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Research paper

Measuring distinct regions of grayscale image using pixel values

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Abstract

Grayscale is a series of shades of gray without apparent color. The total absence of transmitted or reflected light, which is the darkest shade, black. The total reflection or transmission of light at all observable wavelengths, which is nothing but lightest possible shade i.e., white. Intermediate shades of gray are characterized by equal brightness levels of the primary colors (red, green and blue) for transmitting light, or equal amounts of the three primary pigments (magenta,cyan, and yellow) for reflected light. This paper focuses mainly on measuring the properties of objects in a grayscale image using Regionprops to calculate the standard Deviation. This is achieved by segmenting a grayscale image to get objects of a binary image. Although, the common problem of including chromatic values to a grayscale image has objective solution,not exact, the present approach tries to provide an approach to help minimize the amount of human labor required for this task. We transfer the source's whole color "mood" to the target image by matching texture information and luminance between the images rather than selecting RGB colors from a group of colors to an individual color components. We pick out to transfer only chromatic information and retain the target image's original luminance values. Further, the procedure is improved by permitting the user to match areas of the two images with rectangular swatches. It is essential to develop grayscale image pixel value, resultant to each object in the binary image to inspect the original grayscale image.Based on the original grayscale image pixel values, the pixel value properties in grayscale image are used to do routine calculations.

Keywords: *Grayscale image, regionprops, binary image, pixel value.*

1. Introduction

The colors are extremely subjective and personal. They have a prominent feature by which we try to identify images better and improve the visual appearance of the image. A grayscale image is also known as Black and white, in which the each pixel valuecarries only intensity information. The black and white or grayscale image composed full of gray shades, changing from black at the feeblest intensity (weak) to white at the sturdiest (strong).

The fundamental process of color followed by the human brain in perceiving color is a psychological wonder that is not yet fully understood, the color's physical nature can be expressed on a formal basis supported by experimental and theoretical results. Image analysis involves investigation of the image data for a specific application. Normally, the raw data of a set of images are analyzed to advantage insight into what's going on with the photos and the way they can be used to extract desired information. The processing of an image, recognition of pattern and extraction of feature is a critical step, which is nothing but a distinct form of reduction of dimensionality. When the data(input) are just too large to be processed and alleged to be redundant, then the data is converted into a comprised set of feature depictions. The process of remodeling the input data into a set of capabilities is known as feature extraction. Features regularly comprise information relative to shape, color, context or texture. Basically, the colors we observe in an object are decided by means of the nature of the light pondered from the object.

Due to the human eye's structure, all colors are visible as variable mixtures of the three so-called Primary colors Red, Green and Blue (RGB). Digital image processing permits the use of complicated computer algorithms to carry out image processing digital images. An image is captured through a sensor and digitized. There is a massive representational gap between the image and the concept which describes or abstracts the image data. To connect that gap, image processing has a variety of representations connecting the inputs and the output. Then the Image processing tasks involve in the layout of these intermediate representations and the implementation of algorithms to assemble them and relate them to each other. A Grayscale image is more than a few shapes of gray in obvious color. The darkest color is black and the lightest shade is white. The intermediate shades of gray are represented with the aid of equal brightness level of primarycolors (red, blue, green). Grayscale image may have any value for each pixel between 0 (zero) and 256. A binary image is a digital image that has only two possible intensity values for each pixel. They are commonly displayed as black and white. Binary images are produced with the aid of segmenting the grayscale images containing the objects in the image.

2. Literature review

Satyajit Mondal et al.,[1] has proposed a method for similarity measurement of image using the property-regionprops, color and texture. Swain and Ballard[4] has proposed amethod to measure the image similarity by histogram analysis, intersection. Jitendra Malik et.al., has proposed an algorithm for partitioning. There, the

