Anti-eigenvalues and a conjecture of McKenna and Walter

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McKenna and Walter remarked in 1987 that the following linear problem needs more study:

$$(1) \qquad \begin{cases} \Delta^2 v + b\,v & = & f & \text{in } \Omega, \\ v = \Delta v & = & 0 & \text{on } \partial\Omega, \end{cases}$$

where Ω is a bounded domain in $\mathbb{R}^n$ and f a given function:

. . . we should be able to estimate the value $b_c(\Omega)$ with the property that for $0 \leq b < b_c(\Omega)$ the inverse operator is positivity preserving (. . .). We conjecture that this constant $b_c(\Omega)$ is largest among all regions Ω with given volume when Ω is a ball.

In the lecture I present results on this conjecture and on related questions that were obtained jointly with G.Sweers from Delft. The parameter b can be interpreted as a spring constant, and u as a deformation of a hinged plate in a bed of springs under a load f.

1