Study on Digital Image Processing System

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Abstract:- Image processing is one of the massively growing fields in today's generation.It is nothing but a technique used to produce an image that is of better quality by taking some raw image as an input.The input that are received from several resources can be improved using image processing.This paper provides a summary about the methods used in the image processing technique.The main concern is not only to describe about the processing of images by some digital means but also the techniques applied with it to produce an image that is of better quality.

Keywords:- Image Processing, Applications, Image Acquisition, Pattern Recognition.

I. INTRODUCTION

Image processing is spreading in several fields.[1] It is a technique which is generally used to improve raw images which are received from several resources and to convert an image into digital form to implement some actions on it, in order to generate an enhanced image or to abstract valuable facts from it. It is a kind of signal dispensation where input is given as an image and output is generated as an image or features related with image.

The methods used for processing of images are analog image processing and digital image processing. Analog Image Processing is done on analog signals in which two signals are processed.Here,images are altered by changing the signal.[1] It is mainly used for hard copies.

II. DIGITAL IMAGE PROCESSING

This technique focuses on processing of digital images using a digital system or computer.The input is given as an0020image that is of digital form and when the system processes image by effective algorithms, output is finally generated as an image.It performs tasks which involves image pre-processing, segmentation of image, feature extraction, classification of images.[2]

Digital signal processing is all about processing of analog signal or real-time signals which individuals communicate, for example, speech. The digital signal processing system involves transformations of digital to analog signals and vice-versa using converters.
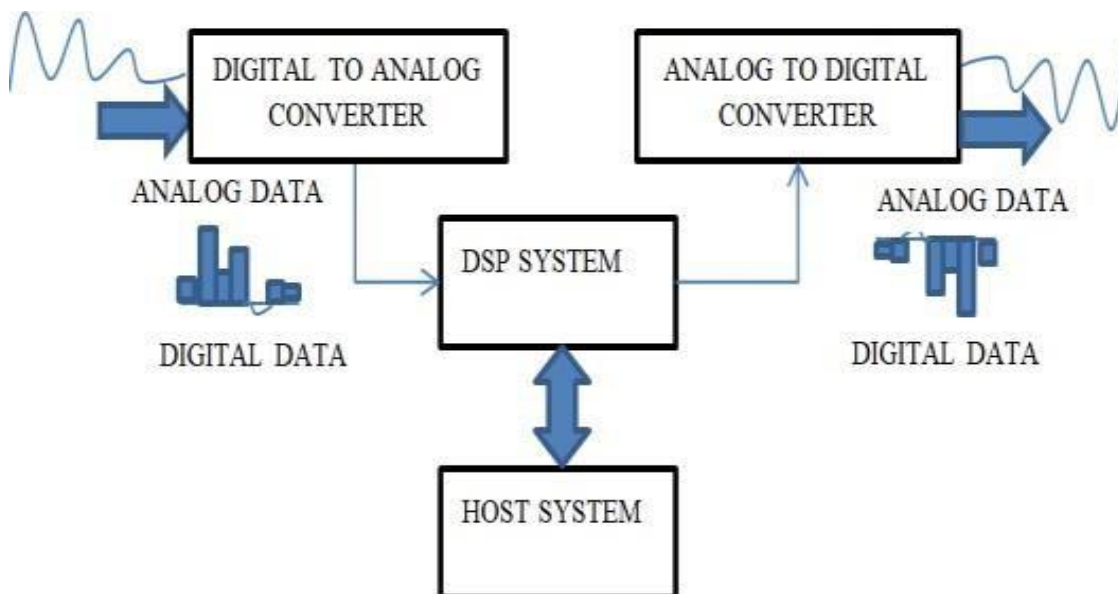

Fig 1:- Analog Image Processing Versus Digital Image Processing

III. GENERAL STEPS INVOLVED IN PROCESSING OF DIGITAL IMAGES

A. Image Acquisition
This is the first and foremost technique used in the major steps of digital image processing.The input of this phase is an image which is not possible without an image.The image should be in digital form and also involves preprocessing steps.[2]

B. Image Enhancement
This is one of the major components in digital image processing.It is a technique used to get the details that are concealed, or generally to focus some specific features of an like modifying the brightness.[4]

C. Image Restoration:
This is also one of the significant component which restores images that have been distorted.This technique is used to enhance the appearance of the image.This differs from the enhancement technique in the way that it is of objective process where the other technique is of subjective process.[3]
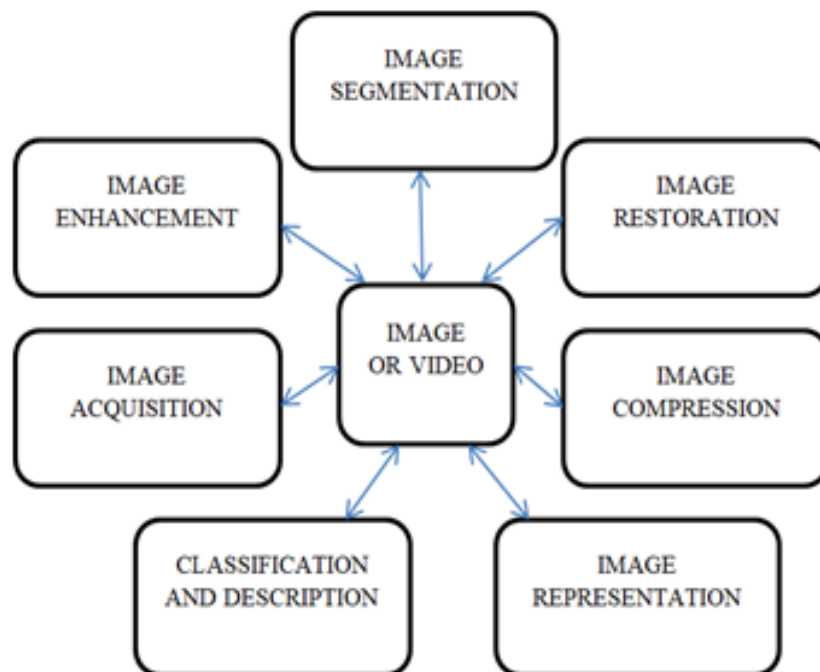

