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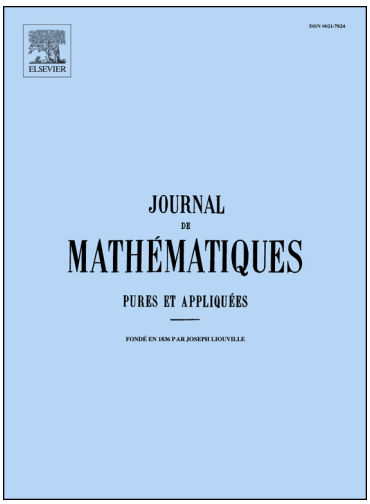

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Symmetry and spectral properties for viscosity solutions of fully nonlinear equations

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Abstract

We study properties of viscosity solutions in bounded domains of fully nonlinear uniformly elliptic equations of the form $F(x, D^2u) + f(x, u) = 0$, where f is convex in the second variable. The main results consist in showing connections between symmetry or other qualitative properties of the solutions and the sign of some principal eigenvalue of the operator $\mathcal{L}_u = \mathcal{M}^+ + \frac{\partial f}{\partial u}(x, u)$, which plays the role of the linearized operator at u, with $\mathcal{M}^+$ standing for the Pucci's sup-operator. We apply our results to obtain bounds on the eigenvalues of the uniformly elliptic operator F and to deduce properties of its possible nodal eigenfunctions.

Résumé

Nous considérons les solutions de viscosité pour les problèmes de Dirichlet dans des domaines bornés, d'équations totalement non linéaires uniformément elliptiques de la forme $F(x, D^2u) + f(x, u) = 0$, où f est convexe dans la seconde variable.
Les principaux résultats lient la symétrie, ou autres propriétés qualitatives des solutions, avec le signe de certaines valeur propres principales de l'opérateur $\mathcal{L}_u = \mathcal{M}^+ + \frac{\partial f}{\partial u}(x, u)$. Cet opérateur joue le rôle de l'opérateur linéarisé autour de la solution u, avec $\mathcal{M}^+$ le sup-opérateur de Pucci. Nos résultats permettent d'obtenir des bornes sur les valeurs propres de l'opérateur F et d'en déduire les propriétés d'éventuelles fonctions propres nodales.

Keywords: Fully nonlinear elliptic equations, Pucci's extremal operators, maximum principle, principal eigenvalues, symmetry of solutions, nodal eigenfunctions
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