ABSTRACT

Denoising an image is a well studied problem and a paradigm technique, which prevails in communities of medical, environmental, educational and communication. In the recent past, many conventional and novel approaches had been developed for denoising the images. Although these approaches provide qualitative results, there is always a scope for enhancing the performance. Taking a lead from this concept, an improvised framework consisting of four models has been developed in order to achieve resultant images with high quality and accuracy for the purpose of its application.

Learning framework means a supporting structure around which it can be built, to propose a method or process that enables achievement of a defined objective. In this work, a developmental framework is conceived that can be effectively used for denoising an image, by overcoming the bottlenecks of existing models. This work is a learning process, wherein the models selected and discussed are the ones proven in earlier research work, and is comparable to with the results of the proposed models to arrive at a conclusion.

Despite the fact that several conventional and novel approaches have been developed for denoising images, they have not yielded the adequate, qualitative results in terms of enhanced performance. Depending on the nature of the noise to be reduced, the improvised model uses individual approaches in order to get clear images without noise.

Taking a lead from four approaches namely Dictionary Based, Non Local Means Decision Based Unsymmetric Trimmed Median, Patch Based
and Fourth Order Kernel Regression models are developed, that can be used for denoising an image depending upon the nature of noise to be removed.

Each model is validated with the help of classical database images available for denoising research work that is ably substantiated by effective algorithms. On analyzing the results, it can clearly be ascertained that in comparison to the existing methods, the proposed method of Dictionary based denoising provides effective results for removing Gaussian noise from an image. Further the NLM-DBTUM based denoising method work outperforms the prevailing models in removal of Gaussian and impulse noise from an image. The third method proposed, namely Patch Based Method helps to remove Gaussian, Speckle and impulse noises and the results are proven to be effective with the proposed algorithm. For 3D medical images Fourth Order Kernel Regression is proposed which can be considered as an innovative model for removing Rician and Gaussian noises in the process of image denoising. The models serve to overcome the shortcomings of the earlier mentioned approaches by developing algorithms to arrive at qualitative images without losing their edges.

These suggested approaches are deliberated in detail with the classical database of images available for denoising and application of developed algorithms with extensive analysis. The results obtained using these algorithms are consolidated together to attain a learning framework for image denoising and restoration. The models discussed in this framework can be used together or independently depending on the requirement, application, nature of image considered and types of noise present in them.