SENSITIVITY PROBLEMS FOR SOME SHELLS WITH EDGES

J. L. Lions — E. Sanchez-Palencia

Dedicated to O. A. Ladyzhenskaya

1. Introduction

1.1. We wish to present a family of two-dimensional boundary value problems which are linear but exhibit some strong instabilities, so as to make in particular numerical computation impossible.

Although very singular, the problems considered here have a physical origin. We begin by explaining that origin; we then proceed in this introduction to give a more general idea of what are the instabilities mentioned above.

1.2. Physical origin of the problems. We are dealing with a class of slightly curved shells that we now describe. Let Ω be a 2-dimensional domain, bounded, with smooth boundary $\partial\Omega$, simply connected or not. Consider a surface S defined by a function

$$(1.1) \qquad (x_1, x_2) \to \theta(x_1, x_2)$$

from $\overline{\Omega}$ to $\mathbb{R}^2$ where θ is of the form

$$(1.2) \qquad \theta(x_1, x_2) = (x_1, x_2, \psi(x_1, x_2))$$

where ψ denotes a smooth function $\overline{\Omega} \to \mathbb{R}$ satisfying

$$(1.3) \qquad \psi(x_1, x_2) > 0 \quad \text{for } (x_1, x_2) \in \Omega,$$

$$(1.4) \qquad \psi(x_1, x_2) = 0 \quad \text{for } (x_1, x_2) \in \partial\Omega.$$