

# Image Processing: Review, Types, Fundamental Steps

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## ABSTRACT

Two main application areas are provided by digital image processing techniques: improving pictorial information for human interpretation and processing image data for storage, transmission, and representation for autonomous machine perception. In this paper, the significance of image processing and its applications to the field of computer vision are thoroughly investigated. An image is referred to as an array or matrix of square pixels (picture elements) organised in rows and columns.[1] The process of translating an image into digital form and applying various operations to it in order to improve the image and extract useful information from it is known as image processing. Edges characterize boundaries and edge detection is one of the most difficult tasks in image processing hence it is a problem of fundamental importance in image processing. Most image processing methods treat an image as a two-dimensional signal and implementing standard signal-processing techniques to it.[2] The goal of this operation can be divided into 3 categories. Firstly image processing in which input is an image and output is also an image; secondly image analysis in which input is an image and output are the dimensions or measurements. Finally image understanding in which input is an image and output is the standard description of an image. Some of the important applications of image processing in the field of science and technology include computer vision, remote sensing, feature extraction, face detection, forecasting, optical character recognition, fingerprint detection, optical sorting, argument reality, microscope imaging, lane departure warning system, Non-photorealistic representation, medical image processing, and morphological imaging.

## INTRODUCTION

The technology of Image processing encompasses by highly utilizing the computer

proficiency to analyze the digital images i.e. the images generated using a computer. Computer plays an important role in every parts of today life and society in modern civilization. With increasing technology, man becomes involved with computer as the leader of this technological age and the technological revolution has taken place all over the world based on it. It has opened a new age for humankind to enter into a new world, commonly known as the technological world.[4]

The Digitized image is analyzed and manipulated to improve the image's eminence. Separation of images at present is a most domineering phase in image processing which is popularly called as 'Image Segmentation'. The process of Image segmentation involves separating the required objects from an existing image. Image processing generally refers to digital image processing.[9] It is also refers to optical and analog image processing. In this paper we, have presented a systematic study on image processing and its importance to the field of computer vision. The acquisition of images is called as imaging. Some of the important applications of image processing in computer vision include, remote sensing, feature extraction, face detection, finger-print detection, optical sorting, argument reality, microscope imaging, lane departure warning system, Non-photorealistic representation, medical image processing, and morphological imaging. An image contains sub-images often referred as regions or regions-of-interest. Images regularly contain groups of objects each of which is the basis for a region.

Most generally, image processing requires the images to be available in digitized form. For digitization process, the input image is sampled on a separate lattice and every sample or pixel is quantized by a fixed number of bits. The processes the digitized image.

To show a digital image, first it is converted into an analog signal that is scanned onto a output. Image processing is very closely related to computer vision and computer graphics. Within

computer graphics, images are physically prepared from environments, physical models of objects and lighting, as an alternative of being acquired through imaging devices from natural scenes, as in most animations. Computer vision is frequently measured good quality image processing by which computer or software means to interpret the objective contents of an image, a sequence of images.[2] For example videos or three Dimension full-body magnetic resonance scans.

#### Digital image

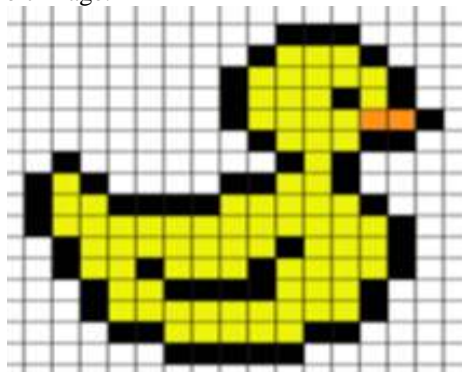
It is the type of image which is made of pixels. A digital image is a representation of a real image as a set of numbers that can be stored and handled by a digital computer.

Types of digital images

- Binary Images
- Grayscale Images
- Color Images

#### Binary image

- Images with only two values (0 and 1)
- Simple to process and analyze.
- Binary images takes only 1 binary digit to represent each pixel so it is also known as 1-bit image.



Binary Image

#### Grayscale

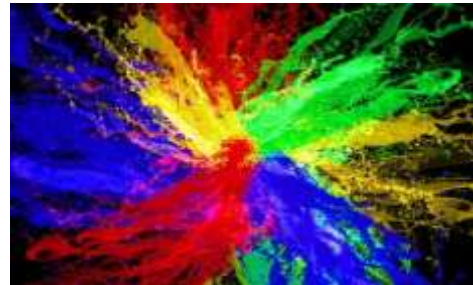
- Grayscale images are referred to as monochrome (one color) image.
- They contain grey-level information, no color information.



Grayscale Image

#### Color image

Color images are also known as the RGB image because color images are represented as the red, green, and blue.



Color Image

#### Fundamental steps in digital image processing

The digital image processing steps can be divided into two broad areas as the methods whose input and output are images, and methods whose inputs may be images, but whose outputs are attributes extracted from those images. Image acquisition is the first process in the digital image processing. Note that acquisition could be as simple as being given an image that is already in digital form. Generally, the image acquisition stage involves preprocessing, such as scaling.

The next step is image enhancement, which is one among the simplest and most appealing areas of digital image processing.[5] Basically, the idea behind enhancement techniques is to bring out detail that is obscured, or simply to highlight certain features of interest in an image. An overview of image processing and big data analysis techniques Image processing involves applying computing techniques to processing images. Images are taken as input and the properties of the images are changed to enhance the image or features are extracted to make them less complex to study. The following section gives an overview of different image processing techniques.[8]

**Image Acquisition :** Image is captured by a sensor & digitized if output of sensor is not already in digital form .

**Image Enhancement:** Image enhancement is different from the process of restoration of images. Image Enhancement's principal aim is to give an excellent image with high quality.

**Color Image Processing :** Use the color of image to extract features of interest in an image .

**Image Restoration:** Image restoration is to clear noise and recover the resolution loss. Otherwise, we say that image restoration recovers the original image from a given degraded image. Software used

image restoration Adobe Photoshop, CS3 Extended, GIMP, Paint and NET.

**Compression** : To reduce storage required to save an image or bandwidth required to transmit.

**Image Segmentation** : Partition an image into its constituent parts or objects.

**Representation & Description** : Boundary Region.

**Image recognition:** Image recognition is nothing but recognizes the image object. For example: Consider the collection of image as an input and the output is to recognize the object. Some of the open source software is used to recognize the image.

**Visualization:** Visualization is to communicate a message through images, diagrams, or animation. One of the visualization techniques is visual imagery. There are two methods of image visualization. The first method is abstract visualization and the second technique is model-based scientific visualization. In abstract visualization, 2D or 3D techniques are used. Whereas, another method using digitally constructed images (real object) is directly obtained from source of data like medical images.

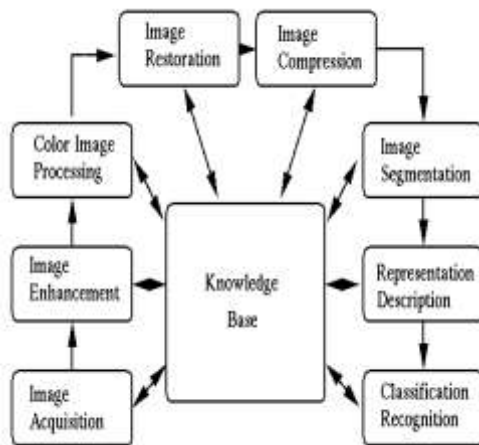
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