Enhancement in Texture Analysis on the Basis of Intensity of the Image

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Abstract

The texture analysis is the technique of extracting texture features of the image. These methods are discussed in the literature review section. The traditional approach of texture analysis is that the various images are combined together and image which is having higher intensity is shown and other images become hidden. In this paper, we are proposing new hybrid type of technique in which every image will show on the basis of their intensity. The image which is having higher intensity will be shown first and rest others shown correspondently according to their intensities. The proposed technique is implemented in MATLAB and results are shown in visual and graphical form.

Keywords: - Digital Image Processing, Texture analysis, Intensity.

1. Introduction

The digital image is the representation of a two dimensional image as a finite set of digital values called pixels. The digital image processing mainly focus on two major tasks:

1. Improvement in the pictured information for human representation
2. Processing of image data for storage and transmission

Image characterization consists in obtaining properties that represent regions of the image based on different criteria like the particularities of surface and structure. Texture is one of the criterions that can be used to characterize the image. It can be understood as a repetition, either deterministic or random, of an element or pattern on a surface, leading intuitively to properties such as smoothness, coarseness or regularity. For example, the pattern which characterizes the surface of wood is different from that one of grass or sand. Texture analysis is important because it constitutes a major step in texture classification, image segmentation and image shape identification. Textures can be roughly classified as artificial and naturals depending on their origin. Since they present very different characteristics, there is no generic texture model that can properly describe them. Different approaches have been proposed and usually trial and error experiments are preferred to select the best characterization and to tune the parameters adequately [7]. Methods for characterizing the texture can be grouped as statistical, structural, monetization and space frequency filtering. Statistical methods analyze the spatial distribution of gray values by computing local features at each point in the image, and deriving statistics from the distributions of the local features. The most used methods in this category are energy masks, co-occurrence matrices, parametric masks and local binary patterns [7]. The other major techniques of texture analysis are discussed in section 2.

2. Literature Review

Pham, Tuan D. "Image texture analysis using geostatistical information entropy"in IEEE 2012 has studied and proved that the extraction of effective features of objects is an important area of research in the intelligent processing of image data. A well-known feature in images is texture which can be used for image description, segmentation and classification. A novel texture extraction method using the principles of geostatistics and the concept of entropy in information theory [1]. Experimental results on medical image data have shown the superior performance of the proposed approach over some popular texture extraction methods. Ehmann, J. "Structural Texture Similarity Metrics for Image Analysis and Retrieval"in IEEE 2013 has developed new metrics for texture similarity that account for human visual perception and the stochastic nature of textures. The metrics rely entirely on local image statistics and allow substantial point-by-point deviations between textures that according to human judgment are essentially identical [2]. The proposed metrics extend the ideas of structural similarity (SSIM) and are guided by research in texture analysis-synthesis. We conducted systematic tests to investigate metric performance in the context of known-item search, the retrieval of textures that are identical to the query texture. This eliminates the need for cumbersome subjective tests, thus enabling comparisons with human performance on a large database. Waller, B.M. "Analysing Micro- and Macro-Structures in Textures" in IEEE 2012 has analysed the micro- and macro-structures within images confers ability to include scale in texture analysis. Filtering allows for selection of texture structures at different scales, revealing the micro- and macro-structures which would otherwise be concealed. The new approach to texture segmentation uses low- and high-pass filters to achieve this scale-based analysis [3]. Segmentation is performed using Local Binary Patterns as an example of the type of feature vector that can be used with the new process. These are generated for the original image and each of the filtered images. A two stage training process is used to learn the optimum filter sizes and to produce model histograms for each known texture class. These are used in the supervised segmentation of texture mosaics generated from the VisTex database. The results demonstrate the superiority of the new combined approach compared to the best multi-resolution LBP configuration and analysis only using low pass filters. Noise analysis has also confirmed the advantageous properties of low- and high-pass filtering, and confirms that it is optimal to combine the two forms in texture segmentation. Costa,Alceu Ferraz "An Efficient Algorithm for Fractal Analysis of Textures"in IEEE 2012 has proposed a new and efficient texture feature extraction method: the Segmentation-based Fractal

Texture Analysis, or SFTA. The extraction algorithm consists in decomposing the input image into a set of binary images from which the fractal dimensions of the resulting regions are computed in order to describe segmented texture patterns [4]. The decomposition of the input image is achieved by the Two-Threshold Binary Decomposition (TTBD) algorithm.

3. Texture Analysis and Intensity Factor

The texture can be complex visual patterns composed of entities that have characteristics like brightness, color, size etc. The techniques for the texture analysis can be broadly classified as:

- Structural
- Statistical
- Modal based
- Transform

The hierarchy of the well defined primitives is defined to represent textures in structural approach. In structural approach the primitives is defined and rules are defined to arrange these primitives. The choice of a primitive (from a set of primitives) and the probability of the chosen primitive to be placed at a particular location can be a function of location or the primitives near the location. The advantage of the structural approach is that it provides a good symbolic description of the image [5].

Statistical approaches do not attempt to understand explicitly the hierarchical structure of the texture. Instead, they represent the texture indirectly by the non-deterministic properties that govern the distributions and relationships between the grey levels of an image [7].

