A Survey on Various Types of Image Processing Technique

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Abstract— **In recent trend, image processing domain plays a vital part of real time applications in modern world. Such image processing technique helps to carry process on the digitized image to provide better solutions. Various techniques resembles to be tool for image processing, most of these are involves in enhancing the clarity of image, noise free images and compressing the original image to compressed data in order to reduce the storage space .This survey paper presents the brief overview and applications for various types of techniques included in image processing are discussed.**

Keywords— **Image processing, enhancement, restoration, compression, segmentation, recognizing, smoothing**

Introduction

Image processing is any form of signal processing in which the input will be given as an image, such as a photograph or video frame; the output of image processing will be either an image or a set of characteristics or parameters that are related to given image. Image processing involves processing or altering an existing image in a desired manner and also helps in obtaining the image in the readable format. Most techniques of image-processing involve treating the image as 2 -dimensional signal and applying standard signal-processing techniques to it. The MatLab and MathCAD are the two environments which suits for image processing. In this, Mat Lab's based on matrix-oriented language and well suited for manipulating images. The result produces very clarity image and economical way of expressing image processing operations.

Benefits of image processing:
1. Visualization helps in identification of the objects that are not visible.
2. Image processing is faster and cost effective.
3. Noise free.
4. Image sharpening and restoration - To create a better image.
5. Images can be retrieval easily from the database
IMAGE
An image may be defined a two-dimensional function f(x.y), where x and y are the coordinates for a point in a given plane. And f is the intensity or gray orelse color in the position of x and y.

I. TRANSFORMATIONS IN IMAGE PROCESSING

- Image-to-Image transformation
- Image to information transformation
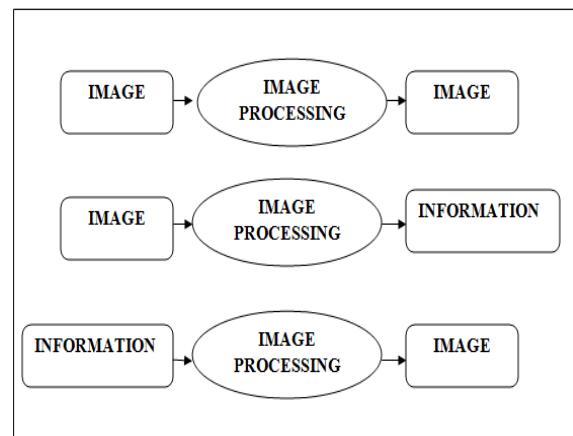- Information-to image transformation

Fig.1 Transformation in Image Processing

A. IMAGE TO IMAGE TRANSFORMATIONS
- Enhancement
- Restoration
- Geometry

Fig.2 Image Transformations

B. IMAGE TO INFORMATION TRANSFORMATIONS

- Image statistics(histograms) histogram helps in analyzing and processing the image
- Image compression
- Image analysis includes image segmentation, extracting the features in image , pattern recognition scheme)
- Computer-aided design.

C. INFORMATION-TO IMAGE TRANSFORMATIONS

- Decompression from the image which is already compressed.
- Reconstruction of small parts of images to forms new original image.
- Animations Computer graphics, and virtual reality.

II. DIFFERENT TYPES OF IMAGE PROCESSING TECHNIQUES

1. Image enhancement
2. Image restoration
3. Image compression
4. Image segmentation
5. Image recognizing
6. Image smoothing

A. IMAGE ENHANCEMENT

Image enhancement is the method for providing the results of image to be clearer, by improving from original images so that the results are more suitable for display or further image analysis. It helps in removing noise, sharpening the image, or brightens an image, making it easy to identify key features.The process of enhancing the quality of images from the original image by removing the noise, provide the enhanced image by sharpening the original image and increasing contrast in image.

2 categories in Image enhancement
1. Spatial domain method (modification or aggregation of pixels that forms the image).
2. Frequency domain method (Enhancing the image in a linear manner, positioning invariant operator.
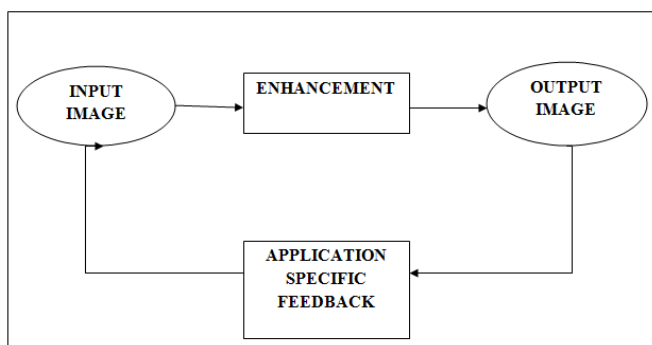The 2-Dimensional convolution is performed in frequency domain with Discrete Fourier Transform

