CCIT Report No. 389

ON NEUMANN EIGENFUNCTIONS IN LIP DOMAINS

Rami Atar and Krzysztof Burdzy

ABSTRACT

A "lip domain" is a planar set lying between graphs of two Lipschitz functions with constant 1. We show that the second Neumann eigenvalue is simple in every lip domain except the square. The corresponding eigenfunction attains its maximum and minimum at the boundary points at the extreme left and right. Two conjectures of Jerison and Nadirashvili are special cases of our main result. Our techniques are probabilistic in nature and may have independent interest.