Abstract

Trabecular bone microarchitecture and bone mineral density (BMD) are two main factors related to osteoporotic fractures. Currently, however, microarchitecture is not evaluated in the clinical routine. In this paper, an oriented analysis method combining an anisotropic fractional Brownian motion model (ap-fBm) with an efficient estimator of the fractal dimension called anisotropic piecewise Whittle estimator (ap-WhE), are proposed to better characterize trabecular changes on bone radiograph images. To validate our approach several well-known estimators were compared on isotropic and anisotropic synthetic fractional Brownian motion images in different orientations of multiple 45°. Results of a real application on radiographic bone images to discriminate between two populations composed of 87 osteoporotic patients and 87 control subjects are presented. A comparison with well-known texture analysis methods is also provided. The results obtained demonstrate the performance of the proposed approach to characterize synthetic isotropic and anisotropic fractal textures as well as natural textures for a medical application.