Fig. 3 Image Enhancing Method

Fig. 4 Enhanced Example Image

B. IMAGE RESTORATION

Restoring the clear image from the degraded or corrupted image is provided by the technique called image restoration. Corrupted/Blur images are due to noisy, blur images or camera misfocus. Blurring occurs due to formation of bandwidth reduction of an ideal image caused by imperfect image formation process. Thus the images will be restored into original quality by reducing the physical degradation.

Degradation model
Distortion is due the imperfection in the imaging system that occurs mainly involved in stored images. This problem leads to severe due to random noise involved in the imaging system. Degradation operation works on input image f(x, y) to lessen a degraded image g(x, y).
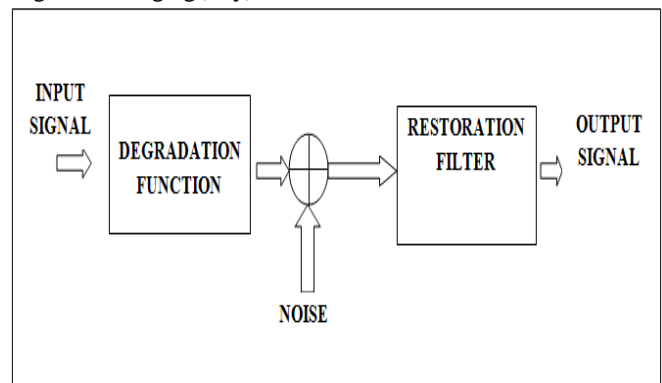

Fig. 5 Image Restoration Method

Categories in image restoration technique
Image restoration technique is classified into two types depending upon the degradation of the image. If information about degradation is known previously, then deterministic method of image restoration can be used. If it is not known then the stochastic method of image restoration has been introduced.
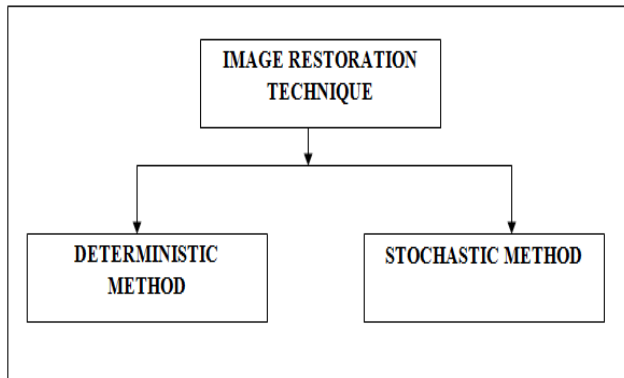
Fig. 6 Categories in Image Restoration Techniques.

C. IMAGE COMPRESSION

Image compression is minimizing the size of bytes of a image file without degrading the quality of the image inorder to obtain the image in more clarity. The reduction in file size allows more images to be stored in a given amount of disk or memory space. And also reduces the time during sending of images via networks or downloading from web pages.

Fig. 7 Compressed image from 2.1mb into 306kb

Two types of compression
1. *Lossless*
2. *Lossy*

Lossless Compression:

In image compression, there is no loss in information regarding image, during compression of a text file or program can be compressed without any errors and the application includes images stored in medical repository, text file compression, and technical drawings.

- No loss of information
- Extracting original data from compressed image.
- Lower compression ratio

Lossy Compression:

Compression techniques that involves the loss of information included in used at low bit rates, and used in application streaming media and internet telephony.

