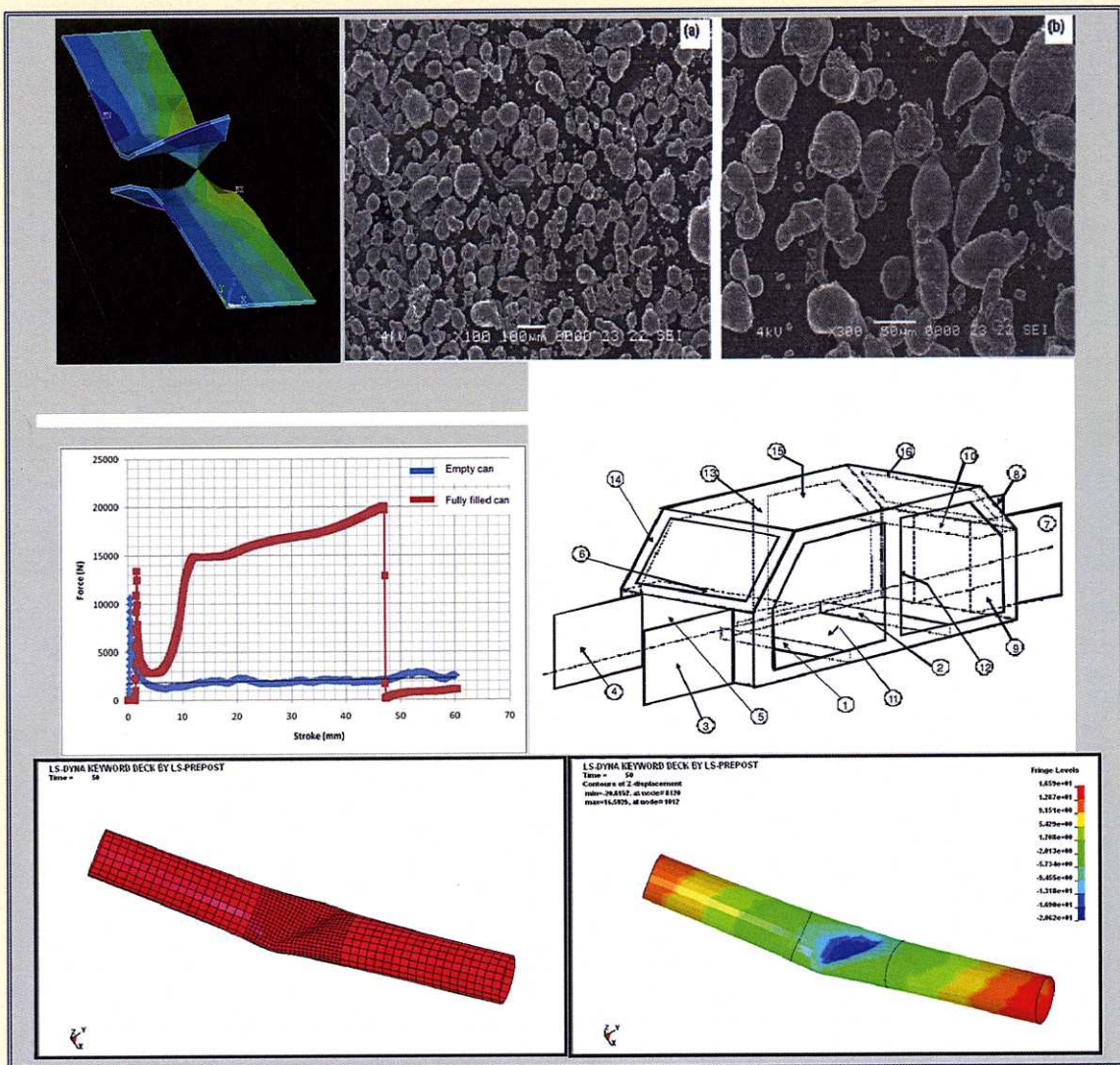


ADVANCED TOPICS IN MECHANICAL BEHAVIOR OF MATERIALS



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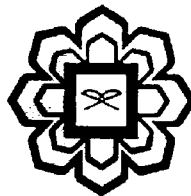
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

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GENERAL FRAMEWORK FOR INVERSE IDENTIFICATION OF CONSECUTIVE PARAMETERS

Meftah Hrairi

1. INTRODUCTION

The study of inelastic behavior of materials generally follows two steps: (1) the formulation of the mathematical model representing the governing physical effects and (2) the identification of the material's constants. The latter is traditionally achieved through experimental measurements. In this direct identification process, the problem of interpretation of experimental tests requires the assumption of homogeneity of deformation and therefore the use of an approximation method.

Very few works can be found in the documentation that account for the non uniform stress and strain distribution during experiments [1, 2]. For complex mechanical parts or structures subjected to large strains and deformations, the solution of the field equation is required in order to incorporate this non uniformity of stress and strain in the material identification process. The finite element method will be used as a tool to solve the field equations.

The numerical of the associated inverse problem can be based either on a recent neural network or from a more classical approach of considering the parameter identification as an optimization problem in which nonlinear least square functions are to be minimized so as to obtain the best agreement between experimental and simulated data in specified energy norm.

Algorithms for solution of the resulting optimization problem may be classified into three classes:

1. those just requiring the value of the function (0th order)
2. descent methods requiring the gradient of the function (1st order)
3. quadratic programming methods requiring the Hessian of the function to be evaluated (2nd order)