B. Prommegger, *Verification and Evaluation of Superiorized Algorithms Used in Biomedical Imaging: Comparison of Iterative Algorithms With and Without Superiorization for Image Reconstruction from Projections*, Marshall Plan Scholarship Report, Salzburg University of Applied Sciences, Salzburg, Austria, and The Graduate Center of the City University of New York, NY, USA, October 2014, (84 pages).
http://www.marshallplan.at/images/papers_scholarship/2014/Salzburg_University_of_Applied_Sciences_PrommeggerBernhard_2014.pdf.

Abstract

The thesis aims at efficient methodologies for obtaining accurate biomedical images by mathematical/algorithmic development, computer implementation and practical evaluation of the novel methodology of superiorization. The underlying idea is the following: in many biomedical imaging applications, there exist efficient iterative algorithms that produce constraints-compatible images for given constraints. Often, the algorithm is perturbation resilient in the sense that, even if a number of changes are made at the end of each iterative step, the algorithm still produces a constraints-compatible image. Superiorization exploits this property by using the perturbations to steer the algorithm to an image that is not only constraints-compatible, but also preferable according to an optimization criterion reflecting some biomedically desirable property.

The specific aim of this master's thesis is the comparison of iterative algorithms with and without superiorization for image reconstruction from projections. The comparison is performed for two algorithms that are used very frequently in CT: algebraic reconstruction technique (ART) and simultaneous algebraic reconstruction technique (SART). Although both algorithms have been used in a lot of scientific papers, the performance of the two algorithms compared to each other has never been evaluated - not even in their non-superiorized versions.

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