

DEVELOPMENT OF BIOMECHANICAL DEFORMABLE THORACIC MODEL

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The aim of this study is development of biomechanical model of the thorax by the creation of the new factual model of this part of human's body through the medium of hexahedral grid. The whole model is based on the Finite element method and it has been generated with respect to the real anatomical human data, since the photographs of Visible Human Project have been used for the determination of the spatial arrangement of individual organs. The material properties and contacts have been implemented into the model for the completion of the spatial arrangement and for the completion of the model. The Kroell test has been applied for the validation of the thoracic model. The thoracic injury criteria can be determined from the results of the Kroell test. These injury criteria play considerable role during the accidents. One of these injury criteria is just chest deflection, which has been investigated during the Kroell test. The validated model will be utilized for the simulation of the vehicle crash situations and for the observation of motion of thoracic organs during the impact. The created model is of great scientific importance since the model is much closer to the biological reality.

Key words: biomechanical simulation, thoracic model, Kroell test, injury criterion

1. Introduction

The area of the biomechanical simulation has been rapidly advancing for the past several years. At present time more complete and more complex models are generated.

Finite element models have been considered to be the best tool for the modelling of objects with the complex geometry, multiple material compositions and complicated loading conditions. The material characteristic of investigated tissue and its spatial arrangement is needed for the simulation of the living system by virtue of Finite element method.

The Finite Element Method [14] has also been applied to generation of the thoracic model. The geometry of the model results from the real anatomical human data since the photographs of Visible Human Project [10] have been employed. The material properties have been defined to complete the spatial arrangement.

2. The creation of thoracic model

The photographs of Visible Human Project (VHP) have been the starting point for the creation of the thoracic model.

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