

Performance Analysis and Optimization of Image Restoration Techniques in Engineering & Scientific Domain

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ABSTRACT: In the last decades, researchers have evolved many restoration techniques to suppress the specific degradation. As many types of degradations and image fields occur in the advance digital image processing (ADIP), optimum solution is desired in scientific and technical applications. Therefore, suppression of noise from degraded image remains fundamental problem in the field of ADIP. Hence, our main focus is on to investigate the performances of various restoration methods to provide the optimum technique/solution. It is very much essential to suppress the noise in an image to preserve the edges and fine details that may possible in engineering applications. Research work is mainly attentive to semi-blind image restoration to provide the optimum solution in ADIP system. The process involved in the restoration is oriented towards modeling the degradation and then applying an inverse procedure to obtain an appropriate original digital image. There are two basic approaches for image restoration: the spatial filtering techniques and transform filtering techniques to suppress the (degradations) noise. These two important domains of image restoration are studied in terms to select the optimum restoration technique to specific combination of particular noise and image from diversified fields.

Aim of research work is to investigate the performances of various state-of-art restoration techniques and developed novel techniques to provide the optimum solution for image restoration based on appropriate significant quantitative and qualitative measures. The analysis of restoration methods and their simulation is performed with standard test images and synthetic noise. The critical performance analysis is investigated based on universal quality parameter PSNR with combinations of Speckle, Poisson, Gaussian and Salt & Pepper noise and images from various fields i.e. Medical, Aerial, Natural and Underwater. Reported schemes in the literature did not make it realistic under the consideration of above-mentioned combinations. This fact further inspires us to investigate the restoration techniques in both domains to specific combination of noise and diversified field images.

In this proposed schemes, we have investigated total, seven thousand one hundred and sixty seven combinations including various standard textures. Finally, it may be concluded that many efficient spatial and transform domain restoration techniques have been investigated in this research activity to suppress the degradations encountered in an images from diverse fields. In addition, based on the results of these investigations, an attempt is being made to find out an optimum solution to the particular combination of specific noise and particular class of images. It is found that some spatial domain restoration techniques are providing the better results and sometimes few transform domain techniques are providing improved results for specific combinations.

Key Words: Semi Blind Restoration, Diversified fields, Spatial & Transform Domains, Texture Analysis