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STATISTICAL BASED IMAGE COMPARISION BY QUAD TREE SEGMENTATION

Abitha Gladis N. K[1],
Department of Mathematics, S. T. Hindu College,
Nagercoil-629002, India

Nagarajan.D[2],
Department of Mathematics, Debre tabor university, Ethiopia,

Nagarajan. V[3]
Department of Mathematics, S. T. Hindu College,
Nagercoil-629002, India

ABSTRACT

The feature extraction is one of the most important steps in face analysis applications. Quadtree decomposition is an analysis technique that involves subdividing an image into blocks that are more homogeneous than the image itself. Texture features are extracted from the spatial black in every images and it performs to segmentation directly using spatial frequency data. Quad tree decomposition is the evaluation criterion of image segmentation. It works by dividing a square image into four equal-sized square blocks, and then testing each block to see if it meets some criterion of homogeneity. In this paper use quadtree decomposition for segmenting images by texture content with application to indexing images in a large image data base, measures the closeness of the distribution of elements in the GLCM to the GLCM diagonal, measures the local variations in the gray-level co-occurrence matrix and provides the sum of squared elements in the GLCM. Compare the images are using correlation and using F test value.

Keywords: Quad tree decomposition, correlation, homogeneity, GLCM,

Introduction

A main point of quadtree segmentation is the evaluation criterion of image segmentation. In quadtree decomposition, It is accomplished by classifying a block either as a uniform or edge block. The classifier employs the residual values of a block and classifies the block according to the shape of the histogram of the residuals[1],[2]. The classification is carried out through a peak detection method on the block histogram[4].[7]. A brief description of the classifier is as follows. Each block of n x n pixels is converted into a residual block by subtracting the sample mean from the original pixels[3]. The residual samples are less correlated than the original samples within a block. Here, two of the most important local characteristics of the image block are considered: central tendency, represented by the mean value and the dispersion of the block samples about the mean, which is represented by the residual values[10]. The challenge here is to analyze the dispersion of the residual values about the mean.

Quadtree decomposition has been widely used in digital image analysis to define regions of interest for further processing as image segmentation, feature selection, object detection, sample annotation, among others[5][6]. This technique consists of a hierarchical data structure whose nodes are recursively subdivided in four parts until a predefined split condition is not satisfied. This process performs a top-down approach beginning with a single node, that represents the entire image, and give a structure with variable block sizes at the end, where smaller blocks describe fine details more accurately and bigger blocks incorporates similar regions to represent them with fewer information as possible [8][9].

As the neighboring pixels in the original block are highly correlated, the residual samples will tend to concentrate around zero[11],[12],13]. One can then quantize the residual samples

prior to forming the histogram. The histogram of the quantized residuals may then be formed and analyzed by simply detecting its peaks. Based on the distribution of the residual samples within the test images, we choose to apply a coarse quantization, in particular a 15-level non-uniform quantizer. We now define q j as the output of the quantizer with index j[15]. The histogram of the quantized values h(q j) may then be formed to provide the occurrence of q j . The quantized residual histogram (QRH) is then analyzed by simply detecting its peaks. According to the number of detected distinct peaks on the histogram, image blocks can be placed into two major categories of uniform and edge blocks. A histogram with a unique peak at its centre (uni-modal histogram) identifies a uniform block. Whereas, the existence of two distinct peaks implies that the processed block is an edge block and requires further

segmentation. “Fig. 2” shows the histogram analysis of a 4x4 uniform block. In the decomposition approach, an image to be coded is first divided into blocks of 16x16 and then each block is repeatedly divided into four equal quadrants, if its residual histogram is not a uni-modal type. On the other hand, the decomposition process will stop if the residual histogram of the block has a

dominant peak at its center. This block is regarded as a uniform block and all the pixels in the block will be represented by the block mean. If the smallest block size of 4x4 is reached and its residual histogram is still not a uni-modal type, it is regarded as an edge block. Fig. 3 depicts the histogram analysis of a 4x4 edge block Since variable block sizes are used in quadtree segmentation, decoding of transmitted images requires the information about the size and location of each block. That is, if a block is divided into smaller blocks, the quadtree code is "1." Otherwise, the quadtree code is "0." This amounts to too much overhead information needed for transmission. To overcome this problem, we use the method presented in [6] which introduces 17 possible combinations within a 16x16 image block[14].
Measure of the intensity contrast between a pixel and its neighbour over the whole image. Contrast is 0 for a constant image.

