

Proposition de stage de M2: A level set approach to study front propagation problems with a prescribed normal velocity

PLACE: Laboratoire de Mathématiques et Physique Théorique UMR 6083,
Fédération Denis Poisson, Université de Tours

ENCADRANT: Olivier Ley, ley@lmpt.univ-tours.fr
<http://www.lmpt.univ-tours.fr/~ley>

SUBJECT: We want to study the geometrical evolution of a hypersurface S_t of \mathbb{R}^N (called the “front”) starting from a given front S_0 and which moves with a given normal velocity. A powerful tool to solve such problems is the “level set approach” developed by Evans-Spruck and Chen-Giga-Goto in 1991. This approach allows to define a generalized evolution for all time as the 0-level set of an auxiliary function which is solution to a partial differential equation.

The aim of this traineeship is (1) to study the viscosity solutions to the partial differential equation of the level set approach in the case of the mean curvature motion (which is the evolution which tends to minimize the area of the hypersurface); (2) to understand the fundamental theorem of the level set approach. Then several directions are possible: consider the evolution by mean curvature of hypersurfaces which are graphs or to turn to another geometrical motion, namely the motion by Gaussian curvature (which is a model for the erosion of stones).

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