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Identification of Constitutive Parameters for the Non-Local Damage Model of Soft Biological Tissues

Taotao Yuan[1], Haitian Yang[1] and Yiqian He[1,2,*]

[1] State Key Lab of Structural Analysis for Industrial Equipment, Department of Engineering Mechanics, Dalian University of Technology, Dalian, 116024, China

[2] Institute of Mechanics of Materials, Ruhr Universität Bochum, Bochum, 44801, Germany

[*]Corresponding Author: Yiqian He. Email: heyiqian@dlut.edu.cn

ABSTRACT

Computational modeling can provide insight into understanding the damage mechanisms of soft biological tissues, and identification of constitutive parameters is key issues in the computational modeling. On the other hand, although it is thought that computational model should be non-local for soft tissues based on the existence of intrinsic length scales, there is very few work for the identification of the parameters of nonlocal damage models of soft tissues. Firstly, we use the gradient-enhanced damage model presented in our previous publication showing advantages in considering the internal length scales and in satisfying mesh independence for simulating damage [1]. Secondly, the tension experiments are carried out on soft tissue of bovine heart artery containing damage process to collect the measurement. Thirdly, an inverse problem is solved by solving an optimization problem, and a surrogate model is built to replace nonlinear FEM computation to save the computational cost of inverse problems [2]. The computational results show the proposed model has good accuracy in the identification of nonlocal damage parameters.

KEYWORDS

Nonlocal damage; soft biological tissues; material parameter identification; tension experiment; surrogate model

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