Extracting Geometrical Features of Discrete Images from Their Projections

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The task of *Reconstruction Tomography* is to produce 2-dimensional cross-section images of an otherwise 3-dimensional target object from several projections, which would reveal the inner structure of the object under investigation. Due to the nature of the problem, any prior information about the build-up or conformation of the test object is more than welcome to assist the task, usually leading to a reconstruction of better quality. This especially applies for *Discrete Tomography*, designated by DT in short, where the number of projections to work with is very limited. In return, we assume that the image only holds a few discrete intensity values known beforehand. Nevertheless, in order to obtain appropriate results we have to limit the search space by exploiting the additional information about the object given prior to reconstruction.

Most of the reconstruction algorithms in DT rely heavily on such 'a priori' knowledge. Extraction of these features could be attempted from the projections themselves, e.g. by using the wide range of tools of Artificial Intelligence. We succesfully used learning algorithms, like Feedforward Neural Networks to retrieve geometrical properties of images, such as convexity and connectivity [1], as well as estimating the perimeter of the shape [2] and the number of distinct intensities present in the image [3] from the projection data only. Knowledge gained during this preliminary step could then be used to ease the task of choosing the proper reconstruction method, or setting its parameters appropriately.

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References

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