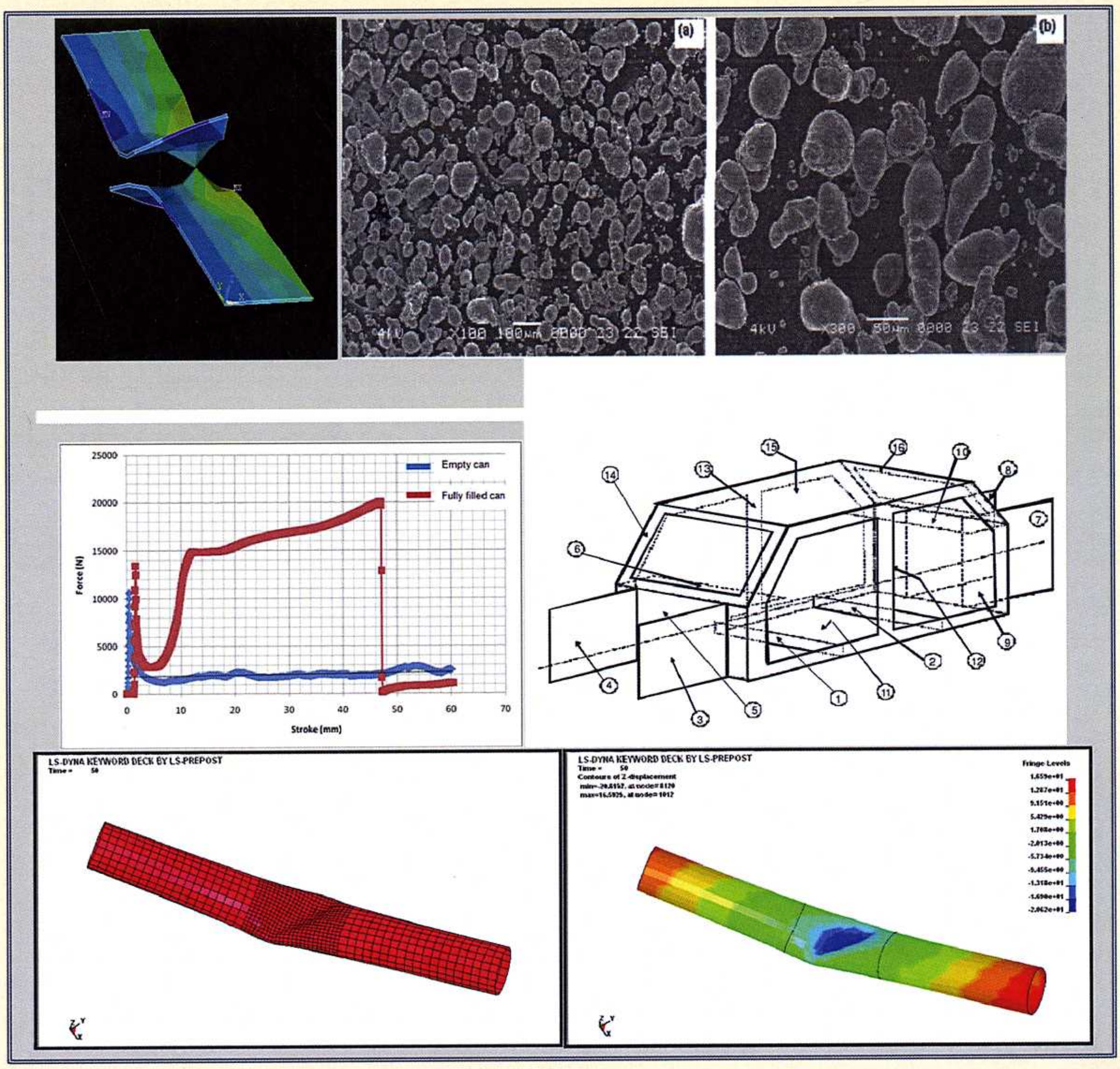
ADVANCED TOPICS IN MECHANICAL BEHAVIOR OF MATERIALS



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IIUM PRESS
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

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IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011

Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

ISBN: 978- 967-418-174-1

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed by :
IIUM PRINTING SDN. BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan

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