

Parameter characterization for numerical models in biomechanics

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Computer simulation of engineering problems dates from the beginning of the use of computers, improving the power of available numerical methods. The first scientific computers in Brazil were used in structural analysis, while the first supercomputers in the use of civilians were used to solve meteorological models.

The use of numerical tools in the analysis of biological systems is quite more recent, especially in Brazil, and was restricted for many years to the analysis of biological signals. The challenges and opportunities in this area are quite large, as the study of a wide group of problems of mechanical nature has been restricted to professionals of background in biological sciences, without access to concepts and tools based on the laws of mechanics.

The application of a multidisciplinary perspective to the area enabled the use of an approach based on physical and mathematical models for biological systems, but it also opened new questions. One of them is the need to create a space for interaction of professionals of different but complementary backgrounds when treating the problems at hand. This requires a learning effort from the group to reach a common language with which the concepts can be worked without simplifications leading to a lack of effective communication. In the present work the author gives examples of different questions raised by the modeling of health problems using the principles of solid and computational mechanics by the Biomechanical Engineering Group at UFMG. Civil, mechanical, electrical, metallurgical and material engineers, physiotherapists, speech pathologists, dentists, veterinary doctors, physicists, computer scientists and statistics participate in the group searching for the understanding and intervention in problems in the interface between engineering and health.

The original problem discussed refers to the preparation of a model for a sane or a restored tooth submitted to the usual loads occurring in the oral environment. The complexity of this task and the determination of the required parameters for consistent models to represent this element are discussed, as well as the related recent experimental developments in laboratory and computer simulations by the group.

Estevam Barbosa de Las Casas finished his Ph. D. At Purdue University in 1988. He was visiting professor at UPC in Barcelona for one and a half years. Today he is professor of Structural Engineering at Federal University of Minas Gerais, and supervised students in Civil, Mechanical and Electrical Engineering, Physiotherapy, Speech Pathology and Dentistry, both undergraduates and graduates. Coordinates research projects in Civil, Mechanical and Biomedical Engineering, with emphasis in Computer Modeling, Structural Mechanics and Biomechanical Engineering. Has coordinated and participated in cooperation agreements with institutions in the European Union, Portugal and United States, as well as different institutions in Brazil. He was the first president of the Brazilian Association for Computational Methods in Engineering and secretary of the Bioengineering Committee of the Brazilian Association for Mechanical Sciences and Engineering. He was also coordinator of the Engineering and Architectural Committee of FAPEMIG, member of the CAPES committee for valuation of the Brazilian graduate programs and acted as advisor for FAPEMIG, CAPES, CNPQ, FAPERJ, FACEPE, FINEP, PUC-MG and Universidad Politècnica de Catalunya , as well as several scientific journals.

