International Journal of Latest Trends in Engineering and Technology
Special Issue SACAIM 2017, pp. 025-028
e-ISSN:2278-621X

STUDY ON IMAGE PROCESSING AND SEGMENTATION TECHNIQUES

K.Geethalakshmi[1]

Abstract- Digital Image Processing is always an interesting field as it gives improved pictorial information for human interpretation & processing of image data for storage, transmission and representation for machine perception. Image processing is a technique to enhance raw images received from cameras/sensors placed on satellites, space probes and aircrafts or pictures taken in normal day-to-ay life for various applications. This field of image processing significantly improved in recent times and extended to various fields of science & technology. The Image Processing mainly deals with image acquisition, Image Enhancement, Image Segmentation, Feature Extraction, and Image Classification. A number of Image Processing techniques, in addition to enhancement techniques can be applied to improve the data usefulness. Techniques include convolution edge detection, mathematics, filters, trend removal & image analysis. The various image enhancements and image processing techniques will be discussed in this paper.
Keywords-Image Processing, Image Enhancement, Image Segmentation, Feature Extraction, Image Classifiaction Introduction

1. INTRODUCTION

Digital image processing has a wide range of applications such as image and data storage for transmission in business applications, medical imaging, remote sensing, etc., Images obtained by satellites are very much useful in tracking of earth resources, geographical mapping, and prediction of agricultural lands, population, weather forecasting, flood and fire control. Image processing consists of four main phases: image formation, visualization, Analysis and Management. Image formation includes image acquisition and digitization of an image. Image Enhancement techniques can be used in pre and post processing in all phases. This process engages a group of techniques that are used to improve the visual appearance of an image, or to convert the image to a form which is better suited for human or machine interpretation. There is no general theory of image enhancement because there is no general standard for the image quality. Therefore, different classes of techniques were developed over the past decades .Some of them, which are most frequently used in practice: Gray level Histogram modifications, Smoothing of noisy images, Sharpening. A process of rendering **image** pixel into 2D or 3D graphical representation is called image visualization. This process includes illumination, shading, surface construction and display techniques. Image Analysis is the most important step in image processing. This phase involves feature extraction, segmentation and classification.[1] Image management sums up all techniques that provide the efficient storage, communication, transmission, archiving, and access (retrieval) of image data.

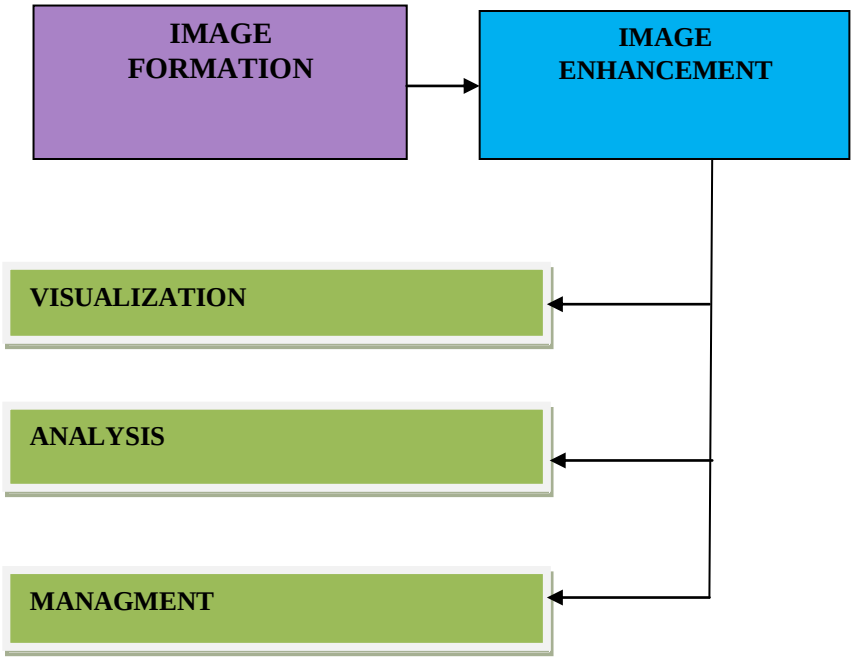

Fig: 1 Areas of image processing

[1] Assistant Professor, Dept. of BCA, PSGR Krishnammal College for Women, Coimbatore, TamilNadu,India.

