

Multi-objective GA optimization of fuzzy penalty for image reconstruction from projections in X-ray tomography

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Abstract: This paper concerns X-ray tomography image reconstruction of an object function from few projections in Computed Tomography (CT). The problem is so ill-posed that no classical method can give satisfactory result. We have investigated a new combined method for penalized-likelihood image reconstruction that combines the fuzzy penalty function (FP) and GA (genetic algorithm) optimization. The proposed algorithm does not suffer from the same problem as that of ML EM (maximum likelihood expectation maximization) algorithm, and it converges rapidly to a low noisy solution even if the iteration number is high, and gives global estimation not a local one like in classical algorithm such as gradient, to the problem of determining object parameters. The method was tested and validated on datasets of synthetic and real image.

Keywords : Computed tomography, Non-Destructive testing, Analytic estimation, Bayesian inference and estimation, Fuzzy inference, Genetic optimization