OPTIMAL THICKNESS OF A CYLINDRICAL SHELL[*]

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Abstract

In this paper an optimization problem for a cylindrical shell is discussed. The aim is to look for an optimal thickness of a shell to minimize the deformation under an applied external force. As a side condition, the volume of the shell has to stay constant during the optimization process. The deflection is calculated using an approach from shell theory. The resulting control-to-state operator is investigated analytically and a corresponding optimal control problem is formulated. Moreover, necessary conditions for an optimal solution are stated and numerical solutions are presented for different examples.

MSC: 49K15, 49J15, 49Q10

keywords: Optimal control of PDE, Shape optimization, Linear elasticity

1   Introduction

In this paper we discuss an optimization problem in linear elasticity, particularly in shape optimization. In this field, much research has been done in the last years. Some few representative books from Sokolowski [1], Pironneau [2], Haslinger [3] and Delfour [4] should be mentioned here.