

# Review Paper on Image Processing Techniques

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**Abstract**— Image processing is among rapidly growing technologies today, with its applications in various aspects of a business. Image Processing forms core research area within electronics engineering and computer science disciplines too. Image Processing is a technique to enhance raw images received from satellites, space probes, aircrafts, military reconnaissance flights or pictures taken in normal day-to-day life from normal cameras. The field is becoming powerful and popular because of technically powerful personal computers, large memories of available devices as well as graphic softwares and tools available with that devices and gadgets. Image acquisition, pre-processing, segmentation, representation, recognition and interpretation are the different basic steps through which image processing is carried out. [3][4].

**Key words:** Image Processing Techniques, Analog Image Processing

## I. INTRODUCTION

Image processing is processing of images using mathematical operations by using any form of signal processing on any form of an image, such as a photograph or video frame [1]. They are used in various applications such as

- Printing Industry
- Document processing
- Textiles
- Medical imaging
- Research centers
- Graphic arts
- Military applications
- Material science
- Forensic studies

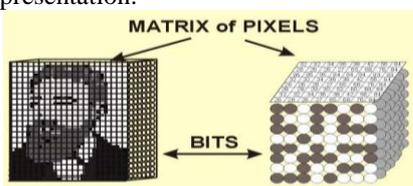
There are two types of image processing:

### A. Analog Image Processing:

Analog image processing is the alteration of image appearance by electrically varying the signal. The amplitude of the signal is adjusted in such a way that brightness and contrasts in the images are adjusted.

### B. Digital Image Processing:

In digital image processing initially the image will be converted into digital form using a scanner or digitizer and then it is processed. e.g. The image data is not only analog in nature but it has many levels of complexity. The data can be measured in a linear fashion as it has only one dimension of variance i.e. temperature (cold to hot).Applying numerical values to temperature, the image itself tends to numeric representation.



Various techniques have been developed in Digital Image Processing during last few years. The figure below shows different steps in image processing and the manner in which the steps are carried out. All such steps are carried out on the input image or the video frame.[2]

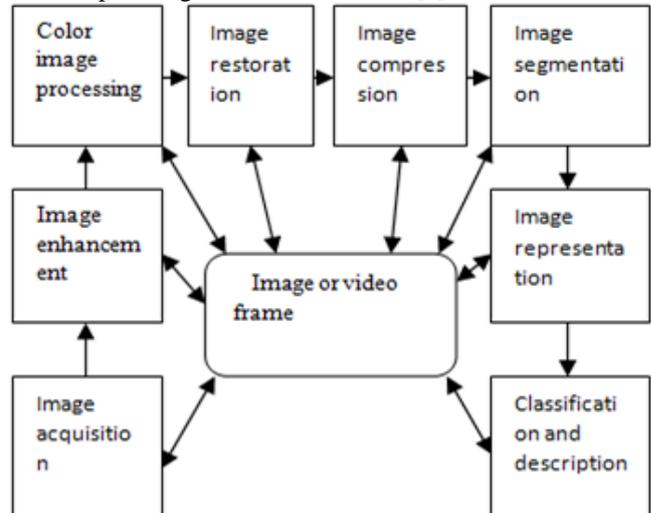


Fig. 1: Various Techniques

## II. IMAGE ACQUISITION



Fig. 2: Image Acquisition

It is the process of acquiring the digital image using image sensor or camera. This process includes image sensing, sampling, quantization that is conversion of image into digital form if the input image is in analog form.

### A. Pre-Processing:

It improves images ways that increase the chance of success of other processes like

#### 1) Image Enhancement:

Image enhancement is the process of adjusting digital images so that the results are more suitable for display or further image analysis. For example, you can remove noise, sharpen, or brighten an image, making it easier to identify key features.[4]

#### 2) Restoration:

- a) Image restoration is different from image enhancement in that the latter is designed to emphasize features of the image that make the image more pleasing to the observer, but not

necessarily to produce realistic data from a scientific point of view. Image enhancement techniques (like contrast stretching or de-blurring by a nearest neighbor procedure) provided by imaging packages use no a priori model of the process that created the image.

### 3) Morphological Analysis:

Morphological image processing is a collection of non-linear operations related to the shape or morphology of features in an image. morphological operations rely only on the relative ordering of pixel values, not on their numerical values, and therefore are especially suited to the processing of binary images. Morphological operations can also be applied to greyscale images such that their light transfer functions are unknown and therefore their absolute pixel values are of no or minor interest .e. g. noise removal, image processing



Fig. 3: Morphological Image Processing

### B. Segmentation:

It is the process of breaking down an image into its constituent parts. Output is usually a raw pixel data. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain characteristics.[2][6].

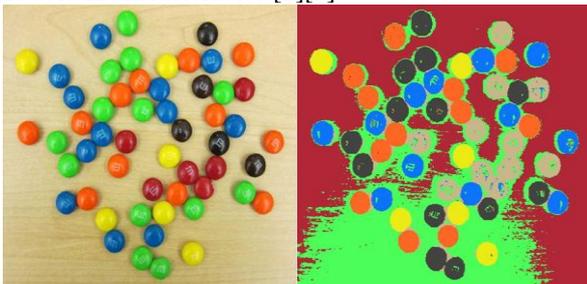


Fig. 4: Segmentation

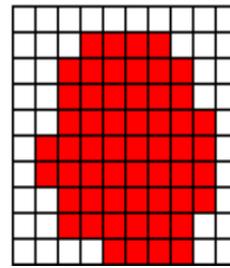
### C. Representation:

Representation is the process of transferring raw data into a form that is suitable for further computer processing. There are two types of representation techniques.

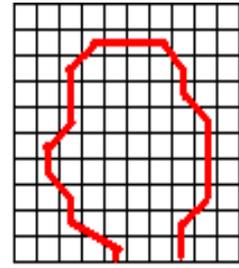
- Boundary representation
- Region representation

Boundary representation is appropriate when the focus is on internal shape characteristics e.g. corner, rounded.

Region representation is appropriate when the focus is on internal properties.[5] e. g. texture, skeletal shape.



(a)



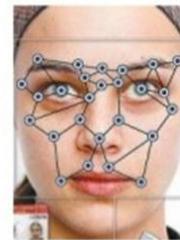
(b)

### D. Recognition and Interpretation:

Recognition is the process of assigning a label to an object based on the information provided by descriptor.

Interpretation is the process of assigning meaning to an ensemble of recognized object.[2]

identifying a person from their face



reading bar coded tags



### E. Image Compression:

Compression is a very essential tool for archiving image data, image data transfer on the network etc. They are various techniques available for lossy and lossless compressions. One of most popular compression techniques JPEG (Joint Photographic Experts Group) uses Discrete Cosine Transformation (DCT) based compression technique. Currently wavelet based compression techniques are used for higher compression ratios with minimal loss of data.[3]

## III. CONCLUSION

In this paper, many image processing techniques like image segmentation, compression, edge detection etc are discussed. Choosing image processing method depends upon its application for which it is going to be used .Each technique has its own advantage and disadvantage but it converts the input image into that form which is suitable for further processing.

This paper will be helpful to beginners for understanding the basic concepts of image processing.

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