Locally orthotropic femur model

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The ability of spongy bone, which speci¯es the direction of trabeculae to be parallel to the local principal stress directions is called, Wo l®'s law [1]. Based on this statement we can create a simple model using an easy iterative method which is called locally orthotropic femu r model [2]. The gist of the iteration is the following: in an FE model according to the actual loading, ¯rst the material directions are engage d to be parallel to the calculated principal stress for every element, then the principal stress directions are calculated again and the material dir ections are modi¯ed. (The initial material orientations are parallel to each other, or random.) The obtained iterative method is strongly converg ent, after six iteration loops the material angles do not change more than a few tenths and after the ¯fteenth iteration are practically constan t. Therefore the advantages of this iterative method are its speed, e®ectiveness and similarity to real bone's trabeculae structure. We are plan ning to extend the 2D model to 3D, or rather to use the model obtained to the validation process of femur prosthesis.

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