

Approximations of Stiffness Tensor of Bone – Determining and Accuracy

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The paper deals with properties of the apparent stiffness tensor of bone. We used the computer reconstruction method combined with spectral and harmonic decomposition. Hexahedral samples of trabecular bone was reconstructed from computer microtomograph images, next Finite Element models of samples was build and numerical tests combined with averaging procedure was performed in order to identify the fully anisotropic apparent stiffness tensor. Subsequently, the spectral and harmonic decompositions of the tensor were performed. Six Kelvin moduli and invariants of projectors were evaluated. The closest isotropic tensor and possible orthotropic approximation were specified basing on the harmonic decomposition. Analysis of these quantities allowed to discuss symmetries of apparent stiffness tensor and to measure the deviation of the proposed approximations from the actual stiffness tensor.

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