Controllability and Asymptotic Analysis of a Semilinear Elliptic Problem in Perforated Domains

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Controlling a system is an interesting subject among engineers and practitioners who want to achieve a desired output for a given situation. Control theory is a branch of mathematics which aims to find a control that will lead the given state of the system in a desirable situation. It may be considered as a theoretical support to control engineering which designs systems with preferred behaviors. This field shows the interplay of theoretical and applied mathematics (in this case in physical sciences and engineering).

In this talk, we will present the controllability of a semilinear second order elliptic boundary value problem in a periodically perforated domain, where the control is distributed in an open subset of the domain. We study the approximate controllability and asymptotic analysis by homogenization technique for this problem in an ε - periodically perforated domain. The holes are of same size as ε with the coefficients of state equation, and the cost functional being rapidly oscillating. The existence of the optimal control relied on the linearization of the semilinear elliptic problem and the constructive approach method introduced by Lions based on the Fenchel-Rockafellar's duality theory.

Keywords: semilinear elliptic problem, approximate control, perforated domain, homogenization