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Sequential selection methods and global uncertainty in projection selection for binary tomography

Abstract

In binary tomography [1] the goal is to reconstruct the inner structure of homogeneous objects from a low number of their projections. There is a strong connection between the quality of a binary tomographic reconstruction and the choice of angles of the projections [2]. For selecting proper projection directions different evaluation values can be used. If the blueprint data is given we can calculate the RME (Relative Mean Error) value of a reconstruction and use it to identify informative angles. In the absence of blueprint data, we can calculate the uncertainty. In many cases there can be several solutions of the reconstruction problem. Knowing all the reconstructions we could calculate the probability of a single pixel taking the value 1. Given the probabilities we can determine the uncertainty of a reconstruction [3]. We provide different projection selection algorithms based on sequential selection methods [4] in order to find the "most informative" projection set. We also compare them with already existing algorithms. For the optimization the two abovementioned evaluation values were used. To show that uncertainty can be useful in projection selection with a great confidence and to compare the performance of the given algorithms we performed experimental tests on a set of binary software phantoms. (Joint work with Péter Balázs and László G. Varga)

References

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