



Einladung zur öffentlichen Defensio von

Michael Fischer

Thema der Dissertation

**Applications of interacting particle systems in life- and social-sciences
across scales**

Abstract:

The present work deals with modeling, analysis and simulation of various applications in biology, social sciences and pedestrian dynamics. We consider modeling approaches at microscopic, mesoscopic, and macroscopic levels. We address the connection between the different levels and their respective advantages and disadvantages, beginning with a broad presentation of these techniques in modeling. Afterwards we study a sociological phenomenon in pedestrian dynamics. We model the experiment conducted at the Jülich Research Center at the microscopic level and also calibrate the model. Subsequently, we derive a partial differential equation and analyse it. We reproduce the experimentally observed phenomena at both scales.

We continue with work on the ELO rating, the widely used rating in chess. We extend previous work to include a factor of performance-fluctuation. Numerical simulations on both scales show good agreement between microscopic and mesoscopic scales. We can use the partial differential equation to show analytically that a proper choice of parameters leads to a convergence of the rating to the expected strength.. In the end we derive a new diffusive term at the macroscopic level from microscopic considerations. We consider particles repelling each other within a finite radius. The macroscopic derivation is rigorous and thus we can show the existence of a weak solution on the macroscopic level. We emphasize our findings with simulations at both scales.

Prüfungssenat

Univ.-Prof. Mag. Dr. Andreas Cap
(Vorsitz)

Univ.-Prof. Dr. Christian Schmeiser
(Universität Wien)

Prof. Dr. Simone Göttlich
(Universität Mannheim)

Prof. Dr. Giacomo Albi
(University of Verona)

Zeit:

Thema: Thesis defense M. Fischer
Uhrzeit: 29.Nov. 2022 13:30 Wien

<https://univienne.zoom.us/j/62798869372?pwd=TFBMSWFjMEExKUEhxU0c1QjJTS0Q3Zz09>

Meeting-ID: 627 9886 9372
Kenncode: 839053