ASYMPTOTIC ISSUES IN INFINITE CYLINDERS

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We would like to present some results on the asymptotic behaviour of different problems set in cylindrical domains of the type $\ell\omega_1 \times \omega_2$ when $\ell \to \infty$. For $i = 1, 2$ ω_i are two bounded open subsets in $\mathbb{R}^{d_i}$.

To fix the ideas on a simple example consider for instance $\omega_1 = \omega_2 = (-1, 1)$ and u_ℓ the solution to

$$-\Delta u_\ell = f \text{ in } \Omega_\ell = (-\ell, \ell) \times (-1, 1) \ , \ u_\ell = 0 \text{ on } \partial\Omega_\ell.$$

It is more or less clear that, when $\ell \to \infty$, u_ℓ will converge toward u_∞ solution to

$$-\Delta u_\infty = f \text{ in } \Omega_\infty = (-\infty, \infty) \times (-1, 1) \ , \ u_\infty = 0 \text{ on } \partial\Omega_\infty.$$

However this problem has infinitely many solutions since for every integer k

$$\exp(k\pi x_1)\sin(k\pi x_2)$$

is solution of the corresponding homogeneous problem. Our goal is to explain the selection process of the solution for different problems of this type when $\ell \to \infty$.

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