

# A Comprehensive Analysis of Different Image Enhancement Techniques for Feature Extraction

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## Abstract

Digital Image enhancement plays very useful role in Feature extraction since enhancing quality of digital image makes extraction easy and accurate. The ultimate goal of Image enhancement is to make Images more noticeable for subsequent analysis or for image display. Examples include contrast and edge enhancement, noise filtering, sharpening, and magnifying. Image enhancement is useful in feature extraction, image analysis and an image display. This work describes some Image enhancement techniques used for feature extraction. In feature extraction, Noise filtering, contrast stretching and histogram modification are most important image enhancing techniques for further analysis.

## Keywords

Image Processing, Image enhancement, Contrast stretching, Noise Filtering, Histogram Modification

## I. Introduction

Image enhancement in Feature extraction is a challenging and important task since enhancing quality of digital image makes extraction easy and accurate. The goal of this manipulation can be divided into three categories i.e. image processing, image analysis, image understanding [1]. In the field of electronics and communication, sensing and computer aided manufacturing (CAM), remote sensing is a promising space of research in Digital Image Processing. Multimedia data like (graphics, audio) that is uncompressed needs considerable storage capacity and transmission bandwidth. The recent growth of data intensive multimedia-based web applications has not only maintained the requirement for many efficient ways to encode signals and images but has made compression of these signals central to storage and communication technology [2]-[5].

## II. Different Image Enhancement Techniques

Image enhancement, the goal is to accentuate certain image features for further analysis. Examples include contrast enhancement, noise filtering, sharpening, and histogram modification. Image enhancement is useful in feature extraction, image analysis and an image display. The enhancement process itself does not increase the inherent information content in the data. It simply emphasizes certain specified image characteristics. Enhancement algorithms are generally interactive and application-dependent [6]-[8].

Some of the image enhancement techniques used for feature extraction is:

- Contrast stretching
- Noise Filtering
- Histogram Modification

### A. Contrast Stretching

A Comprehensive Analysis of Different Image Enhancement Techniques for Feature Extraction Some images (over water bodies, dense forests, snow, clouds and under hazy conditions over heterogeneous regions) are homogeneous i.e., they do not have

much change in their levels. In terms of histogram representation, they are characterized as the periodical occurrence of extremely narrow peaks. The homogeneity may also be due to the incorrect illumination of the Image. Finally the images are not easily interpretable due to bad human perceptibility. This is because there is some narrow range of pixels in the image having provision for wider range of pixels. The contrast stretching methods are designed for frequently occurring situations. Different stretching methods have been applied to stretch the narrow range to the whole of the available range [9]. It is sometimes refer as normalization of image enhancement techniques that improve the quality of an image by stretching the range of different intensity values. It differs from the more sophisticated histogram equalization in that it can only apply a just scaling function to the image pixel values.

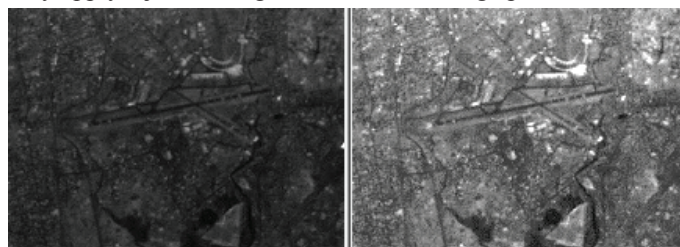


Fig. 1: Contrast Stretching Noise Filtering is Used to Filter

As a result the enhancement is less harsh. Most implementation accept grey level image as input and produce another gray level image as output. Before the stretching can be performed it is necessary to specify the upper and lower pixel value limits over which the image is to be normalized.

### B. Noise Filtering

Noise filtering is used to filter the unnecessary information from an image. It is also used to eliminate various types of noises from the images. Mostly this feature is interactive. Various filters like low pass, high pass, mean, median etc., are available. In the case of photographic noise can be both visible and audible due to the grain structure of the medium [10]-[12].

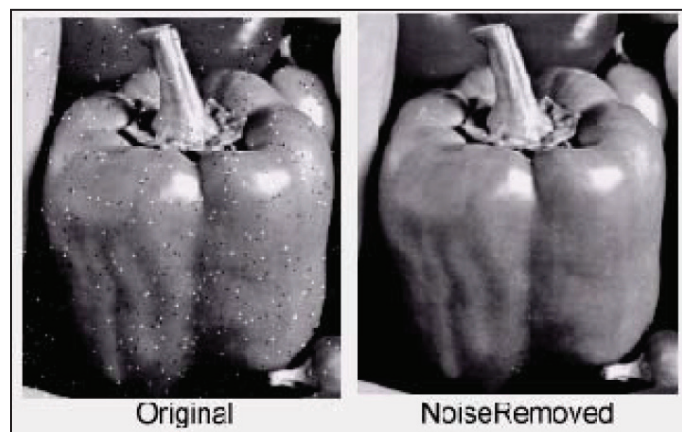


Fig. 2: Noise Removal

### C. Histogram Modification

Histogram has a lot of importance in image enhancement. It reflects the characteristics of image. By modifying the histogram, image characteristics can be modified easily. One such example is Histogram Equalization [13].

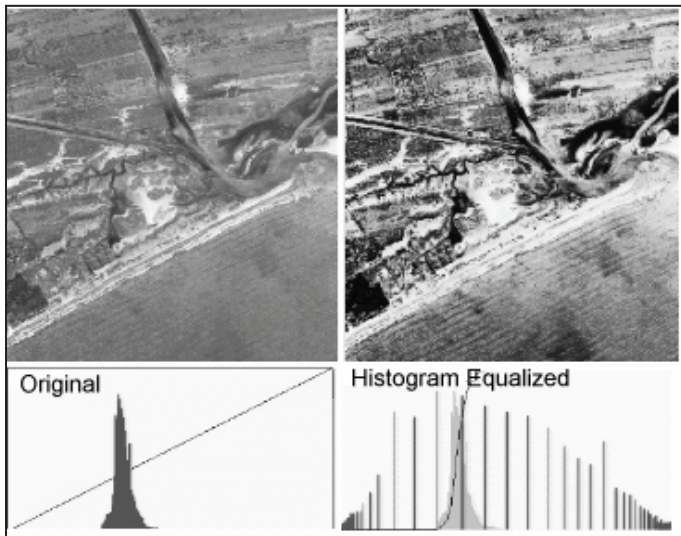


Fig. 3: Histogram Equalized Output

The result approximates a flat histogram. Therefore, contrast is increased at the peaks and lessened at the tails. Histogram equalization is a nonlinear operation that redistributes pixel values so that there is nearly the same number of pixels within a range [14].

### III. Conclusion

In feature extraction, it is necessary to remove unwanted portion as well as highlights important areas of Image. There are three basic image enhancement techniques used in feature extraction have been discussed here. By modifying the histogram, image characteristics can be modified in a great extent. Noise can be eliminated using some filters like median, high pass and low pass filtering.

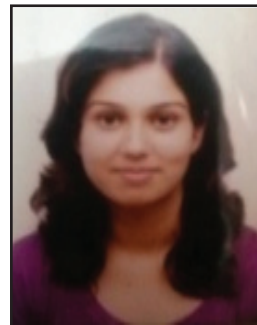
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