

Preface

This volume focuses on the biomechanical modeling of biological tissues in the context of Computer Assisted Surgery (CAS). More specifically, deformable soft tissues are addressed since they are the subject of the most recent developments in this field. The pioneering work on this CAS topic dates from the 1980s, with applications in orthopaedics and biomechanical models of bones. More recently, however, biomechanical models of soft tissues have been proposed since most of the human body is made of soft organs that can be deformed by the surgical gesture. Such models are much more complicated to handle since the tissues can be subject to large deformations (non-linear geometrical framework) as well as complex stress/strain relationships (non-linear mechanical framework).

Parts 1 to 4 of this volume present biomechanical models that have been developed in a CAS context and used during surgery. This is particularly new since most of the soft tissues models already proposed concern Computer Assisted Planning, with a pre-operative use of the models. Then, the volume addresses the two key issues raised for an intra-operative use of soft tissues models, namely (Part 5) how to estimate the in vivo mechanical behavior of tissues? (i.e. how to estimate their stress/strain constitutive laws?) and (Part 6) what kind of open-source platforms can be used to implement such biomechanical models with generic real-time (or at least interactive-time) numerical simulations?

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