

Implementation of Various Image Processing Techniques



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ABSTRACT: Digital image processing plays a vital role in the analysis and manipulation of sensed data. Digital image processing is always a concern field as it gives improved pictorial information and processing of image data for storage purpose, transmission and illustration for machine perception. Image processing is one of the most important areas of multimedia applications and these applications can be found nearly all over in the present world. Due to which, the number of people functioning with images is rapidly growing so that demand for image processing tools also grows. The image processing mostly deals with image acquisition, Image enhancement, image segmentation, feature extraction, image classification etc. In this paper we acquire an image by image acquisition method, enhance that image, filtering is used for denoising the image as well as for edge preservation of the digital image. This paper also gives the introduction about noises there types, image denoising and about the techniques used for noise removal. Basically, the thought behind the techniques is to fetch out detail that is hidden, or simply to bring to light certain features of interest in an image.

Keywords: Image Acquisition, Enhancement, Noises, Denoising.

1. INTRODUCTION

Digital image processing deal with manipulation and study of images by using different algorithm to improve pictorial information for better understanding and clarity. The image processing refers to processing of digital image, i.e. removing the noise and any type of irregularities there in an image using the digital computer. The noise or irregularity may move slowly into the image either during its configuration or during transformation etc. Image can be define as a two dimensional function $f(x, y)$ where x, y are plane co-ordinates and the amplitude of f at any pair of a coordinate (x, y) is called the intensity or gray level of the image at the point. If all of them (i.e. x, y and amplitude of f) are finite discrete quantities we call them a digital image. Digital images are formed by digital computers.

Digital image is composed of a finite numbers of elements each of which have a particular location and value. These elements are referred to picture elements, image elements, pels and pixels. Pixel is the term most broadly used to denote elements of a digital image [1].

The quality of an image is an important part which is degraded by introducing noise in it. . Noise can degrade the image at the time of capturing or transmission of the image. Digital image processing deal with manipulation and study of images by using different algorithm to improve pictorial information for better understanding and clarity. The image processing refers to processing of digital image .i.e. removing the noise and any type of irregularities there in an image using the digital computer. Noise is introduced in the image at the time of image acquisition or transmission. Different factors may be responsible for introduction of noise in the image. The number of pixels corrupted in the image will decide the quantification of the noise.

2. IMAGE PROCESSING TECHNIQUES:-

Various Image Processing techniques are described below:

Image Acquisition

The first step in the process is image acquisition means to acquire a digital image. Popular methods of produce a digital image are with Digital camera or Flat-bed Scanner. Generally, the image acquisition step involves preprocessing, such as scaling. The images are in RGB format [8].

Image enhancement

At sometimes images taken from different sources and conventional digital cameras lack in brightness and contrast because of the limitations of imaging sub systems and lighting conditions while capturing image. Images may have different types of noise, so this is among the simplest and most interesting areas of digital Image processing for this purpose.

Basically, the thought behind enhancement techniques is to fetch out detail that is hidden, or simply to bring to light certain features of interest in an image. A familiar example of enhancement is when we raise the contrast of an image because “it looks better.” It is essential to keep in mind that enhancement is a subjective area of image processing [3].

Image restoration

Image restoration termed as to removal or minimization of degradations in an image. It is an area that also deals with recovering the appearance of an image. However, unlike enhancement technique which is subjective, image restoration is objective, in the sense that restoration technique likely to be based on mathematical or probabilistic models of image degradation. Enhancement is based on human subjective regarding what constitutes a good enhancement result.

Image Segmentation

This procedure separates an image into its constituent parts or objects. In general, self-sufficient segmentation is one of the most difficult tasks in digital image processing. A rough segmentation procedure brings the process a long way toward successful clarification of imaging problems that involve objects to be identified individually. On the other hand, weak or irregular segmentation algorithms almost always guarantee ultimate failure. In general, the more correct the segmentation, the more likely recognition is to be successful.

Image compression

Compression is a very vital tool for obtaining image data, which is transfer on the network etc. They are a variety of techniques available for both lossy and lossless compressions. One of most accepted compression techniques, JPEG (Joint Photographic Experts Group) that uses Discrete Cosine Transformation (DCT) based compression technique. Presently wavelet based compression techniques are used for advance compression ratios with minimal loss of data.

Types of Noise

- **Gaussian noise :**

One of the most occurring noises in the image is Gaussian noise. Main sources of Gaussian noise arise during acquisition e.g. sensor noise caused by poor illumination and/or high temperature, and/or transmission e.g. electronic circuit noise. Gaussian

noise represents statistical noise having probability density function (PDF) equal to that of the normal distribution, which is also known as the Gaussian distribution. In other words, the values that the noise can take on are Gaussian-distributed.

- **Impulse Noise (Salt and Pepper Noise) :**

The term impulse noise is also used for salt and pepper noise [2]. Other terms used are spike noise, random noise or independent noise. Black and white dots appear in the image [5] as a result of this noise and hence salt and pepper noise. This noise arises in the image because of sharp and sudden changes of image signal.