Fig 2:- Key Stages in digital image processing

D. Color Image Processing
This can be distributed into two major regions:full-color and pseudo-color processing.It is attaining its significance because of its increased use of digital images. This can take in color modeling and processing of images in digital domain.[9]

E. Wavelets and Multiresolution Processing
Wavelet converts small waves (wavelets) of limited interval as simple functions.It is a base for demonstrating images in several degrees of resolution.[4]

F. Compression
This technique deals with the process of dropping the size of an image in bytes of a graphics file without distorting the picture quality to an intolerable stage. It also employs methods to minimize the storage necessary to store an image or the bandwidth to transfer it by using internet that is required to compress the data.[10]

G. Morphological Processing
This is a collection of non-linear processes that are connected to the shape or morphology of features in an image.It also deals with tools for extracting the components of image that are beneficial in the representation and depiction of shape.

H. Segmentation
The partitioning of image into several regions is called segmentation.Initially,an image is divided into subparts depending upon the requirement of the user which is then divided in to pixels.After the image gets converted into the pixel, it becomes so accurate.The result is a set of divisions that covers the total image or set of contours23 that is removed from the image. Generally,autonomous segmentation is one of the most challenging tasks in digital image processing.[6]

I. Representation and Description

This technique describes the region depending on the selected representation.The representation phase in this technique represents the regions based either on their external characteristics(boundary) or internal characteristics(regions) or both. The description phase represents length,orientation,the number of concavities and those statistical measures of region.

J. Object recognition

It is a task of detecting and recognizing objects in an image or video sequence. Recognition deals with allocating a label to its object depending on the descriptions.[5]

K. Knowledge Base

This phase monitors the procedure of each processing module and controls the communication between modules. This also can be somewhat difficult, such as an interconnected list of all major possible faults in a materials inspection problem or an image database holding high-resolution satellite images of a region in connection with change-detection applications.

IV. APPLICATIONS OF DIGITAL IMAGE PROCESSING

A. Image sharpening and restoration

This processes pictures that have been captured using modern camera to convert it into an enhanced image or to control images to accomplish expected outcome. This involves Zooming, blurring , conversion of gray scale to color images, identifying edges and vice versa , retrieval and recognition of images.[8].

B. Medical field

In medical field,digital image processing is adapted in fields like:
➢ Gamma-Ray imaging which includes nuclear medicine and astronomical observations ,
➢ X-ray Imaging which is not only known for its use in medical diagnostics only,but also vastly used in other areas like industry and astronomy,
➢ Imaging of UltraViolet Band which involves lithography,microscopy and other such industrial and astronomical observations and
➢ Imaging in radio band where it is used mostly in medicine and astronomy.[7]

C. Transmission and encoding

This field focuses on both transmission and encoding.Various formats have been raised for high or low bandwidth to encode photos and stream it over the internet.[8]

D. Machine/Robot vision

It is still a biggest challenge to improve robot vision, detect any hurdles or to see things.Many efforts have been taken by this field of digital image processing and another technique of computer vision is presented to work on it.

E. Hurdle detection

This field works by detecting the various types of elements in the given picture following calculation of the distances between those hurdles and the robot.

F. Line follower robot

The robot which works by following a certain line are definitely called as line follower robots which aids the robot to move or walk in a certain path and perform tasks.This is one of the ultimate achievement that has been done through object recognition technique.[8]

G. Color processing

This involves colored images processing and different color spaces used.Some instances are RGB color model, HSV and YCbCr. This also includes reviewing transmission, storage, and encoding of the color image.[9]

H. Pattern recognition

This application includes reviewing of image processing which involves detection of the objects within an image and various other fields that involves machine learning which aids in training the system for the modification of pattern.This is used in computer aided diagnosis and other fields including recognition of handwriting and image recognition.

I. Video processing

Movement of images or pictures constitute a video.The video quality totally depends on the number of frames/pictures in the video (per minute) and each frame quality.This application includes noise reduction , detailed enhancement , motion detection ,e.t.c.[8]

V. CONCLUSION

We have concluded that the technique of processing images digitally is to manipulate the digital image through some relevant algorithms.The above technique,not only includes several procedures to process images using digital computer but also includes several applications.The conversion of analog signals to digital signals is also possible using DSP system which is also represented using a diagram.

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