MONICA CLAPP, Universidad Nacional Autónoma de México
Towers of nodal bubbles for the Bahri-Coron problem in punctured domains

Let Ω be a bounded smooth domain in $\mathbb{R}^N$ which contains a ball of radius R centered at the origin, $N \geq 3$. Under suitable symmetry assumptions, for each $\delta \in (0, R)$, we establish the existence of a sequence $(u_{m,\delta})$ of nodal solutions to the critical problem

$$\begin{cases} -\Delta u = |u|^{2^*-2}u & \text{in } \Omega_\delta := \{x \in \Omega : |x| > \delta\}, \\ u = 0 & \text{on } \partial\Omega_\delta, \end{cases}$$

where $2^* := \frac{2N}{N-2}$ is the critical Sobolev exponent. We show that, if Ω is strictly starshaped, then, for each $m \in \mathbb{N}$, the solutions $u_{m,\delta}$ concentrate and blow up at 0, as $\delta \to 0$, and their limit profile is a tower of nodal bubbles, i.e., it is a sum of rescaled nonradial sign-changing solutions to the limit problem

$$\begin{cases} -\Delta u = |u|^{2^*-2}u, \\ u \in D^{1,2}(\mathbb{R}^N), \end{cases}$$

centered at the origin.

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