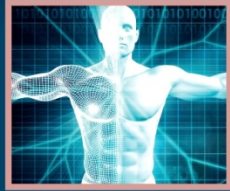


ACADEMIC PRESS SERIES IN BIOMEDICAL ENGINEERING



BIOMECHANICS OF LIVING ORGANS

HYPERELASTIC CONSTITUTIVE LAWS FOR FINITE ELEMENT MODELING

EDITED BY
YOHAN PAYAN
JACQUES OHAYON



Biomechanics of Living Organs Series

Series Editors: Jacques Ohayon and Yohan Payan

Volume 1

Hyperelastic Constitutive Laws for Finite Element Modeling

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Covers finite element biomechanical modeling of each organ in the human body with constitutive laws in mind

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AUDIENCE

Biomedical Engineers,
Biomechanical Engineers,
Graduate Students of Biomedical
Engineering, Clinicians, Tissue
Engineers

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KEY FEATURES

- Covers hyperelastic frameworks for large tissue deformations
- Considers which strain energy functions are the most appropriate to model the passive and active states of living tissue
- Provides Finite Element simulations for most organs of the human body

DESCRIPTION

Biomechanics of Living Organs: Hyperelastic Constitutive Laws for Finite Element

Modeling is the first book to cover finite element biomechanical modeling of each organ in the human body. This collection of chapters from the leaders in the field focuses on the constitutive laws for each organ.

Each author introduces the state-of-the-art concerning constitutive laws and then illustrates the implementation of such laws with Finite Element Modeling of these organs. The focus of each chapter is on instruction, careful derivation and presentation of formulae, and methods.

When modeling tissues, this book will help users determine modeling parameters and the variability for particular populations. Chapters highlight important experimental techniques needed to inform, motivate, and validate the choice of strain energy function or the constitutive model.

Remodeling, growth, and damage are all covered, as is the relationship of constitutive relationships of organs to tissue and molecular scale properties (as net organ behavior depends fundamentally on its sub components). This book is intended for professionals, academics, and students in tissue and continuum biomechanics.

ENGINEERING

Biomedical

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BIOMECHANICS OF LIVING ORGANS

HYPERELASTIC CONSTITUTIVE LAWS FOR FINITE ELEMENT MODELING

EDITED BY

YOHAN PAYAN AND JACQUES OHAYON

Provides a basic understanding of physiological principles with an emphasis on quantitative aspects

Biomechanics of human soft tissues has been an emerging research field since the 1981 publication of Yuan-Cheng Fung's *Biomechanics: Mechanical Properties of Living Tissues*. Since then, many groups in the world have proposed biomechanical models of soft organs to study their physiology and mechanical behavior. *Biomechanics of Living Organs: Hyperelastic Constitutive Laws for Finite Element Modeling* is the first book to cover finite element biomechanical modeling of each organ in the human body. This book introduces the basic notions concerning the hyperelastic constitutive laws for biological living tissues and describes the main human organs from the head to the foot, proposing for each organ the most adapted constitutive model.

This book offers a comprehensive overview of the state-of-the-art in hyperelastic constitutive laws for organs' Finite Element modeling and provides a deeper understanding of the associated problems that students, researchers, clinicians, and industrial partners will face in the future.

Key Features

- Covers hyper elastic frameworks for large tissue deformations
- Considers which strain energy functions are the most appropriate to model the passive and active states of living tissue
- Evaluates the physical meaning of proposed energy functions



Yohan Payan

The Editors

Yohan Payan and Jacques Ohayon are PhD senior researchers belonging to TIMC-IMAG Laboratory (CNRS & Univ. Grenoble Alpes, France). They are both members of the International French Society of Biomechanics from which they received the Senior Prize, respectively in 2012 and 2016. With an engineering background and a CNRS senior position, Yohan Payan's main research interests concern the biomechanical modeling of soft tissues, with applications to Computer Assisted Medical Interventions (CAMI). He is the deputy director of TIMC-IMAG Laboratory and leads the CAMI team. Jacques Ohayon is professor of Applied Mechanics at the Engineering School Polytech Annecy-Chambéry – University Savoie Mont-Blanc and is part of the TIMC-IMAG DyCTiM team (Cellular/Tissular Dynamics and Functional Microscopy). His research interests are in biomechanics of atherosclerotic plaque, plaque detection, plaque rupture prediction, plaque growth, and development of new clinical tools for imaging the elasticity of vulnerable plaque based on clinical OCT, MRI, and IVUS sequences.



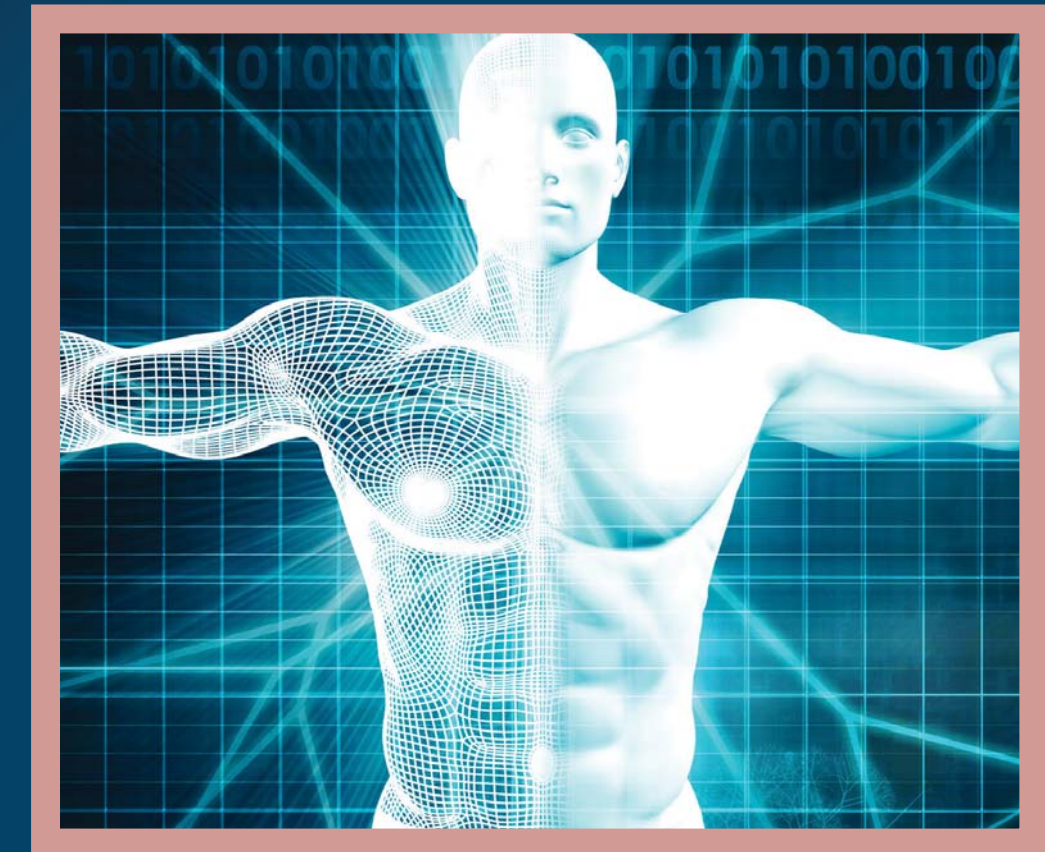
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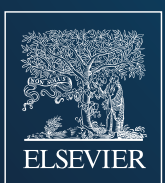


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