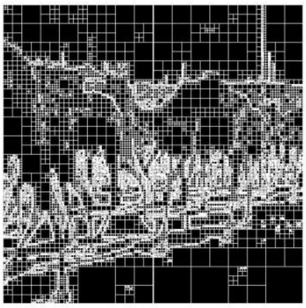
$$h = \begin{cases} true, \max(r) - \min(r) \geq t \\ false, \max(r) - \min(r) < t \end{cases}$$

where r is the analysed region and t is the threshold value used as split criteria to set block homogeneity. Compare the two images and calculated the value of correlation. If the correlation is one ,the same entropy and homogeneity then the images are same .

```
I = imread('camels.jpg');
J = rgb2gray(I);
V = imresize(J,[512 512]);
```

Read a image Read the image, convert greyscale and resize a square image.

```
S = qtdecomp(V,.20);
```

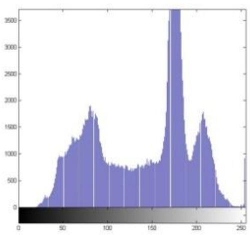


```
blocks = repmat(uint16(0),size(S));

for dim = [512 256 128 64 32 16 8 4 2 1];
  numblocks = length(find(S==dim));
  if (numblocks > 0)
    values = repmat(uint16(1),[dim dim numblocks]);
    values(2:dim,2:dim,:) = 0;
    blocks = qtsetblk(blocks,S,dim,values);
  end
end

blocks(end,1:end) = 1;
blocks(1:end,end) = 1;
imshow(V), figure, imshow(blocks,[])
M = entropy(V)
GLCM2 = graycomatrix(V,'Offset',[2 0;0 2]);
stats = graycoprops(GLCM2,{'contrast','homogeneity'})
```

entropy of the image is 7.3464

Contrast: [0.4380 0.4946] and Homogeneity: [0.8895 0.8813]

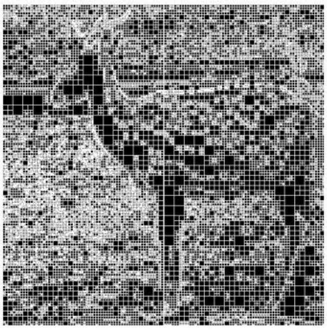
Histogram of the image is



```
A = imread('deer.jpg');
B = rgb2gray(A);
```

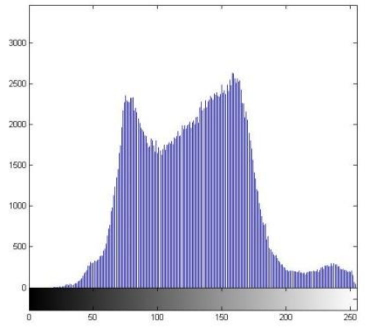
```
M = imresize(B,[512 512]);
```

```
W = qtdecomp(M,.20);
```



```
blocks = repmat(uint16(0),size(W));
for dim = [512 256 128 64 32 16 8 4 2 1];
    numblocks = length(find(W==dim));
    if (numblocks > 0)
        values = repmat(uint16(1),[dim dim numblocks]);
        values(2:dim,2:dim,:) = 0;
        blocks = qtsetblk(blocks,W,dim,values);
    end
end
blocks(end,1:end) = 1;
blocks(1:end,end) = 1;
imshow(M), figure, imshow(blocks,[])
K = entropy(M)
GLCM2 = graycomatrix(M,'Offset',[2 0;0 2]);
stats = graycoprops(GLCM2,{'contrast','homogeneity'})
```

entropy is 7.3138,Contrast: [0.6688 0.5305], Homogeneity: [0.7828 0.8117]



Correlation between the quadtreee decomposition

R = corr2(V,M)

0.3692

From the correlation value the two images are not identical. If the r value is one then the image is identical.

L = var(S(:))

K= var(W(:))

G = L / K

If the variance is equal than the two images are identical. From the above two image variances are 0.9571 and0.9058 respectively, so the above images are not identical.

CONCLUSION

quadtree decomposition for segmenting images by texture content with application to indexing images in a large image data base, measures the closeness of the distribution of elements in the GLCM to the GLCM diagonal, measures the local variations in the gray-level co-occurrence matrix and provides the sum of squared elements in the GLCM. Compare the images are using correlation and using F test to found the image are identical or not identical. From the above two images are not identical according to the correlation and using F test value.

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