

A Study of Image Processing Techniques and its Application in the Field of Medical

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Abstract— image processing is a technique to change over a image into digital frame and play out a few tasks on it, so as to get an upgraded image or to extricate some helpful data from it. It is a sort of signal dispensation in which input is image, similar to video casing or photo and yield might be image or qualities related with that image. Generally Image Processing framework incorporates regarding images as two dimensional signs while applying effectively set signal handling techniques to them. The impact and effect of computerized images on current society is huge, and image preparing is presently a basic segment in science and innovation. The fast advancement in electronic medical image reproduction, and the related improvements in examination techniques and PC supported determination, has moved therapeutic imaging into a standout amongst the most essential sub-fields in logical imaging.

Keywords-Image Processing; medical; image; information.

I. INTRODUCTION

Image Processing is a method to upgrade crude image got from cameras/sensors set on satellites, space tests and air ships or image taken in typical day-today life for different applications.

Different procedures have been created in Image Processing amid the last four to five decades. The majority of the strategies are created for improving image got from unmanned rockets, space tests and military observation flights. image Processing frameworks are getting to be mainstream because of simple accessibility of amazing personnel computers, substantial size memory gadgets, illustrations programming and so forth [1].

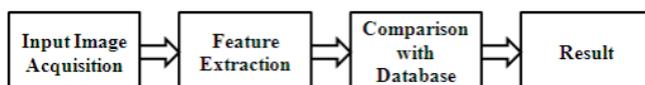


Figure 1: Basic Block Diagram of Image Processing System

Image processing generally have the following three steps:

- Importing the image via image acquisition tools;
- Analysing and manipulating the image;

Output in which result can be altered image or report that is based on image analysis.

There are two types of methods used for image processing namely, analogue and digital image processing.

Analog image processing

Analog signal used in Analog image processing. It incorporates preparing on two dimensional analog signals. In this sort of preparing, the image is controlled by electrical methods by fluctuating the electrical signal. The normal precedent incorporate is the TV image.

Digital image processing has control over analog image processing with the passage of time due its wider range of applications.

Digital image processing

The digital image processing works with developing a digital system that do operations on an digital image.

The various Image Processing techniques are:

- Image representation
- Image preprocessing
- Image enhancement
- Image restoration
- Image analysis
- Image reconstruction
- Image data compression

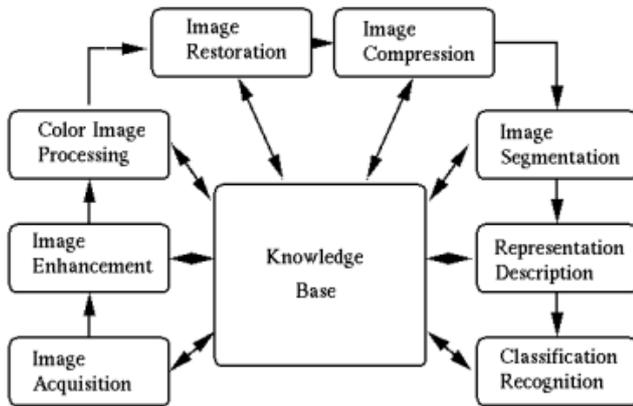


Figure 2: Steps of Image processing

The word digital image processing for the most part alludes to handling of a two-dimensional image by a digital computer [3,4]. In a more extensive setting, it suggests advanced preparing of any two-dimensional information. A computerized image is a variety of genuine numbers spoken to by a limited number of bits.

II. IMAGE REPRESENTATION

Images are wherever on PCs. Some are self-evident, as photographs on website pages and symbols on catches, yet others are increasingly unpretentious: a textual style is extremely an accumulation of images of characters, and a fax machines is extremely a PC that is great at filtering and printing.

Researchers have continually gone separate ways on the genuine wellspring of warmth Digital Images are made out of a variety of pixels. For instance, a size 6000 x 4800 digital image is made out of 6000 lines by 4800 sections of image components. Each image component (pixel) area is filed by the line number and the segment number. Every pixel is additionally made out of three 8 or more bit numbers for shading images and just a single at least 8 bit whole number for highly contrasting images. The three shading whole numbers esteems speak to the measure of red, green and blue (RGB) light that is distinguished by a two dimensional (2D) exhibit of charged coupled gadgets (CCD), reciprocal metal-oxide semiconductors (CMOS), or other unmistakable light sensors It is basic math to change over shading images to a grayscale image. The change from grayscale to shading isn't as straight forward and still an open finished research point [2].

III. IMAGE PREPROCESSING

Pre-preparing of images ordinarily includes evacuating low-frequency background noise, normalizing the force of the individual particles images, expelling or upgrading information images preceding computational handling [5].