2. IMAGE ANALYSIS

Image analysis phase involves feature extraction, segmentation and classification{2]. The main aim of feature extraction is to produce the most relevant information from the original image and represent the particular information in a 2D/3Dspace. Segmentation partitions an image into distinct regions containing each pixels with similar attributes. The segmentation is based on measurements taken from the image and might be *grey level*, *colour*, *texture*, *depth* or *motion*. Image classification refers to the task of extracting information classes from a raster image.

3. IMAGE PREPROCESSING

In Image Preprocessing, image data contain errors related to geometry and brightness values of the pixels. These errors are corrected using suitable mathematical models which are either definite or statistical models. Image enhancement is the modification of image by changing the pixel brightness values to improve its visual impact. Image enhancement involves a group of techniques that are used to improve the visual manifestation of an image, or to convert the image to a form which is better suited for human or machine investigation.

4. IMAGE ENHANCEMENT

Image Enhancement alters the visual impact of an image that improves the information content. a. Contrast enhancement b. Intensity, hue, and saturation transformations c. Density slicing d. Edge enhancement e. Making digital mosaics f. Producing synthetic stereo images. Contrast Stretching, Gray level Histogram modifications are the general techniques of image enhancement.

Contrast stretching is a simple image enhancement technique that attempts to improve the contrast in an image by `stretching' the range of intensity values it contains to span a desired range of values, *e.g.* the the full range of pixel values that the image type concerned allows. It differs from the more sophisticated histogram equalization in that it can only apply a *linear* scaling function to the image pixel values.

Histogram reflects the characteristics of an image. Image characteristics can be modified by image Histogram. Histogram equalization is a nonlinear draw out that redistributes pixel values so that there is approximately the same number of pixels with each value within a series. The result approximates a flat histogram. Therefore, contrast is increased at the peaks and lessened at the tails.

5. VISUALISATION

Visualization is the process of transforming digital data into images which represents the information about the data. The data retrieved usually from analysis results of images or from simulations.

6. IMAGE ANALYSIS - FEATURE EXTRACTION

Feature extraction is a method to retrieve the important data from the raw data. Feature extraction is finding the set of parameter that define the shape of a character specifically and individually. In feature extraction, each character is denoted by a feature vector, which becomes its identity[7]. The major goal of feature extraction is to extract a set of features, which maximizes the recognition rate with the least amount of elements and to generate similar feature set for variety of instance of the same symbol desired object from the scene that measurements can be made on it subsequently. Quantitative measurements of object features allow classification and description of the image.

7. IMAGE ANALYSIS - IMAGE SEGMENTATION AND METHODS

Segmentation is one of the key issue in Image Processing. In computer vision, Image Segmentation is the process of partitioning a digital image into multiple segments(sets of pixels, also known as super-pixels).The main aim of segmentation is to simplify and change the representation of an image into something that is more meaningful and easier to analyse[8]. Image segmentation is typically used to locate objects and boundaries(lines, curves, etc) in images. Image segmentation is the process of denoting a label to each pixel in an image such that pixels with same label share certain characteristics. A popular method used for image segmentation is thresholding. After the formation of binary image all object pixels have one gray level and all background pixels have another- generally the object pixels are 'black' and the background is 'white'. The best threshold is the one that selects all the object pixels and maps them to 'black'. Segmentation of images involves the separation between objects and the background and different regions. One method for such separation is known as Watershed Segmentation.

7.1 Thresholding

Thresholding is the simplest form of segmentation. This is basically a pixel operation in which each extracted structure is specified as a range of intensities. This is a simplest non-contextual segmentation technique. With a single threshold, it transforms a greyscale or colour image into a binary image considered as a binary region map. The binary map consists of two possible disjoint regions, one of them containing pixels with input data value smaller than a threshold usually labelled with zero(0) and another equal or greater than the threshold labelled with non-zero(1) respectively. The segmentation depends on image property being thresholded and on how the threshold is chosen.

7.2 Clustering

Clustering is a type of unsupervised learning method. It deals with determine a structure in a collection of unlabeled data. Clustering is the process of organizing objects into groups whose members are similar in some way and dissimilar objects belonging to some other group[3]. K-means is one of the simplest unsupervised learning algorithms that follows a simple and easy way to classify a given data set through a certain number of clusters (K).[6]

7.3 Histogram

Histogram-based image segmentation is one most often used segmentation techniques. Histogram is used to select the gray levels for grouping pixels into regions. The two entities of an image are background and objects. Background and objects are two entities of an image. The background is generally one gray level and occupies most of the image. In Histogram, gray level is represented in large peak. The object or subject of the image is another gray level, it is represented in smaller peak in the histogram.