- **Poisson Noise (Photon Noise)**

Poisson noise is the noise that can cause an image, when number of photons sensed by the sensor is not sufficient to provide detectable statistical information [11]. This noise has a root mean square value proportional to square root intensity of the image. Different pixels are suffered by independent noise values. At realistic grounds the photon noise and other sensor based noise corrupt the signal at different proportions [10].

- **Speckle Noise:**

This noise can be modeled by random value multiplications with pixel values of the image and can be expressed as:

$$J = I + n * I$$

Where, J is the speckle noise distribution image, I is the input image and n is the uniform noise image by mean 0 and variance v. This type of noise is originated because of coherent processing of back scattered signals from multiple distributed points.

3. RESULT AND DISCUSSION

There are various fundamental steps involved image processing such as image acquisition, image enhancement, image restoration, compression, segmentation and so on, but we perform some of it.

The first scenario was very simple it is the image acquisition showing in the below figure that is the stage of involving pre processing function and taking out the image or acquiring the image and converted it into grayscale for better processing, also represent the intensity of the image. Acquired images have low contrast Classifying the image by gray-level pixels may decrease and simplify some image processing operations. Remove noises that are present in the image such as Salt-and-pepper noise, Gaussian noise,

speckle and poisson to make it suitable for computer vision. Different types of filters such as 2D median filtering, wiener filter etc, are used to remove the noises as shown in the below figure. Image enhancement means bring out details that is obscured or basically to highlight certain features of interest in an image such as changing brightness and contrast so that the result is more suitable than original image. The process was image adjustment i.e. increasing the contrast and brightness of the image.

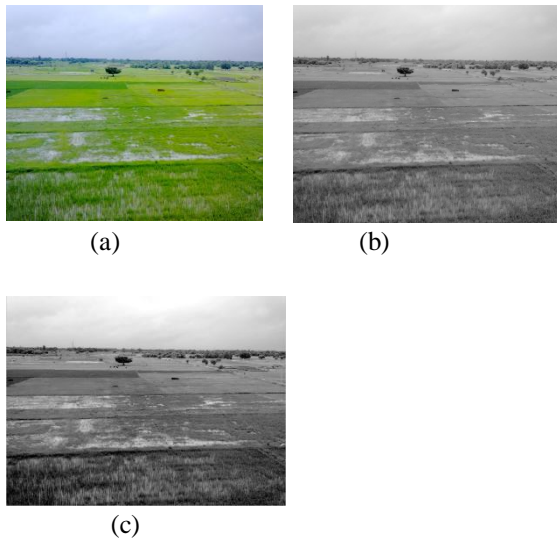


Figure 1:- The results of image pre- processing applied to the image: (a) original image, (b) grayscale image, (c) image contrast.

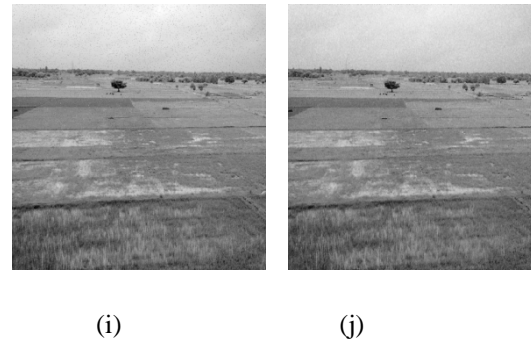
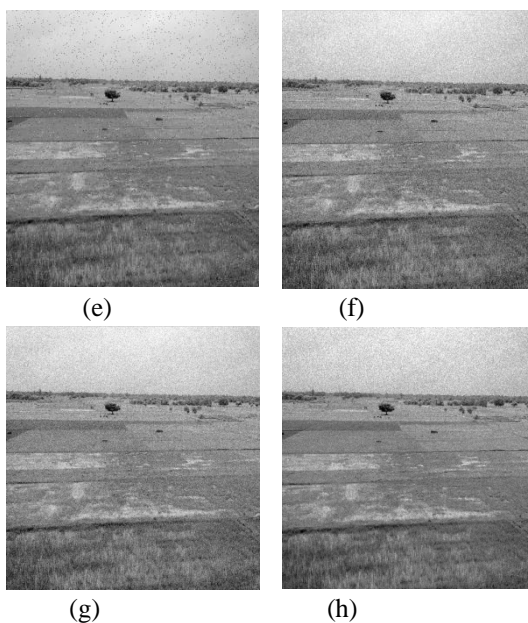


Figure 2: Figure showing different noises and de noised images (e) salt and pepper noise, (f) Gaussian noise, (g) poisson noise, (h) speckle noise, (i) 2 D median filter image, (j) wiener filter image.

4. CONCLUSION

There are various techniques available which create highly balanced and visually appealing results for a variety of images with special qualities of contrast and edge information and it will produce acceptable result and various image processing techniques are implemented in order to obtain more accurate result. Analysis of various images using digital image processing is more accurate as well as this method is efficient in terms of cost and time consuming compared to existing techniques, MATLAB software use for this analysis. The denoised images better determines the quality of the image and can be utilize for better results , here we can see that image after filtering have the high quality of vision.

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