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Abstracts

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Existence Theorems for Nonhomogeneous Differential Inclusions by Convex Integration

In our work we address the issue of optimal existence theorems in the theory of differential inclusions.

We show that given a bounded set U and a compact set K in the set of $m \times n$ matrices we can resolve the inclusion $Du \in K$ in Ω, $u = l_A$ on $\partial\Omega$ for all $A \in U$ (l_A is an affine matrix with the gradient equal to A everywhere) if and only if for each $A \in U$ we can find a sequence u_j of perturbations of the function l_A with $Du_j \in U$ and $\operatorname{dist}(Du_j, K) \to 0$ in L^1.

We show how to extend this result to the nonhomogeneous case and discuss a number of applications to equations and systems of Hamilton-Jacobi type, to some problems from the theory of solid-solid phase transitions, and to nonconvex variational problems.

The method we develop in our work goes back to Gromov's idea to obtain solutions of differential inclusions by constructing approximate solutions converging in $W^{1,1}$-norm.