Study of Type of images and Segmentation

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KEYWORD

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ABSTRACT

More and more images, recordings, and illustrations are accessible to open with the fast advancement of electronic photography methods. It is easier to understand large amounts of data with the help of graphics and images. There are a number of elements that make up an image, known as picture elements or pixels, and these elements are what make up the image. The pixels are arranged in rows and columns according to a two-dimensional matrix, consisting of rows and columns of pixels.

1. Introduction

With the fast advancement of computerized imaging methods mobile platform and internet, videos and images, more a number of images, recordings and illustrations are accessible to open. Images and graphics provide a large amount of data with better clarity. From the last few decades gradual growth in the number, accessibility and significance of pictures in varying backgrounds. Presently, images play an essential job in the field of science, technology and social sciences as diverse as medicine, journalism, advertising, design, education, entertainment, etc. Photography, TV, Facebook, WhatsApp, Instagram, twitter, and so on has assumed a significant job in encouraging the capture and communication of image information. The well-known proverb “a picture is worth a thousand words” indicates that an image has a powerful ability of describing the rich information it carries.

In computer science and engineering Digital image processing is a developing zone. The principal goal of the image processing is to better understanding of the constituents of the image and decipher its semantic importance. In the field of image understanding recognition of the image components is very essential. In some areas image recognition is sufficient and not requires any further processing of images constituents. For example, the acknowledgment of picture articles might be sufficient in itself, for instance, in clinical pictures, the identification of tumor is sufficient and no further handling is required. On the other hand, there are some many areas where more understanding and identification of the image objects are required such as to get video clips automatically on the particular area of interest.

2. Image

An image may be defined as a two-dimensional function f(x, y), where x and y are spatial coordinates. Amplitude of f at any location (x, y) is called the intensity value or gray level of the image at that point. An image will be a

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digital image when the amplitude of f and values of x, are finite and discrete. Digital images are composed by the finite number of elements known as “pixel” or “picture element”. Pixels are the smallest unit of any image and every pixel contains some information about that image. In simple words an image can be defined as a two-dimensional array which is usually arranged in rows and columns. Images or Digital images are the best method to represent and transfer information. This information can be in the form of of simple drawing, photographed picture, graph, logo etc.

There are many digital devices and techniques by which images can be formed. These devices are Digital camera, mobile phones, coordinates measuring machine etc. Digital images can be classified into various categories such as Binary images, Gray scale images and color images. Processing of the digital images by digital computers is known as “Digital image processing”. In this, input and output must be in the form of image. Digital images are widely used in various fields such as Medical field, remote sensing, Forensics, Communication and Automobiles etc.

2.1. Feature of an Image

Digital image has basically two features or characteristics as: (a). Type of image (b). Resolution (c). Color depth (d). Format (e). Compression

(a). ‘Type’ of image – Basically type of image give information about the color of pixels in an image. For example, Binary or Black and White image then it will include only two color i.e. Black or white. RGB images include three color channels that are Red, green, Blue and CMYK has Cyan, Magenta, Yellow, Black color respectively. There are also non-optical images such as ultrasound or X-ray in which the intensity of sound or X-rays is recorded

(b). Image Resolution- Resolution of an image can be defined as number of pixels per inch(or ppi). Resolution of any device is directly proportional to the number f ppi. A higher resolution gives a more detailed image. A computer monitor typically has a resolution of 100 ppi, while a printer has a resolution ranging from 300 ppi to more than 1440 ppi. This is why an image looks much better in print than on a monitor.

(c). Color depth- It is also called as Bit depth and it can be defined as the number of bit required to represent the color of the single pixel. For example, an RGB image with 8 bits per color has a total of 24 bits per pixel ("true color").

(d). Format- Format is an very important feature of images which gives an idea about the arrangement of the numbers in an image as well as described which type of compression is used (if any). Among the most well known of the many arrangements accessible are TIFF, GIF, JPEG, PNG, and Post-Script.

(e). Compression- Image compression is a task of reducing the size of media files without degrading the quality of original file.

