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Image Processing and its Applications

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Abstract: - Computer digital image technology is a significant branch of computer application. Digital image processing aims to improve the quality of images and subsequently to perform feature extraction and classification.

It is effectively used in computer vision, Medical imaging, Meteorology, Astronomy, Remote Sensing, and another related field. In an image processing operation, the input given is an image and its output is an enhanced high-quality image as per the techniques used. Image processing is usually referred to as digital image processing but optical and analog image processing also are possible.

Keywords: - Digital Image Processing, Application of Image Processing, Image Enhancement

- **Introduction**

Image processing is a method to perform some operation on an image, to get an enhanced image, or to extract some useful information from it. It is a type of signal processing in which the input is an image output may be an image or characteristics /features. Nowadays image processing is among the rapidly growing technology. It forms the core research area within engineering and computer science. Digital Image Processing deals with

developing a digital system that operates on the digital image. An image is nothing more than a two-dimensional signal. It is defined by the mathematical function(x, y) where x and y are two coordinates horizontally and vertically. The value of

f(x, y) at any point is used as the pixel value at that point of an image

- **Aim**

Image Processing is to transform an image into digital form and perform certain functions on it to obtain specific models or to extract useful information from the image

- **Objective**

Our aim of research paper is to achieve the methodology of techniques to get the perfect output after taking an input as an image. It allows much wider range of algorithm to be applied to the input data and can avoid a problem such as the built-up of noise and

manipulation. Vision is the most advanced of our senses, so it is not surprising that images play the single most important role in human understanding.

- **Applications**

1. Image Enhancement

Image Enhancement is a procedure of improving the quality and information content of original data before processing.

The tools used for image enhancement include many different kinds of software such as filters, image editors, and other tools for changing various properties for an entire image or parts of an image such as image sharpening, image blurring, contrast, etc. They are divided into two types

- Spatial Domain Methods
- Frequency Domain Methods

- **Advantages**

- Image Enhancement is widely used in computer graphics.
- The method is useful in images with backgrounds and foregrounds that are bright or both dark.
- It is used to adjust the image intensity at easily

(a) (b)

Fig.1- This figure shows the example of image enhancement technique image (a) is uncleared and (b) is after using technique

2. Image Restoration

Image restoration is an operation of taking a corrupt/noisy image and estimating the clean, original idea. An alteration may come in forms such as motion blur, noise, and camera misfocus. Image restoration techniques are based on probabilistic analysis of an image or mathematical models. A model in which there is no error in the prediction of one variable from the others. Probabilistic model that include one or more probability distributions in the model to overcome for these additional factors. To enhance the quality of an image various filters are used.

The quality of images could degrade for several reasons, especially photos from the era when storage was not so commonplace.

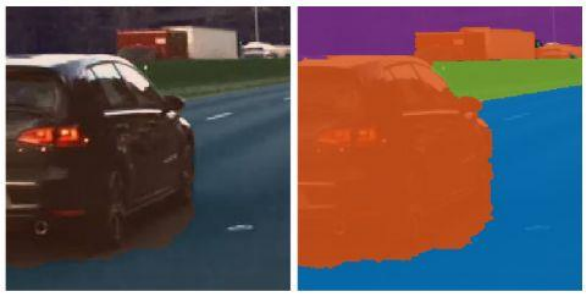
For example, Images scanned from hard copies taken with old instant cameras often acquire scratches on them.

(a) (b)

Fig.2- The image (a) is the degraded image and image (b) is restored image after applying technique

3. Image Segmentation

Image Segmentation is the process of partitioning an image into multiple segments or regions. Each segment represents a different object in the image, and image segmentation is often used as a pre-processing step for object detection. Image segmentation involves converting an image into a collection of regions of the pixel that are represented by a mask or a labelled image. By dividing an image into segments, you can process only the important segment of the image instead of processing the entire image.



(a) (b)

Fig.3-Using segmentation to connect each pixel of (a) image with class label (b) (such as car, road, sky, pedestrian, or bike.

