ANALYSIS STUDY OF CONJUGATE GRADIENT METHOD IN IMAGE RESTORATION PROBLEM

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ABSTRACT

The conjugate gradient (CG) method is one of the optimization methods. The CG methods are quite famous among researchers in previous studies where it is widely used due to unconstrained problem-solving. The major characteristic of the CG method is low memory requirement and strong local and global convergence properties. CG method is widely used in various applicability in life problems. In this research, the CG method is applied to the image restoration problem in order to recover or improve the quality of a digital image that has been degraded, damaged, or corrupted. The PRP, HS and NMRI methods are compared under a strong Wolfe line search. The numerical result of number of iterations (NOI) and CPU times are assessed by the performance of each method. The chosen CG methods also are tested for applicability in image restoration problems. The Camera, Monarch and Cat images are chosen to be compared. Each method is compared based on CPU times, relative error and peak signal-to-noise ratio (PSNR). The PRP method gives the best result in terms of efficiency and robustness followed by NMRI and HS methods respectively. The HS method yields better results compared to PRP in image restoration problems but has slight differences while the NMRI method can only solve for cat image. As a conclusion, PRP is the best method in terms of robustness and efficiency and also for application in image restoration problems.

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TABLE OF CONTENTS