7.4 Edge Detection

Edge detection is the most common approach for detecting meaningful discontinuities in gray level An edge is the boundary between two regions with relatively distinct gray-level properties.

7.5 Region Growing

Region growing method is a simple region based image segmentation method. Pixel based image segmentation method involves the selection of initial seed point and determine whether the neighboring pixel should be added to the region. This procedure is iterated for next neighboring pixel in the same manner as general data clustering algorithms.[5]

7.6 Watershed Method.

The Watershed Transform is one type of digital image segmentation that uses the concept of region growing method based on an image gradient. In this method images are visualized in three dimensional. ie two spatial coordinates versus gray scale. [4]

7.7 Compression based method.

There are two broad categories of image compression techniques. The first category consists of methods, which completely preserve the original data, when compressed image is converted back into its uncompressed form, it is identical with the original image. This kind of technique is called “lossless” compression. . The second category of compression technique consists of methods that only approximate the original data. This category of compression is called “lossy” compression.

8. IMAGE ANALYSIS - IMAGE CLASSIFICATION

Image Classification is the labeling of a pixel or a group of pixels based on its grey value. Classification is one of the most often used methods of information extraction. In classification, usually multiple features are used for a set of pixels i.e. , many images of a particular object are needed. In remote sensing area , this procedure assumes that imagery of a specific geographic area is collected in multiple regions of the electromagnetic spectrum and is in good registration. Most of the information extraction techniques rely on analysis of the spectral reflectance properties of such imagery and employ special algorithms designed to perform various types of 'spectral analysis'. Supervised or Unsupervised are the two methods in multispectral classification.

9. CONCLUSION

This paper has information about a few fundamental definitions such as analog image processing and digital image processing. This paper has also examined various techniques of Image Processing. The latest advancements in computer technology have opened the use of image processing analysis to fields that for their complexity would be impossible to be included in the past. High computational speed, high video resolution, more efficient computer language to process the data, and more efficient and reliable computer vision algorithms are some of the factors that let fields such as medical diagnosis, industrial quality control, robotic vision, astronomy, and intelligent vehicle / highway system to be included as a part of the large list of applications that use computer vision analysis to achieve their goals. An overview of all related image processing methods such as Preprocessing, Segmentation , Feature extraction and Classification techniques have been presented in this paper.

10. REFERENCES

[1] J. Priya, Dr. R. Manicka Chezian, “A Survey on Image Mining Techniques for Image Retrieval “ International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 2, Issue 7, July 2013

[2] A.Hema, E.Annasaro “A Survey in need of Image Mining Techniques” . International Journal of Advanced Research in Computer and Communication Engineering Vol. 2, Issue 2, February 2013

[3] A. M. Khan, Ravi. S “Image Segmentation Methods: A Comparative Study”. International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-3, Issue-4, September 2013

[4] Ashraf A. Aly, Safaai Bin Deris, Nazar Zaki "Research Review For Digital Image Segmentation Techniques", International Journal Of Computer Science & Information Technology (Ijcsit) Vol 3, No 5, Oct 2011

[5] Krishna Kant Singh , Akansha Singh "A Study Of Image Segmentation Algorithms For Different Types Of Images" IJCSI International Journal of Computer Science Issues, Vol. 7, Issue 5, September 2010

[6] Ishmeet Kaur & Lalit Mann Singh "A Method of Disease Detection and Segmentation of Retinal Blood Vessels using Fuzzy C-Means and Neutrosophic Approach Imperial Journal of Interdisciplinary Research (IJIR) Vol-2, Issue-6, 2016, ISSN: 2454-1362,

[7] Surya G, Athul S Jayan, " Personal Identification Using Retinal Images" International Journal of Electrical and Electronics Engineers" Vol-8, Issue-1, Janyary-June 2016.

[8] Pushpendra Kumar, Pushpendra Kumar, Vineet Richhariya " Retinal Image Segmentation by using Gradient Descent Method International Journal of Computer Applications (0975 – 8887) Volume 86 – No 10, January 2014