3. Image Representation

Images are composed by the number of elements known as pixel or picture elements. These pixels are arranged in a form of two-dimensional matrix or in rows and columns format. An image can be represented as:

$$f(x,y) = \begin{bmatrix} f(0,0) & f(0,1) & f(0,2) & \dots & f(0,N-1) \\ f(1,0) & f(1,1) & f(1,2) & \dots & f(1,N-1) \\ \cdot & \cdot & \cdot & & \cdot \\ \cdot & \cdot & \cdot & & \cdot \\ \cdot & \cdot & \cdot & & \cdot \\ f(M-1,0) & f(M-1,1) & f(M-1,2) & \dots & f(M-1,N-1) \end{bmatrix}$$

3.1. Type of image

Binary Image: The binary images are the images which includes only two colors black and white, where 0 represents black and white represents 1. This type of images also known as Monochrome images because such

images contain only single color pixel element either 0 or 1.in such types of images only one bit is required to store a single picture element.

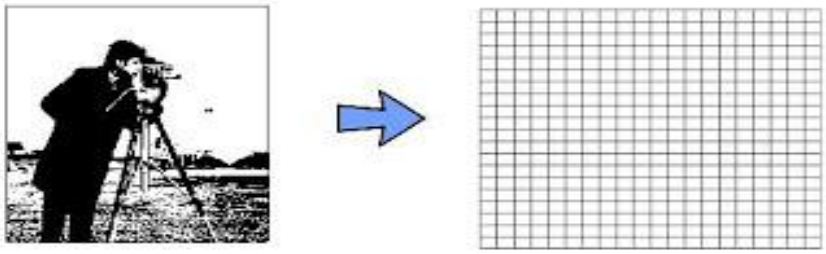

Figure 1: Analog image and Pixels

Black and white images: As the name defines, black and white image having two colors i.e. Black and white. There are a big confusion between the Binary images and black /white images because both include black and white color only. The best difference between these two types of images are that it requires 8-bit to store a single picture element while binary images need only single bit to store a single pixel.

Gray scale images: Gray scale image contains only shades of gray which are lies between black and white colors. Most commonly used format in gray scale image is 8-bit format and it has 256 different shades of gray or the picture elements value varies from 0-255 where 0 refers to pure black color and 1 refers to white color.

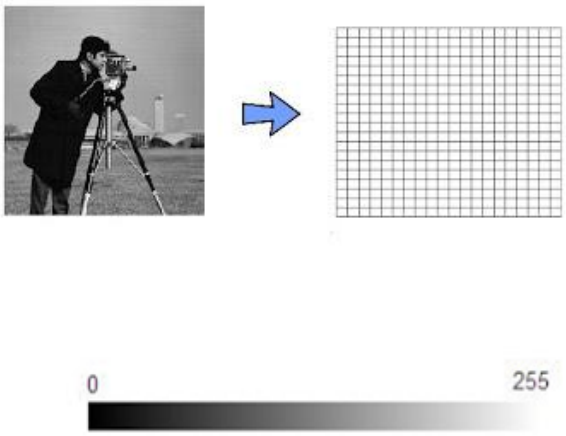

Figure 2: Analog image, Grey Scale levels

Color images: Color images are also known as RGB images. Each pixel in color image shall be having information about its colors. Color images can be representing as MxNx3 where M, N represents number of rows and columns respectively and 3 refers to the number of planes. RGB images are having a 3 color channels named as Red channel (R), Green channel (G) and Blue channel (B). To store a single picture element or pixel in RGB image, it requires 24- bits because every channel needs 8-bit to store a single pixel.

4. APPLICATIONS OF DIGITAL IMAGE PROCESSING

Digital images are widely used in various fields such as medical field, remote sensing, Forensics, Communication and Automobiles etc.

- Image sharpening and restoration
- Medical Field
- Robot vision
- Pattern recognition
- Video processing
- IMAGE SEGMENTATION

Image analysis and image processing are two distinct methodologies for managing picture. Image analysis provides a detail portrayal of the picture is generated while image processing accepts the picture as input and produces a picture of better quality.

