traffic jam from store to store as people try to navigate the pathways that will lead them to the perfect holiday gift, and maybe even a bargain. Trying to get around or through droves of people isn't just a science perfected by savvy shoppers. This tutorial brings together two disciplines when analyzing crowd dynamics: psychology, which studies the cognitive processes behind the action of walking; and mathematics, which attempts to quantify the laws that govern the way crowds of people move or interact. Topics will include:

1. The phenomenology of crowd dynamics: self-organization, patterns and cognitive processes.
2. Experiments with crowds: what to measure, how to measure, experimental settings.
3. Modeling crowd dynamics: choice of the scale, ODE and PDE models, new measure theory approach.
4. Measure-theory multi-scale models: math behind, properties of the model, numerics and simulations.



Speaker

Benedetto Piccoli is the Joseph and Loretta Lopez Chair of Mathematics and director of Rutgers–Camden's Center for Computational and Integrative Biology. Dr. Piccoli is the author of several books and scholarly articles on crowd dynamics and traffic flow. Piccoli's most recent book, *Multiscale Modeling of Pedestrian Dynamics* (Springer, 2014), brings together two disciplines when analyzing crowd dynamics: psychology, which studies the cognitive processes behind the action of walking; and mathematics, which attempts to quantify the laws that govern the way crowds of people move or interact. "The main idea of the book is to create a mathematical framework in which you can essentially integrate the two approaches and give rise to more efficient crowd behavior models," Piccoli says. "We wanted to make the jump forward in this research area to produce reliable data and mix ideas from many different fields."

Piccoli says most of the complex trends exhibited by crowds are due to an intrinsic interplay between individual and collective behaviors. "When you walk you can decide your pace, when to accelerate or decelerate, the angle you take, and a mixture of other factors that lead to your decisions," he says. Generally, pedestrians will choose to take the route that expends the least amount of energy.

For questions or more information, please contact Dr. Eugene Fiorini, Associate Director of DIMACS and Program Coordinator (gfiorini@dimacs.rutgers.edu). The Workshop is organized by the DIMACS REU program (http://dimacs.rutgers.edu/REU/).

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