



Lothar-Collatz-Kolloquium für Angewandte Mathematik

Donnerstag, den 26. Januar 2012, um 17:15 Uhr, im Hörsaal 5

Prof. Dr. Jens Starke*

(Technical University of Denmark, Kongens Lyngby, Department of Mathematics)

“Traveling waves and oscillations in particle models”

Zusammenfassung/Abstract:

The macroscopic behaviour of microscopically defined particle models are investigated by equation-free techniques where no explicitly given equations are available for the macroscopic quantities of interest. We investigate situations with an intermediate number of particles where the number of particles is too large for microscopic investigations of all particles and too small for analytical investigations using many-particle limits and density approximations. By developing and combining very robust numerical algorithms, it was possible to perform an equation-free numerical bifurcation analysis of macroscopic quantities describing the structure and pattern formation in particle models. The approach will be demonstrated for two examples from traffic and pedestrian flow. The presented traffic flow on a single lane highway shows besides uniform flow solutions also traveling waves of high density regions. Bifurcations and co-existence of these two solution types are investigated. The pedestrian flow shows the emergence of an oscillatory pattern of two crowds passing a narrow door in opposite directions. The oscillatory solutions appear due to a Hopf bifurcation. This is detected numerically by an equation-free continuation of a stationary state of the system. Furthermore, an equation-free two-parameter continuation of the Hopf point is performed to investigate the oscillatory behaviour in detail using the door width and relative velocity of the pedestrians in the two crowds as parameters.

This is in parts joint work with Olivier Corradi, Poul Hjorth and Rainer Berkemer.

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Die aktuelle Version der Kolloquiumsankündigungen (inkl. Abstracts) finden Sie unter:

<http://www.math.uni-hamburg.de/spag/angmath/kolloq/>