

# An Improved Method for Image Enhancement Using Fuzzy Approach

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**Abstract-** Image enhancement is a mean as the improvement of an image appearance by increasing dominance of some features or by decreasing ambiguity between different regions of the image. An image enhancement in spatial domain is a process which improves the quality of digital images. The images which are digitally stored are manipulating the pixel values with the help of software, so that the images can be visualized by the viewers. There is different type of techniques of image enhancement which are used for enhanced the images. The images can be enhanced by improving the quality regarding the pixel values. The pixel values are manipulated with the number of inputs and the gray level values. On the other hand Fuzzy image enhancement is based on gray level mapping into a fuzzy plane, using a membership function. This paper mainly focuses on spatial domain techniques for image enhancement using fuzzy approach. The image enhancement consist the histogram equalization, smoothing and fuzzy technique.

**Keyword-** Spatial Domain Techniques, point operations, Coarseness, Contrast, Fuzzy Image Enhancement, software.

## I. INTRODUCTION

Image enhancement processes consist of a collection of techniques that seek to improve the visual appearance of an image or to convert the image to a form better suited for analysis by a human or machine. The different type of images is suffered from the poor contrast with the noise so it is necessary to enhance the images. It is useful in many applications such as Satellite image processing, Medical, Military, Print media etc. Image enhancement techniques can be broadly divided into three categories:

- Spatial Domain Methods, which are operate directly on pixels.
- Frequency Domain Methods, which operate on the Fourier transform of an image.

The process of image enhancement identifies the feature extraction. The techniques in the image enhancement identifies the images so that the poor contrast of images can be removed and the quality of images are increased by apply

different techniques [1]. The different techniques of the image enhancement are histogram equalization, point processing, contrast stretching, bit plane slicing. Fig.1 shows the enhancement result.



Fig.1 (a) Original Image (b) Enhanced Image

## II. CONTRAST STRETCHING

It is one of the simplest piecewise linear function is a contrast stretching. Contrast stretching is a simple image enhancement technique that attempts to improve the contrast in an image by stretching the range of intensity values which contains to span a desired range of values [2]. For example, the full range of pixel values that the image type concerned allows.

## III. FUZZY TECHNIQUE

Fuzzy image processing is the collection of all approaches that understand, represent and process the images, there segments and features are fuzzy sets. Fuzzy set theory is thus useful in handling various uncertainties in computer vision and image processing applications [3]. The representation and processing depend on the selected fuzzy technique and on the problem to be solved. It has three main stages that are image fuzzification, modification of membership function values, and defuzzification. Fuzzy image enhancement is based on gray level mapping into membership function with fuzzy intensification factors. The aim is to generate an image of

higher contrast than the original image by giving a larger weight to the gray levels levels that are closer to the mean gray level of the image that is farther from the mean. Fig. 2 shows the general structure of fuzzy image enhancement.

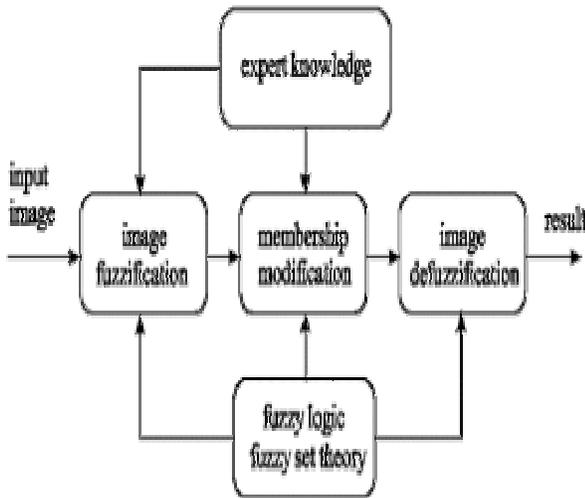


Fig.2 The general structure of fuzzy image Enhancement

The fuzzification and defuzzification steps are due to the fact that we do not possess fuzzy hardware. The fuzzy image processing is the collection of different areas of fuzzy set theory, fuzzy logic and fuzzy measure theory. The most important theoretical components of fuzzy image processing are fuzzy geometry, measure of fuzziness and image information, fuzzy inference system, fuzzy clustering and fuzzy mathematical morphology. Fuzzy image enhancement is based on gray level mapping into a fuzzy plane, using a membership function [4]. The aim is to generate an image of better quality as compare to other techniques. Fuzzy image enhancement technique is based on fuzzy set theory to improve the contrast of an image. Fuzzy image enhancement process identifies the all fuzzy sets and the variables which are used with the membership functions. The fuzzy intensification factors are used to modify the membership values which are applied on the images so that the gray scale images can be enhanced [5]. These enhanced images identify the quality.

#### IV. METRICS FOR IMAGE ENHANCEMENT

Image quality is a characteristic of an image that measures the perceived image degradation. To evaluate the performance of image techniques in terms of retaining important details, edges and quality of image, several quantitative measures has been developed. These metrics are correlated strongly with the human perception. The performance metrics used in present work are:

- 4.1 Coarseness
- 4.2 Contrast

#### V. PROPOSED METHOD

This method uses the intensification operator to reduce the fuzziness of the image which results in an increase of image contrast. Steps for algorithm:

1. Read the input image.

2. If the image is RGB then converts the image into gray scale.
3. Identify image fuzzification.
4. Apply contrast enhancement technique.
5. Identify image defuzzification.

#### VI. RESULTS and DISCUSSION

##### A. Results

In this section the proposed work is tested under MATLAB 7.0.1. The proposed method compared with traditional algorithms. The comparison of methods has been proved that this method is better than the other image enhancement techniques and the results are obtained by the proposed method is given in fig.3.

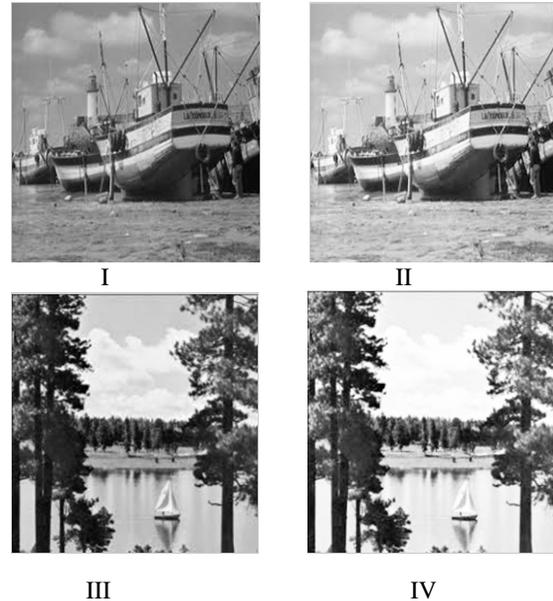


Fig.3 (I) Input Image 1  
 (II) Enhanced Image 1 using Fuzzy Technique  
 (III) Input Image 2  
 (IV) Enhanced Image 2 using Fuzzy Technique

##### B. Discussion

The fuzzy technique in image enhancement is the way through which the images can be easily enhanced with the fuzzy functions without any complications. It is a method which improves the quality of images and there is no requirement of the complicated calculations. The effectiveness of this efficient fuzzy image enhancement technique can be tested with gray scale images. Fuzzy filter is also better for filter the images than the others. This method is a better approach which provides an efficient result and improves the contrast of images which are to be enhanced.

#### VII. CONCLUSION

In the enhancement a fuzzy approach is a proposed method. This method is a better than others, which improves the quality of images and reduce the complexity of the method effectively. This is also efficient for noise reduction. The result shows that this method is better with the fuzzy technique

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