Object Rotation Effects on Binary Tomographic Reconstruction

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The main goal of transmission tomography is to reconstruct the inner structure of objects from their projections. Sometimes, acquiring projections can be of extremely high cost or taking too many of them can damage the object of study. In binary tomography we make the restriction that the object to be reconstructed can only consist of two known materials (usually the parts of a homogeneous object and empty space between them), and sometimes we can also assume that its shape fulfils some special properties as well. With such prior information several algorithms have been developed capable of reconstructing objects from only a few (say, up to 10) projections.

It has already been shown [1, 2, 3] that certain projections can contain more information than others. This fact can be especially crucial in the case of discrete tomography where only a handful of projections are available and choosing appropriate projection angles can yield better reconstruction results.

Experiments on such dependency on the choice of projections have already been presented [3] by comparing the binary tomographic reconstructions of the same objects but with different projection angles. Our research extends the previous work and investigates whether the results still hold in a practical application when the projection data is affected by noise of different characteristics and measurement errors. We have performed experimental tests on a set of software phantoms, comparing their reconstructions from different projection sets corrupted by different levels of random noise.

Our results indicate that the previous results can be extended to the case when the projection data is corrupted by noise and we can discover connections between the reconstructions of objects belonging to the different noise levels. Based on our experiments we discuss a possible application of the results in the field of non-destructive testing as well.

References

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