DISCRETE ALEXANDROFF ESTIMATE AND RATES OF CONVERGENCE FOR FEMS

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Abstract. We derive an Alexandroff estimate for continuous piecewise linear functions which states that the max-norm of its negative part is controlled by the Lebesgue measure of the sub-differential of its convex envelope at the contact nodes. We further exploit this bound to show rates of convergence in the max-norm for three finite element methods (FEMs).

We first present a two-scale FEM for linear elliptic PDEs in non-divergence form. We develop a discrete ABP estimate which controls the Lebesgue measure of the sub-differential in terms of jumps, and thus of the discrete PDE. We next consider two FEMs for the Monge-Ampere equation. The first one is based on its geometric interpretation whereas the second is a two-scale method which exploits the eigenvalue representation of the determinant of a matrix. We prove rates of convergence which seem to be optimal in most cases.

This is joint work with D. Ntokgas and W. Zhang.