

ABSTRACT

Digital Image Processing (DIP) is the science that extracts useful information by carrying out computations on images by digital computer. It allows different algorithms to be applied to the input image and can avoid problems such as the build-up of noise and signal distortion during acquisition of the digital images.

The acquired images contain the noise due to malfunction of internal or external environment. The removal of noise is required to improve the quality of an image for human perception. During transmission, the image can be corrupted due to various noises that affect the quality of the image. The major intention of filtering or denoising the image is to reconstruct the details of the original image as much as possible. The metrics of the image noise removal depends on the type of noise through which the image is corrupted. In the field of eliminating the image noise, various types of filtering techniques have been studied. Various approaches for elimination of the image noise and the enhancement of images have been regarded; each of them has its own merits and demerits. The denoising concept focuses on removing the various noises like Gaussian, salt and pepper, random value impulse and speckle noise from the corrupted image.

The main aim of the research work is associated with the pre-processing stage of an original image before it can be employed in many applications. The pre-processing step is executed by image denoising algorithms. To accomplish these image denoising algorithms, filtering techniques and wavelet based techniques are required and executed for relative analysis. Various noises like Gaussian, salt and pepper and speckle

noises are applied in the analysis. The filtering techniques are established to constitute the best while the images are corrupted with the salt and pepper noise. The wavelet techniques have shown better performance in denoising images that are corrupted with Gaussian and speckle noise.

The existing noise removal techniques introduce artifacts and cause blurring of the images. In order to obtain the most reliable estimate of the original image data, the different methodologies are proposed in this work. The Pixel Weight Based Wavelet transform is one of the methods to reconstruct the original image from noisy condition. The experimental results show that the presented Pixel Weight Based Wavelet Transform is provided better results when comparing to the existing filters in terms of quality related image parameters like Mean Square Error (MSE), Peak Signal to Noise Ratio (PSNR) and Mean Absolute Error (MAE), which are obtained from MATLAB 6.1.

The enhanced Non-Local Means (NLM) algorithm is implemented and compared to the existing algorithms. Various filtering techniques like mean filtering, median filtering and wiener filtering are presented in order to show the performance of the presented NLM algorithm. These existing filtering techniques remove the fine details like image structures and edges from the digital image. The enhanced NLM method can solve this trouble by preserving the fine details of an image in denoising.

An effective denoising technique is required for random value impulse noise removal in the digital images. In this research, a denoising algorithm is proposed for impulse noise removal in the benchmark images like Lena, house and pepper. The simulation result of proposed denoising algorithm for detection and removal of the impulse noise prove that the methodology has better performance than the existing methodology for impulse noise detection and removal.