

Quasilinear elliptic equations with the natural growth in the gradient

Luka Korkut, Faculty of Electrical Engineering and Computing, University of Zagreb, Croatia.

Mervan Pašić, Faculty of Electrical Engineering and Computing, University of Zagreb, Croatia.

Darko Žubrinić*, Faculty of Electrical Engineering and Computing, University of Zagreb, Croatia.

ABSTRACT

We obtain a new type of results about control of essential supremum of supersolutions for quasilinear elliptic equations of Leray – Lions type with the natural growth in the gradient. This implies explicit local and global oscillation estimates, a lower bound on the constant appearing in Schauder’s and Agmon-Douglis-Nirenberg a priori estimates (in terms of inner radius of domain), and a result about generating singularities. We provide an example showing that one obtains better oscillation estimates if deformation retracts of domain are used instead of balls.

We also study existence, nonexistence, and regularity of radial solutions of p -Laplace equations with the natural growth in the gradient, defined in a ball. A uniqueness result has been obtained, based on a comparison principle for integral operators of Volterra type, introduced by Mervan Pašić. These existence and nonexistence results have recently been extended to general bounded domains, in terms of inner and outer radius of domain. Our result about generating singularities has been used to construct Sobolev functions with “large” singular sets, described in terms of rectifiable sets and sets with finite Minkowski content.

References

1. Korkut L., Pašić M., Žubrinić D., Control of essential infimum and supremum of solutions of quasilinear elliptic equations, C. R. Acad. Sci. Paris, t. 329, Série I, 1999, 269–274.
2. Korkut L., Pašić M., Žubrinić D., Some qualitative properties of solutions of quasilinear elliptic equations and applications, J. Differential Equations, to appear.
3. Korkut L., Pašić M., Žubrinić D., A singular ODE related to quasilinear elliptic equations, EJDE, Vol. 2000(2000), No 12, pp. 1–37.
4. Pašić M., Nonexistence of spherically symmetric solutions for p -Laplacian in the ball, C. R. Math. Rep. Acad. Sci. Canada, Vol. 21 (1) (1999), 16–22.
5. Žubrinić, D., Generating singularities of solutions of quasilinear elliptic equations, J. Math. Anal. Appl., to appear.

Keywords: *quasilinear elliptic, control, oscillation, existence, uniqueness, nonexistence, regularity, singularity*

Mathematics Subject Classification: *35B05, 35C15, 35D10, 35J60, 45J05*

Contact Address: darko.zubrinic@fer.hr