Some Recent Results on Nonlocal Geometric Equations and Applications

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We present existence and uniqueness results for nonlocal and possibly nonmonotone geometric equations arising in various types of front propagation problems (dislocations theory, asymptotics of FitzHugh-Nagumo system, volume dependent motions...etc). In these "level-sets" equations, the nonlocal part is of convolution type and depends on the solutions through, typically, the indicator function of the set where the solution is positive.

We first describe a general approach to obtain the global-in-time existence of solutions which is based on a new stability result for equations with a measurable dependence in time. Then we discuss uniqueness and show how it is connected to geometrical properties of the 0-level set of the solutions. In particular, we present new results for curvature dependent front propagation problems.

(Based on joint works with A. Monteillet, P. Cardaliaguet, O. Ley, H. Mitake, R. Monneau.)