4.1. Image segmentation

The technique of separating one picture into several relevant areas is known as image segmentation. S. Sahu, H. Sarma, and D. Jyoti Bora (2018), which aids in the subsequent investigation of its constituents or objects to extract more information. This additional data may be beneficial for advanced machine vision applications. In general, segmentation is more challenging than classification because borders that separate various texture areas must be established in addition to recognizing texture in each zone. The fundamental purpose of image segmentation is to simplify and/or transform the representation of any picture into something more relevant and easier to evaluate.
Division of images or segmentation of images is a very hard problem since it is hard to predict and know from the earlier or know prior information such as what region have which texture, how many texture are presented in the image, what type of texture exist in a picture and so on. Another basic problem of segmentation is that it isn't important that all the time the segmented region or extracted area contain some helpful data in regards to the object and there not any general segmentation algorithm which can apply on all type of images or picture as well as in all circumstances. Mostly researchers have to develop the segmentation algorithm according to their requirement and application.
A good segmentation must have following properties R. M. Haralic and L. G. Shapiro (1992
(i). In the segmented parts of the image features or characteristic like gray level, color, texture etc should be homogeneous or similar.
(ii). Boundaries of all segmented regions should be clear and distinct.
(iii). Each sub regions must have different features with respect to its neighbor region.
(iv). All regions should have be free of small holes and clear interiors.
There are a myriad of image segmentation methodologies are available in the Digital image processing. From the most recent couple of decades various image segmentation techniques has been developed and these techniques are as : segmentation based on Clustering Jianbo Shi and J. Malik (2000) Xiang-Yang Wang and Yi-Feng Sun (2010).template matching Guan-Yu Chen, Ying-Cheng Chen, Chu-Fang Lin, and Yung-Chang Chen (2008), discontinuity based image segmentation, homogeneity based image segmentation, Support Vector Machine (SVM) based segmentation (C. Tan, Y. Sun, G. Li, G. Jiang, J. Kong, and B. Tao 2018), (Xu Haixiang, Cao Wanhua, Chen Wei, and Guo Liyuan, 2008) Convolution Neural Network (CNN) based segmentation and so on.

4.2. APPLICATIONS OF IMAGE SEGMENTATION

Nowadays image segmentation has a very significance job in various areas such as: remote sensing, astronomy and criminology etc. There are some important applications of image segmentation are as follows-
(i). medical imaging
(ii). Object location through satellite image.
(iii). Machine vision.
(iv). Face detection System
(v). Object detection

5. Conclusion

With the rapid progress of electronic photography technology, more photographs, videos, and graphics are becoming available for viewing. Graphics and visuals make it easier to grasp enormous volumes of data. An image is made up of a number of pieces known as picture elements or pixels, and these elements are what make up the image. A two-dimensional matrix, consisting of rows and columns of pixels, is used to organise the pixels in rows and columns.

6. References

C. Tan, Y. Sun, G. Li, G. Jiang, J. Kong, and B. Tao (2018). Research on image segmentation based on support vector machine. In 2018 International Conference on Machine Learning and Cybernetics (ICMLC), volume 2, pages 650–655.

Guan-Yu Chen, Ying-Cheng Chen, Chu-Fang Lin, and Yung-Chang Chen (2008). Template-based automatic segmentation of/drosophila/ mushroom bodies. J. Inf. Sci. Eng., 24:99–113, 01.

Jianbo Shi and J. Malik (2000) Normalized cuts and image segmentation. IEEE Transactions on Pattern Analysis and Machine Intelligence, 22(8):888–905, 2000.

Xiang-Yang Wang and Yi-Feng Sun (2010). A color- and texture-based image segmentation algorithm. Machine Graphics Vision International Journal, 19:3–18, 01 2010.

R. M. Haralic and L. G. Shapiro (1992), Computer and Robot Vision, 1992

S. Sahu, H. Sarma and D. Jyoti Bora (2018), "Image Segmentation and its Different Techniques: An In-Depth Analysis," 2018 International Conference on Research in Intelligent and Computing in Engineering (RICE), San Salvador, 2018, pp. 1-7.

Xu Haixiang, Cao Wanhua, Chen Wei, and Guo Liyuan, 2008. Performance evaluation of svm in image segmentation. In 2008 9th International Conference on Signal Processing, pages 1207–1210, 2008.