Addressing Discretization Artifacts in Tomography by Accessing and Balancing Pixel Coverage of Projections

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Abstract

In computed tomography, the reconstructed object and the measured detector values are represented in a discrete domain. As the real world is not discrete, this restriction of the model usually creates artifacts (i.e., *interpolation errors*) on the reconstructed images. To formulate the projection model, we use so-called interpolation methods, which enumerate the interactions between beams and the image as rays pass through the pixels of the image. The type of interpolation method we select strongly influences the artifacts in the reconstructed image. In this paper, we show a connection between pixel coverage to get a better understanding of the interpolation errors, and we also propose an effective correction method to reduce the effects of interpolation errors in reconstructed images. We tested our proposed method in a comprehensive experiment, where we found that our proposed correction method can significantly improve the quality of the image.