A VIABILITY THEOREM FOR SHAPE EVOLUTIONS

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In shape analysis, the so-called velocity method (or speed method) has been a useful tool for avoiding regularity assumptions about the admitted shapes, i.e. closed subsets of the Euclidean space. For investigating a real-valued shape functional, the key idea is to "deform" the current set according to the flow of a vector field. The corresponding variation of the shape functional facilitates finding its minimum, for example.

Making this vector field dependent on the current set leads to so-called morphological equations. They can be regarded as counterparts of evolution equations for compact subsets of the Euclidean space (supplied with the Pompeiu-Hausdorff metric) and have been investigated by Jean-Pierre Aubin and his collaborators.

We focus on the situation that more than one vector field is admitted for each compact subset, i.e. the morphological "equation" is replaced by a morphological "inclusion". Our aim now is to give necessary and sufficient conditions for the existence of (at least one) solution whose values always satisfy a given constraint. Drawing parallels with differential inclusions, the main result is a viability theorem for morphological inclusions (using bounded Lipschitz vector fields as transitions).