Modal based texture analysis using fractal and stochastic models, attempt to interpret an image texture by use of, respectively, generative image model and stochastic model. The parameters of the model are estimated and then used for image analysis. In practice, the computational complexity arising in the estimation of stochastic model parameters is the primary problem. The fractal model has been shown to be useful for modeling some natural textures

Transform methods of texture analysis, such as Fourier, Gabor and wavelet transforms, represent an image in a space whose co-ordinate system has an interpretation that is closely related to the characteristics of a texture [6]. Methods based on the Fourier transform perform poorly in practice, due to its lack of spatial localization. Gabor filters provide means for better spatial localization; however, their usefulness is limited in practice because there is usually no single filter resolution at which one can localize a spatial structure in natural textures.

3.1. Intensity Factor

In an image processing context, the histogram of an image normally refers to a histogram of the pixel intensity values. This histogram is a graph showing the number of pixels in an image at each different intensity value found in that image. For an 8-bit grayscale image there are 256 different possible intensities, and so the histogram will graphically display 256 numbers showing the distribution of pixels amongst those grayscale values. Histograms can also be taken of color images either individual histogram of red, green and blue channels can be taken, or a 3-D histogram can be produced, with the three axes representing the red, blue and green channels, and brightness at each point representing the pixel count [5]. The exact output from the operation depends upon the implementation. It may simply be a picture of the required histogram in a suitable image format, or it may be a data file of some sort representing the histogram statistics.

3.2. Algorithm Steps

1. **Image read using simple imread() function**
   - Using run+window (command)
   - Using simple imread() function when image placed in similar folder
   - Using path when you give option any of one select from folder
2. **Read image as uint8 rather than double.**
   - Uint8 is used unsigned 8 bit integer. And that is the range of pixel. We can't have pixel value more than 2^8 -1.
   - Double is used to handle very big numbers. There are many functions they only take double as input to ovoid memory out of range.
3. **Hide image**
   - Using simple encryption method
   - Using simple function hide(_,_)
4. **Intensity function**
5. **Final output show**

3.3. Flow Chart

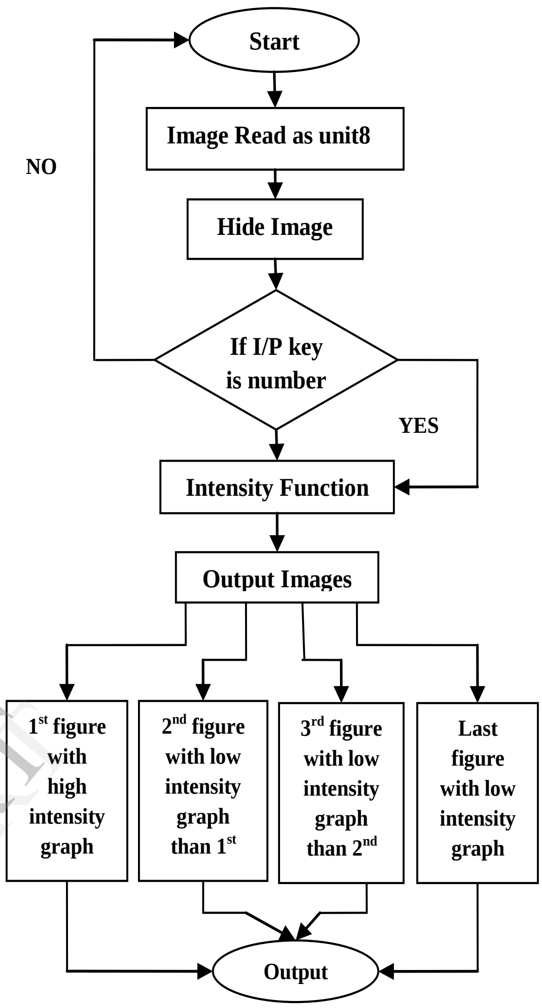

Figure 1: Flow chart of Proposed Algorithm

4. Results and Discussion

At the end in the final result we will draw 3D mesh graph of each image using their intensity graph and their normal image. In that process we will save all values of particular image as related their intensity level than save it into their mat file, all i1, and i2, i3 and i4 images values store in different-2 mat file.

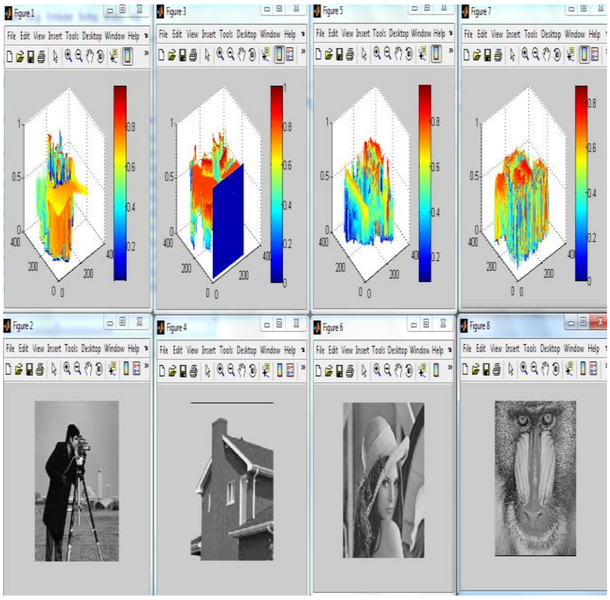

Figure 2: Final Results

After that we used image 2 mat file function which will help us to convert into mat file in which we store all the values of particular image. After this we are using mesh graph function which help us to draw the 3D graph of particular image. In this graph the side bar show intensity level which has a starting colors blue and ending color red.