Eapen, et al. [6] have proposed a strategy to improve the edges and decrease the noise level in the information images before managing division process. In the pre-handling module they included image resizing, histogram leveling, ROI determination (Image editing) and middle sifting. In this strategy, a worldwide histogram adjustment was utilized which was an ideal method for differentiation and surface improvement of restorative images.

In [7] Sivappriya, et al. proposed restorative image edge discovery. Therapeutic images pre-preparing is an imperative advance in medicinal image division and 3D recreation. Salt and pepper noise were progressively common in medicinal images the ordinary strategies were not compelling in sifting salt and pepper noise. Morphological disintegration is the best channel for evacuating salt and pepper noise. The trial results were increasingly successful for medicinal image de-noising.

Puri, et al. introduced a pre-preparing procedure to gather pixels into "super pixels". They might want to work with "super pixels" which were neighborhood, rational, and which save the majority of the structure fundamental for division at the size of intrigue. They connected the standardized slice algorithm to deliver the super pixel map. Both form and surface prompts were utilized [8] in the strategy.

IV. IMAGE ENHANCEMENT

image enhancement strategies have been generally utilized in numerous utilizations of image handling where the abstract nature of images is essential for human interpretation. Complexity is a vital factor in any abstract assessment of image quality. Complexity is made by the distinction in luminance reflected from two adjacent surfaces. At the end of the day, differentiate is the distinction in visual properties that makes an item discernable from different articles and the foundation. In visual perception, differentiate is controlled by the distinction in the shading and splendor of the article with different items. Our visual framework is more delicate to differentiate than outright luminance; in this way, we can see the world likewise paying little respect to the impressive changes in enlightenment conditions. Numerous algorithms for achieving contrast upgrade have been produced and connected to issues in image processing [9].

The enhancement methods can broadly be divided in to the following two categories:

1. Spatial Domain Methods
2. Frequency Domain Methods

In spatial domain techniques [10], we straightforwardly manage the image pixels. The pixel values are controlled to accomplish wanted improvement. In frequency domain methods, the image is first moved in to requery domain. It implies that, the Fourier Transform of the image is figured first.

All the upgrade activities are performed on the Fourier transform of the image and after that the Inverse Fourier transform is performed to get the resultant image. These upgrade activities are performed so as to adjust the image splendor, differentiate or the dispersion of the grey levels. As an outcome the pixel value of the yield image will be adjusted by the change work connected on the input values.

V. IMAGE RESTORATION

Image Restoration is the activity of taking a corrupt/noisy image and evaluating the perfect, unique image. Defilement may come in numerous structures, for example, movement obscure, noise and camera mis-focus.[11] Image reclamation is performed by turning around the procedure that obscured the image and such is performed by imaging a point source and utilize the point source image, which is known as the Point Spread Function (PSF) to reestablish the image data lost to the obscuring procedure [11].

Image enhancement enhances a image independently. image restoration expels distortion from image so as to return to the "original" target process.

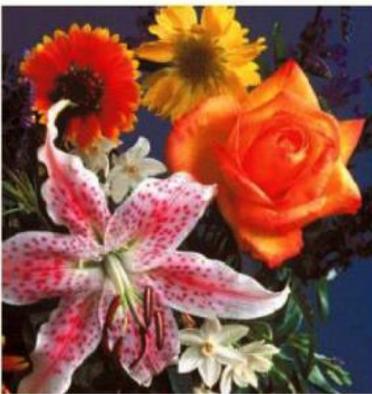


Figure 3: Original Image



Figure 4: Blurred Image

VI. IMAGE ANALYSIS

image analysis strategies remove data from a image by utilizing automatic or semiautomatic methods named: scene analysis, image description, image understanding, pattern recognition, computer/machine vision and so on.

An ongoing and vital expansion to microscopy and digital imaging has been the advancement of magnifying instruments that are utilized to change over recolored tissue on glass slides into entire slide computerized images taking into consideration increasingly productive survey and investigation of histopathology and immune histochemistry with PCs. Most procedures required to get impartial information from tissue tests can be computerized when coordinated with entire slide advanced imaging, making image examination a proficient and powerful apparatus to quantitate versican collection in tissue areas.

VII. IMAGE RECONSTRUCTION

image reconstruction systems are utilized to make 2-D and 3-D images from sets of 1-D projections. These reconstruction procedures frame the reason for basic imaging modalities, for example, CT, MRI, and PET, and they are valuable in medicine, science, earth science, antiquarianism, materials science, and nondestructive testing.

The numerical establishment for these reconstruction strategies are the Radon transform, the inverse Radon transform, and the projection slice theorem. Computational systems incorporate filtered back projection and an assortment of iterative techniques. A few projection geometries are regularly utilized, including parallel beam, fan beam, and cone beam. The Shepp-Logan phantom image is frequently used to assess distinctive reconstruction algorithms.

