Weak-strong uniqueness principles for multi-phase mean curvature flow and fluid-fluid interface evolution

Sebastian Hensel

Institute of Science and Technology Austria (IST)

e-mail: sebastian.hensel@ist.ac.at

For interface evolution problems not admitting a geometric comparison principle, as it is for instance the case in multi-phase systems, the derivation of a stability estimate or a weak-strong uniqueness principle often represents an open problem. In this talk, I will first introduce a notion of relative entropies for two-phase evolution problems incorporating an interfacial energy term proportional to surface area — like in fluid-fluid interface evolutions. In the second part, I will discuss a generalization of the framework to the multi-phase problem for mean curvature flow in the plane. This constitutes the key ingredient for us to establish a weak-strong uniqueness principle for this interface evolution problem: We show that as long as a classical solution to multi-phase mean curvature flow in the plane exists, any weak solution in the sense of the BV formulation of Laux and Otto [3] must coincide with it.

Acknowledgments: The projects [1] and [2] have received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie Grant Agreement No. 665385.

References

[1] J. Fischer, and S. Hensel, *Weak-strong uniqueness for the Navier-Stokes equation for two fluids with surface tension*, Submitted, arXiv Preprint **1901.05433** (2019).

[2] J. Fischer, S. Hensel, T. Laux, and T. Simon, *Weak-strong uniqueness for multiphase mean curvature flow*, In preparation (2019).

[3] T. Laux, and F. Otto, Convergence of the thresholding scheme for multi-phase mean-curvature flow, *Calc. Var. Partial Differential Equations* **55(5)** (2016), 1–74.