1. In 1st image it will something have small value means peak value less then grow value by value so there will be less difference between them as compared to the intensity graph it will be same process in that 3d figure.
2. In the 2nd figure they having an flat value because there will be no more peak value so only blue color show in that after some time there will be peak in that but after that the value exceed so in the 3d graph the only red color show means value exceed than that.
3. In 3rd figure it will something blue and second color means there will be high intensity, in the middle of that there will be high intensity some red, orange in the middle of 3d graph, for some time it will be not change but after that it will be decline and something blue show in some part of end.
4. In the 4th figure from staring there will be small peak value but after some time it will exceed so there will be yellow than red color, as we know earlier there will be when exceed they having an last number of figure in the processing figures.

Sr. No.	Fig. Name	Size	Dimension	Accuracy (Av) old	New Size	Accuracy (Av) new
1.	Camera man	18.7 KB	256*256	0.0870	13.8 KB	0.5017
2.	Lena	12.5 KB	256*256	0.0846	14.5 KB	0.5992
3.	Monkey	17.8 KB	256*256	0.0952	23.6 KB	0.6455
4.	House	10.1 KB	256*256	0.0592	11.5 KB	0.5729

Table 1: Comparison Table

In table 1 we will compare to the basic table which having an accuracy which denoted by Av. We will also process these four image having different size but same dimensions. In the old approaches they will work one by one image but in our process we will process our algorithm on more than one image.

In table 1 value there will be size difference someone in the old method having a more size than new one or vice versa. But there will be same dimension in which we used 256*256 in new and old method. After process each image the accuracy of our image is more than old method. Because in our algorithm we process on some factor that is intensity but in previous approach they will process on internal structure of an image only. The output result of old method they will show the object into another image but in our process we will show first those image who having an intensity more than other image in which size does not matter only dimensions matter it.

At the end these graphs we can compare with those intensity graph which will shown earlier after hide function. In this 3d mesh graph we can easily clear or view the intensity using the side bar having an intensity value, so the image having intensity greater than others it will show first than rather images.

5. Conclusion

It is to be conclude that in the old method of texture analysis process they will work on one image in which they will provide output only one object who having an more intensity than other object in image, in this process they will compare only in the image not other image or object. So we have remove this error to doing work on all image, in our process we will take 3-4 images in which we combine them than hide after that using intensity the picture who having more intensity than other picture it will come out first than other images. In our process we will show image with graph in which you can easily recognize which picture having a more intensity level than other picture, so doing this we can compare to other images not likely in past process they will compare inside the image only.

References

[1] Pham, Tuan D. "Image texture analysis using geostatistical information entropy." In Intelligent Systems (IS), 2012 6th IEEE International Conference, pp. 353-356. IEEE, 2012.

[2] Ehmann, J. "Structural Texture Similarity Metrics for Image Analysis and Retrieval"in IEEE 2013

[3] Zujovic, Jana, Thrasyvoulos N. Pappas, and David L. Neuhoff. "Structural similarity metrics for texture analysis and retrieval." In Image Processing (ICIP), 2009 16th IEEE International Conference on, pp. 2225-2228. IEEE, 2009.

[4] Waller, Ben M., Mark S. Nixon, and J. N. Carter. "Analyzing Micro-and Macro-Structures in Textures." In Signal Image Technology and Internet Based Systems (SITIS), 2012 Eighth International Conference on, pp. 246-253. IEEE, 2012.

[5] Costa, Alceu Ferraz, Gabriel Humpire-Mamani, and Agma Juci Machado Traina. "An Efficient Algorithm for Fractal Analysis of Textures." In Graphics, Patterns and Images (SIBGRAPI), 2012 25th SIBGRAPI Conference on, pp. 39-46. IEEE, 2012.

[6] M. Lukashevich, R. Sadykhov "Texture Analysis: Algorithm for Texture Features Computation" in IEEE IV International Conference On Problem of Cybernetics and informatics (PCI), 2012.

[7] Z.J. Zhang, Q.C. Huang, W.G. Lin and R.S. Che " Probe imaging vision coordinate measuring system using a single camera", Proc. of SPIE on Automated Optical Inspection for Industry: Theory, Technology, and Applications II

[8] Babak Rezaei, Oscar E. Ramos "Scene Segmentation and Interpretation Image characterization: Texture analysis" in 2010

[9] M.Karaman. M.A.Kutay and G.Bozdagi "An adaptive speckle suppression filter for medical ultrasonic imaging," IEEE Trans. Med. Image, vol.14, no.2 pp.283-292, Jun.2009.