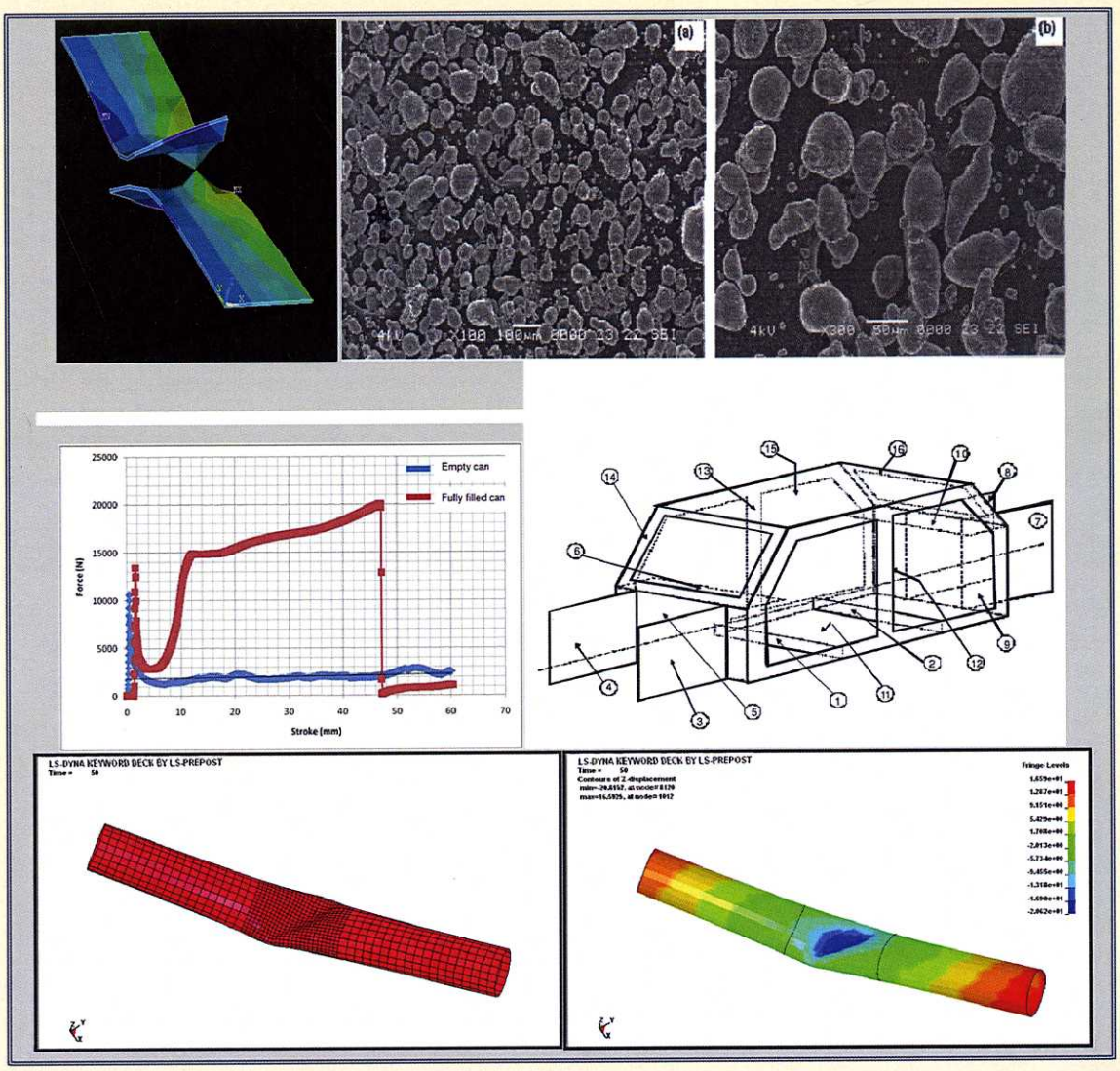
ADVANCED TOPICS IN MECHANICAL BEHAVIOR OF MATERIALS



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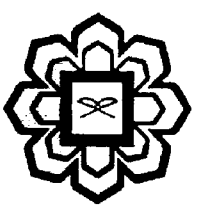

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INVERSE PARAMETER IDENTIFICATION OF ELASTIC AND INELASTIC CONSTITUTIVE MATERIAL MODELS

Meftah Hrairi

1. INTRODUCTION

Formulating the complete description of a material behavior includes finding the numerical values of parameters involved in its constitutive equations [1]. Traditionally, this is based on running some experimental tests and manipulating their results in order to extract the values of these parameters [2]. This chapter presents an alternative approach, based on inverse problems, which will provide a numerical method for determining accurate material parameters. This numerical tool combines an optimization algorithm with a finite element solver giving the material response to arbitrary loading. Two numerical examples are used to demonstrate the effectiveness of the developed identification technique.

2. PARAMETER IDENTIFICATION MODULE

The inverse identification algorithm used here consists in combining the optimization process with the finite element method. This is summarized in Figure 1. The optimization task is based on the Levenberg-Marquardt algorithm in order to determine the parameter corrections while the finite element solver handles the solution of the direct problem. The main task of this module is to identify a selected set of unknown parameters of the material model. The unknown parameters are determined iteratively by minimizing a cost function which expresses the discrepancy between the experimental and the computed response of the physical system under study.