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Assessment of Hex-Dominant Mesh Efficacy for Nonlinear Finite Element Method Structural Analyses

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Abstract

In order to perform Finite Element Analysis of complex biological structures, a three-dimensional physiologic model must be created and then a “good” FEA mesh (discretization) must be attained. This process is very time consuming. Moreover, accuracy cannot be easily assessed due to the absence of gold standards. Researchers are challenged by the absence of a repeatable and reliable method to obtain meshes suitable for non linear analysis, in the case of complex geometries.

The objective of the proposed research is to compare different types of meshes for the solution of static structural problems under large deformation conditions, using nonlinear materials. Automated mesh generation will drastically decrease the errors due to inter- and intra-user variability and will also significantly reduce the computational time required for solving complex nonlinear problems while maintaining an acceptable degree of accuracy in the results.