grayscale images are partitioned into different regions of coherent texture and brightness. SubirDas et al has proposed a new linear displacement sensor by using the grayscale image.
Johan Hatne et al has proposed a model where the counts of the lower-valued pixels to recover the true signal for the high resolution reflections. Xuemei Zhang presented a technique for correcting the sensor values for saturated pixels in digital images.
Neha Sharma et.al has proposed a weighted centroid mechanism based on IOT capable to give an exact calculation between unknown node and anchor node. Fazal-e-malik has proposed a new content based image retrieval(CBIR) algorithm. The mean and standard deviations for each pixel is calculated to get featured vector which is used for the retrieval of image.
Firas Ajassim has proposed a method to combine median filter and standard deviation to achieve edge detector for image processing. Joseph Zacharias, Jayakrishnan S B, Vijayakumar Narayanan suggest that LBP is a robust texture descriptor for retinal images and the proposed method analyzing the retina background directly and avoiding difficult lesion segmentation such as exudates, microaneurysms etc. can be useful for diagnostic aid.
Ashish Semwal paper presents a review regarding basic image segmentation techniques from last 5 years. Current research in each of the image segmentation techniques such as Roberts Edge Detection, Sobel edge detection, Prewitt edge detection is presented in this paper.
Akshay P. Vartak, and Dr. Vijay Mankar deliver an summary of mathematical morphology and evaluate some morphological filters which are broadly used in image processing. Furthermore, based on morphology,they proposed a supervised segmentation system.
Preeti Rani, and Raghuvinder Bhardwaj told about the analysis of the different objects and differentiate it can be implemented using image segmentation process. The proposed work has been implemented in the MATLAB Simulation Tool and results has been generated on the different image data set and correspondingly to deliver the output, PSNR performance parameters have been calculated.
Kamlesh Kumar, Zain-ul-abidin, Jian-Ping Li and Riaz Ahmed Shaikh told about the image similarity purposes, Euclidean distance has been prepared which equals query image feature vector with image database feature vectors. The tentative results produced by two methods showed that whole performance of the proposed method is comparatively better in terms of, average recall, average precision and its average retrieval time.
Priyansh Sharma and Jenkin Suji describe about the techniques of segmentation, clustering method's advantages and disadvantages and a comparison of the clustering techniques.
Apurva B. Parandekar, S.S.Dhande and H.R.Vhyawh are proposed a simple technique that can be successfully applied to a range of grayscale videos and images, provided that texture and luminance are sufficiently distinct.

3. Proposed methodology

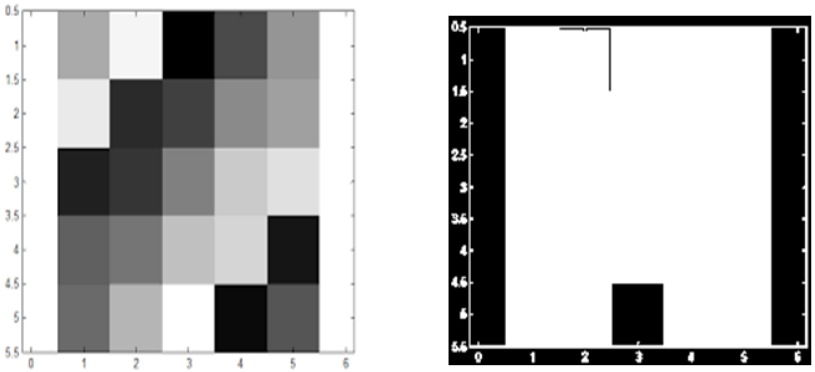
Segmenting gray scale image

The procedure of separating a digital image into numerous segments (set of pixels also known as super pixels) is called Image Segmentation. The mainaim of segmentation is to restructure the image into a more meaningful image, which is easier to analyze. Segmentation splits an image into distinct regions or objects. These distinct regions correlate with region of intersect in the image. In otherwords, it is a procedureof grouping pixels that have similar qualities. Segmentation has two objectives. The first objective is to decompose the image into parts for further analysis. In modest cases, the surroundingsmight be well enough controlled so that the segmentation process consistently extracts only the parts that need to be analyzed more. For instance, aprocedure or algorithmwas presented for the segmentation of a human face from a color video image.

Segmenting grayscale to binary

The method of extracting information from the images such as counting objects,finding shapes, identifying colors or measuring object properties. An image processing toolbar in Matlab provides anample suite of reference visualization functions and standard algorithms for image analysis tasks such as, feature extraction, statistical analysis and property measurement. Statistical function lets you analyze the common characteristics of an image by

1. Calculating the standard deviation or mean.
2. Defining the intensity values along a line segment.
3. Displaying an image histogram.
4. Plotting intensity values.



Original image Binary image

Figure 1: Original and binary image

The function Im2bw converts the black and white or grayscale image to a binary image. In the output image,pixel input image replaced by luminance larger than level with the value 1 (white) and replaces all the other pixel images with the value 0 (black).

