A CLASSICAL APPROACH FOR THE p-LAPLACIAN IN OSCILLATING THIN DOMAINS

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Abstract. In this work we study the asymptotic behavior of solutions to the p-Laplacian equation posed in a 2-dimensional open set which degenerates into a line segment when a positive parameter ε goes to zero (a thin domain perturbation). Also, we notice that oscillatory behavior on the upper boundary of the region is allowed. Combining methods from classic homogenization theory and monotone operators we obtain the homogenized equation proving convergence of the solutions and establishing a corrector function which guarantees strong convergence in $W^{1,p}$ for $1 < p < +\infty$.

1. Introduction

In this paper, we are interested in analyzing the asymptotic behavior of the solutions of a nonlinear elliptic problem posed in a thin domain with high oscillating behavior on its boundary. In order to state the problem, let $g\colon \mathbb{R} \to \mathbb{R}$ be a function of class $\mathcal{C}^1$, L-periodic, positive with $0 < g_0 \leq g(x) \leq g_1$ for all $x \in \mathbb{R}$, where

$$(1.1) \qquad g_0 = \min_{x \in \mathbb{R}} g(x) \quad \text{and} \quad g_1 = \max_{x \in \mathbb{R}} g(x).$$