



# Model-Based Segmentation, Reconstruction and Analysis of the Vertebral Body from Spinal CT

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## Abstract:

In this chapter, we present novel vertebral body segmentation methods in computed tomography (CT) images. Three pieces of information (intensity, spatial interaction, and shape) are modeled to optimize new probabilistic energy functions; and hence to obtain the optimum segmentation. The information of the intensity and spatial interaction are modeled using the Gaussian and Gibbs distribution, respectively. A shape model is proposed using new probabilistic functions to enhance the segmentation results. The models are generic shape information which is obtained using the cervical, lumbar, and thoracic spinal regions. The proposed methods are validated with clinical CT images and on a phantom with various Gaussian noise levels. This study reveals that the proposed methods are robust under various noise levels, less variant to the initialization, and quite faster than alternative methods. Applications on bone mineral density (BMD) measurements of vertebral body are given to illustrate the accuracy of the proposed segmentation approach.

## Keywords:

Computational Methods - Computer Aided Diagnosis - Image Processing - Image Segmentation - Image based modeling - Spine CT - Spine Imaging

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