A compelling way to deal with performing image reconstruction incorporates utilizing techniques in a specialized processing condition for information examination, perception, and algorithm advancement.

VIII. IMAGE DATA COMPRESSION

image compression is an utilization of information compression that encodes the first image with couple of bits. The target of image compression is to diminish the repetition of the image and to store or transmit information in a proficient frame. Figure demonstrates the square outline of the general image stockpiling framework. The principle objective of such framework is to lessen the capacity amount however much as could reasonably be expected, and the decoded image showed in the screen can be like the first image as much as anyone might imagine.

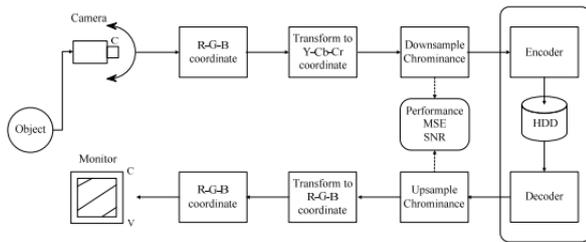


Figure 5: General Image Storage System

IX. APPLICATION OF IMAGE PROCESSING

The field of digital image processing has encountered ceaseless and noteworthy extension as of late. The value of this innovation is obvious in a wide range of orders covering drug through remote sensing. The advances and wide accessibility of image processing equipment has additionally upgraded the helpfulness of image processing [12]. Many applications of image processing is as follows:

- medical applications
- restorations and enhancements
- digital cinema
- image transmission and coding
- color processing
- remote sensing
- robot vision
- hybrid techniques
- facsimile
- pattern recognition
- registration techniques
- multidimensional image processing
- image processing architectures and workstations
- video processing
- programmable DSPs for video coding
- high-resolution display
- high-quality color representation
- super-high-definition image processing
- impact of standardization on image processing.

X. APPLICATION IN MEDICAL FIELD

The common applications of DIP in the field of medical is

- Gamma ray imaging
- PET scan
- X Ray Imaging
- Medical CT
- UV imaging

Biomedical imaging focuses on the catch of images for both diagnostic and therapeutic purposes. Previews of in vivo physiology and physiological procedures can be accumulated

through cutting edge sensors and computer innovation. Biomedical imaging advances use either x-rays (CT scans), sound (ultrasound), magnetism (MRI), radioactive pharmaceuticals (nuclear medicine: SPECT, PET) or light (endoscopy, OCT) to survey the present state of an organ or tissue and can screen a patient after some time over the long haul for demonstrative and treatment assessment.

Digital imaging offered ascend to the CT scanner and enables doctors to observe ongoing x-rays on a screen—a strategy known as x-rays fluoroscopy—to help direct intrusive techniques, for example, angiograms and biopsies. Never again restricted to straightforward anatomical imaging, ebb and flow explore is concentrating on what can be gathered through practical imaging. Biomedical specialists are utilizing CT and MRI to measure the blood abundance of tissue; particularly critical after a heart assault or suspected heart assault. Scientists are additionally utilizing functional MRI (fMRI) to quantify diverse sorts of brain action following strokes and horrendous head injuries.

PET scans—which utilize a radioactive tracer to quantify metabolic changes, blood stream and oxygen use—have likewise enhanced with mechanical progressions. PET scans empower specialists to look at, for instance, mind movement amid times of sorrow dependent on the synthetic action in the brain.

Optical molecular imaging innovations speak to another territory of research that can be utilized to image human cells and particles without the requirement for a biopsy or cell culture. Utilizing complexity or imaging specialists that join to explicit atoms, disease processes, for example, cancer, can be spotted before they render their belongings at the dimension of gross pathology [14].

Optical coherence tomography (OCT) is a more up to date type of CT being utilized in research that builds images from light that is transmitted and dissipated through the body.

The intensity of ultrasound is being utilized related to microbubbles. The microbubbles can be infused specifically into a particular area and after that burst by means of ultrasound to radiate restricted complexity specialists for imaging, chemotherapy for cancer treatment, air to help break up clusters, and qualities or medications which can all the more effectively enter cell films that are debilitated by ultrasound.

New imaging strategies bring new methods for peering into the human body, decreasing the requirement for increasingly intrusive demonstrative and treatment techniques.

XI. CONCLUSION

Digital Image Processing (DIP) is the procedure of digital images utilizing different computer algorithms. This digital image processing has been utilized in number of territories, for example, pattern recognition, remote sensing, image sharpening, shading and video handling and medical. This paper shows a short outline and writing audit of digital image processing techniques for example, image pre-processing, image compression, image enhancement and image reconstruction [5]. Medical images are at the center of restorative science and a gigantic wellspring of data that should be used. Image processing procedures with respect to biomedical images are commonly either utilized for the recovery of images (Content Based Image Retrieval) or for investigation and modification of images [13].

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