4. Image Compression

Image compression is a process applied to a graphics file to minimize its size in bytes without degrading image quality below an acceptable threshold. By reducing the file size, more images can be stored in a given amount of disk or memory space. The image also requires less bandwidth when being transmitted over the internet or downloaded from a webpage, reducing network congestion and speeding up content delivery. There are two types of Image Compression Lossy and Lossless. Traditional approaches use lossy compression algorithms, which work by reducing the quality of images slightly to achieve a smaller file size.JPEG file format, For excuses, the discrete cosine transforms for image compression.

(a) (b) (c)

Fig.4- This figure a, b, c shows the comparison between looseless and loosely compression

5.GIS(Geographical Information System)

GIS is mainly used for capturing, storing, checking, and displaying data related to position on the earth's surface. It performs spatial analysis for running GIS low-end desktop computers and laptops to high-end servers needed. The main types of data used in GIS are:

- Spatial Data
- Tabular Data

Spatial data consist of geographical information and is combined with real-world.

Tabular data specifies spatial features, it provides detail about the characteristics of that features. For example, Tabular data includes an address book with addresses or sales compiled by zip codes. Both these data are combined to form a map

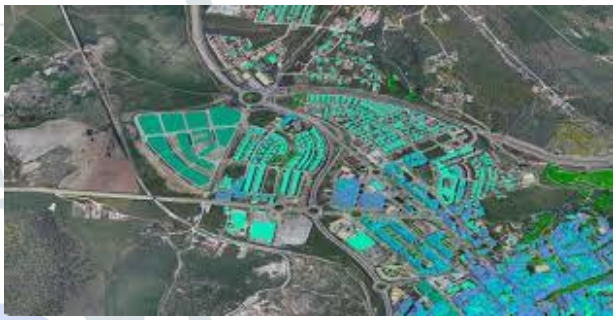


Fig 5- The image is an satellite image of map using GIS technique

Advantages of Image processing

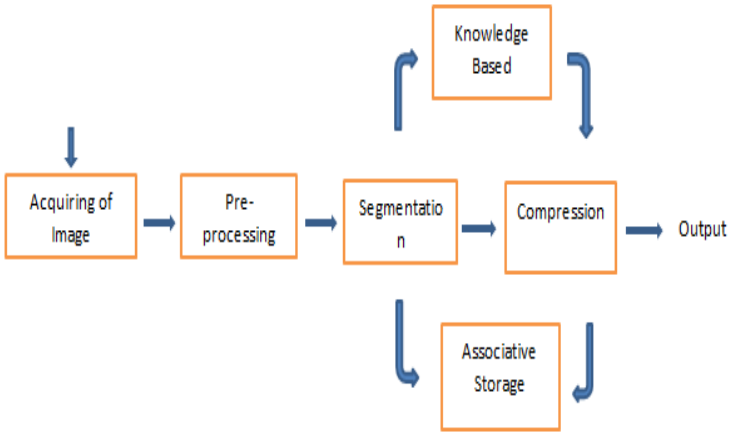
- Digital images can be processed by digital computers.
- Images can be given more sharpness and a better visual appearance.
- Minor errors can be rectified.
- Images size can be increased or decreased.

- **Research Methodology**

Digital image processing deals with the manipulation of digital images through a digital computer. It is a subfield of signals and systems but focuses mainly on images. The input of that system is a digital image and the system process

that image using efficient algorithms and gives an image as an output. The most common example is Adobe Photoshop.

It is one of the widely used applications for processing digital images. We have noted that several authors have used this type of algorithm for manipulation of digital images.



Working of Image Processing

- **Future Scope**

Image Processing is s futuristic and relatively unexplored field, with wide areas of practical, applications, including, scientific and medical applications. This field has a lot of potential for development and implementation in new areas like space exploration, processing signal images, computer vision, etc. A lot of tasks are automated using Image recognization like processing cheques in Bank etc.

- **Conclusion**

We have observed that various image processing techniques as mention in methodology were used by earlier authors. Some of them are the basics of image processing, image enhancement, image restoration, image compression, and image segmentation (Geographical Information Sytsem). This Study will help researchers to work in the fields of image processing and broadly the field of computer vision. Using image processing techniques, we can sharpen the image's contrast to make a graphic display more useful for display, reduce the amount of memory required for storing an image in formation. Due to such techniques, image processing is applied in the recognisation of images.

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