- Loss of information.
- Perceptual loss of information reduced (controlled)
- Higher compression ratio

D. IMAGE SEGMENTATION

Segmenting or partitioning the original image with some defined pixels into number of regions for the purpose of image analysis, depicts the features hidden in the normal image and object recognition, undefined boundary estimation, textures and motions.
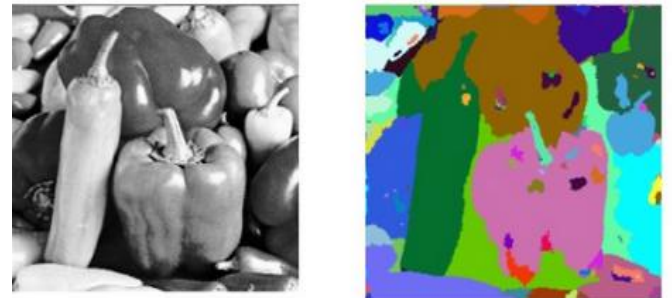It is based on region and edges of image, segmentation is carried out.
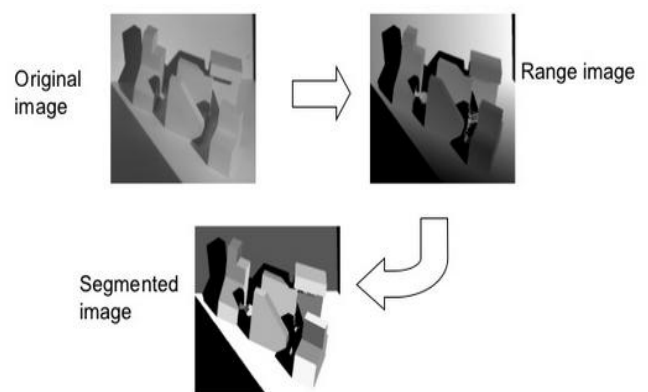

Fig. 8 Examples for Image Segmentation

Fig. 9 Segmentation Process

Different methods of image segmentation
1. Threshold
2. Color based
3. Transform method
4. Texture method
5. Clustering

Applications include identifying objects in object oriented measurement such as size and shape.

Identifying objects in dynamic scene in object oriented video compression (mpeg4)

E.IMAGE RECOGINITION

Image recognition technique involves in recognizing/ identifying and detecting features such as objects in video or images. During the recognition mechanism, images from the database are compared with the current image, if the match is found then further execution of process will be carried out in real time application. It helps in authentication and authorization process.
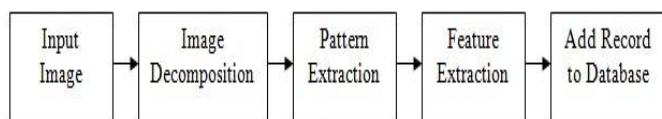
Procedure for Facial Feature's Extraction.
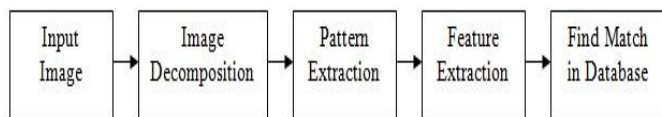
Procedure for Face Recognition.

Fig. 10 Image Recognition Process

Method in image recognition
1. Pattern recognition-recognize any patterns of pixels in image.
2. Face recognition-focuses on detecting face in image
3. Optical character recognition- detects text and read it.

Fig. 11 Phone Login with Pattern And Face Recognition

Applications include tool booth monitoring, biometric recognition, security surveillance, and industrial automation.

F. IMAGE SMOOTHING

With this smoothing technique, noise can be reduced from the image. Image may contain noisy data such as dots, blur, speckles, stains, using this smoothing technique that acts as filter to remove the noisy data. It works Based on the low pass filter, which helps in decreasing the great difference between pixel values by averaging nearby pixel value. Considering single value calculated for an image such as median and average value.

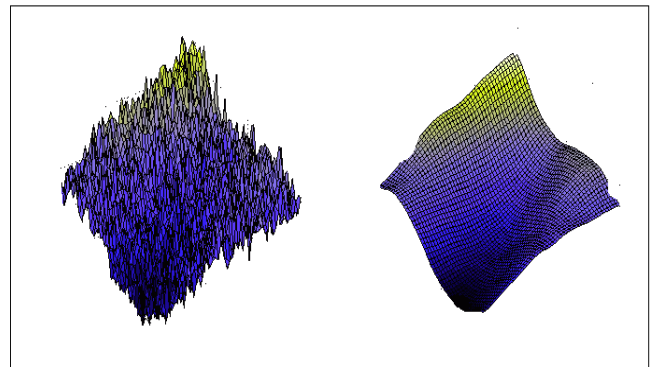Smoothing operations
1. Linear filter
2. Non-Linear filter

Fig. 12 Examples for Smoothing Technique

III.CONCLUSION

This paper presents a review on various types of techniques of image processing such as image restoration, image enhancement, image segmentation, image recognition and image restoration has been discussed briefly and also provides clear view of applications used in image processing.

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