Calculating object properties

The regionprops measures a variety of image quantities and features a black and white image. One of these particular properties is the centroid. This is the(x,y) locations, where the middle of each object is located. The centroid for regionprops works for each object in the image, calculate the center of mass of the object and the output of regionprops return a structure which tells the centroid of each object in black and white image. The centroid of our image is calculated by using regionprops and the centroid is displayed below:

S= regionprops(b,'centroid'); disp(cat(1,S.centroid))

To calculate both centroid and weighted centroid of objects in the image, the binary image containing the objects and the original grayscale image is passed as arguments in regionprops.

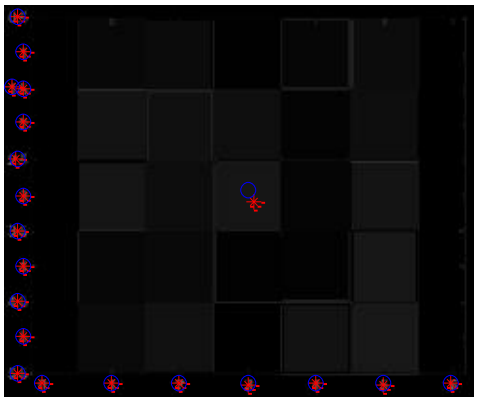


Figure 2: Weight (red) and Unweighted (blue) centroid locations

The pixel value corresponds to binary image of each object are determined by analyzing the original grayscale image And the value of specified pixels in a variable returned using MATLAB are given below :

51	107	91	
81	0	0	0
75	72	81	0
81	43	82	0

Based on the original grayscale imagepixel values,the 'Pixel Values' property is used to do routine calculations. This particular property returns a vector comprising of pixels' grayscalevalues in a region. As an example, the standard deviation of each region is calculated and is shown below:

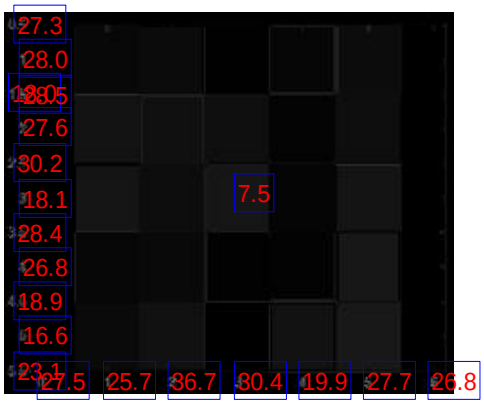


Figure 3: Standard deviation of regions

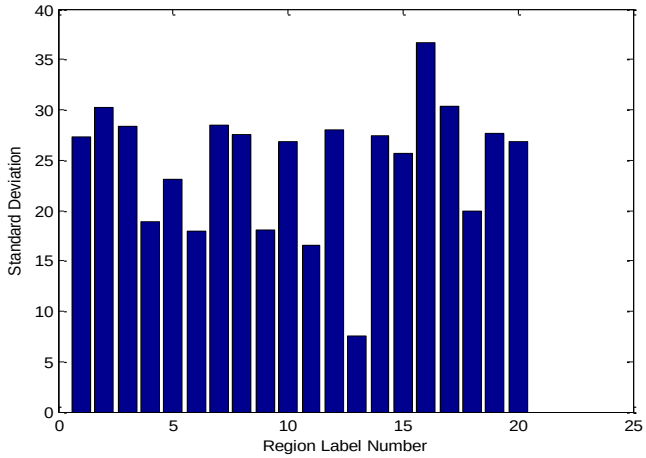


Figure 4: Barchart For Standard Deviation

The above figure4 shows the measurement of standard deviation apply to on each object in the image. The results can be viewed in other ways. For example, the bar graph showing the standard deviation by label number.

4. Conclusion

In this paper, the centroid and standard deviation of a distinct region is calculated by using the pixel values. We have intentionally kept the basic technique simple and general by not requiring registration between the images or incorporating spatial information. Our technique can be made applicable to a larger class of images by adding a small amount of user guidance. The centroid represents the mean position of all the points in all of the coordinate directions. Standard deviation represents the contrast of an image. This approach provides a good result to measure distinct region in a grayscale image. This accuracy and the computation speed can be further improved in the future, we believe the technique can be substantially improved by using a more sophisticated measure.

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