COLOQUIO MATEMATICO

DEPARTAMENTO DE MATEMATICA
UNIVERSIDAD DE CONCEPCION

"Upper bounds for Wentzell eigenvalues and stability"

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Abstract:

We consider the question of giving an upper bound for the first nontrivial eigenvalue of the Wentzell-Laplace operator of a domain $\Omega \subset \mathbb{R}^d$

$$\begin{cases} -\Delta u = 0 & in \quad \Omega \\ -\beta\Delta_T u + \partial_n u = \lambda u & on\ \partial\Omega \end{cases}$$

where Δ_T *us the Laplace-Beltrame operator on* $\partial\Omega$. *This upper bound involves only geometrical informations. We provide such an upper bound, by generalizing Brock's inequality concerning Steklov eigenvalues, and we conjecture that balls maximize the Wentzell eigenvalue, in a suitable class of domains, which would improve our bound. To support this conjecture, we prove that balls are critical domains for the Wentzell eigenvalue, in any dimension, and that they are local maximizers in dimension 2 and 3, using and order two sensitivity analysis.*

To that end, we will address the question of stability in the field of shape optimization. More precisely, given $J: A \to \mathbb{R}$ *defined on* $A \subset \{\Omega$ *smooth enough open sets in* $\mathbb{R}^d\}$, *we consider the optimization problem*

$$min\{J(\Omega), \quad \Omega \in A\} \tag{1}$$

and we ask the following questions:

if Ω^* *is a critical domain satisfying a stability condition (that is to say a strict second order optimality condition), can we conclude that*

$$J(\Omega) - J(\Omega^*) \geq c d_1(\Omega, \Omega^*)^2, \ for\ every\ \Omega \in V(\Omega^*) \tag{2}$$

is a strict local minimum for (1) in the sense that
where $c \in (0, \infty)$, *is a distance among sets, and* $V(\Omega^*) = \{\Omega, d_2(\Omega, \Omega^*) < \eta\}$ *is a neighborhood of* Ω^*, *relying on a (possibly different) distance* d_2*?*

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Auditorio Prof. Alamiro Robledo H.

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