IST AUSTRIA
Institute of Science and Technology

Invitation to Seminar Talk

Entropy structure in cross-diffusion models from biology

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Host: Jan Maas

Multi-particle systems for multiple species or fluid components can be described in the continuum limit by cross-diffusion systems, derived from lattice or fluid-type models. The main feature of these strongly coupled partial differential equations is that the diffusion matrix is often neither symmetric nor positive definite, which makes the mathematical analysis very challenging.

In this talk, we explain that for certain cross-diffusion systems these difficulties can be overcome by exploiting a formal gradient-flow structure. This means that there exists a transformation of variables (called entropy variables) such that the transformed diffusion matrix becomes positive definite, and there exists a Lyapunov functional (called entropy) which enables suitable a priori estimates. Although the maximum principle generally does not hold for systems, we show that the entropy concept helps us to prove lower and upper bounds for the solutions to systems e.g. with volume-filling effects.

We detail this theory for some examples arising from biology and thermodynamics. The existence of global weak solutions is proved and numerical examples are presented.

Thursday, 20 November 2014, 4:00pm

Meeting Room 3rd Floor, Central Building

2014-11-20

This invitation is valid as a ticket for the IST Shuttle from and to Heiligenstadt Station.
Please find a schedule of the IST Shuttle on our webpage (note that the IST Shuttle times are highlighted in dark green):
http://ist.ac.at/fileadmin/user_upload/pdfs/IST_shuttle_bus.pdf
The IST Shuttle bus is marked IST Shuttle and has the Institute Logo printed on the side.