Building Recognition

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Abstract :

Recent research of building recognition has focused on study the problems of building recognition, whereas create a database of building images, which contains all images that were drawing throut students or acquire by using digital camera for certain building.

These images are comparison with image, which called reference image by using many techniques that depends on features extraction of images. These techniques represent histogram of each image that relay on convert it from color to gray level , that causes destroyed many important details of image during conversation operation.

This result helps to use another method depending on colors analysis of these images, By using two systems for return color image to primary colors. The first which is called RGB and the second opponent color space for obtain on best and exact result in recognize operation.

1.Introduction :

Object recognition has been an active research area in computer vision for a long time. Approaches have been proposed to recognize a variety of dissimilar objects coming from different classes. Building have several characteristics which make the recognition more challenging. They are highly structured parallelism and orthogonally being the prevailing relationships between lines. The Typically have repeating structures , such as windows pillars (see fig1). In images of buildings occlusions happen frequently, due to trees around them or self- occlusions due to change of view point. This research focus on features extraction of each image , which is required recognize it. The recognition operation depending on essential methods ,histogram, RGB, and opponent color space.

Fig. 1.1 which explain some images that's difference some features

2. Related work

The majority of approaches for dealing with classes of objects which share common visual attributes such as ,faces or building focused mostly on the problem of detection.

In [1] authors worked on locating building in a given image or classifying images as building / no building images. More challenging problem of detection of manmade structures in cluttered scenes has been addressed in [2], where the authors modeled the image spatial dependencies using Markov random fields. The crucial part of object recognition system is object representation. Currently existing approaches can be broadly divided in to two categories: appearance based and geometric techniques. Geometric techniques model objects using geometric information such as shapes[1],[2],[3], or coordinates of points [3].

Appearance based techniques represent object by their appearance, and be further divided into global or local appearance based methods. Principle component analysis (PCA) [4],[3] belongs to the global category. The disadvantage of standard PCA techniques is that they can't tolerate occlusions and clutter. In[6] authors propose to handle occlusions problems of PCA by considering only subset of image windows. Local appearance based methods represent objects by a set of local image descriptors[7,8] associated with feature points.

APPROACH in this research we introduce three methods for building recognition, these methods are depending on image analysis and return it to the primary colors after that matching is performed by using this color.

The first method will construct histogram of image after convert to the gray level. In the last the matching is performed. The second method is attempt interesting of disadvantage of the first method which is produce, when convert image to the gray level, that's caused lose many important information which contain the prefect details. This method will protect the colors of image, and then analysis it to the main colors. Analysis operation depending on two systems, the first return image to red, green and blue. Whereas matching per formation relay on these colors. Another system using opponent color space that depending upon three essential colors called (L) luminance, (R-G) red green chrominance, which considers main components for the matching and then in building recognition.

3. Building representation

The building represented by a set of methods. The first depending convert image which is represented building to the histogram later use it on the matching. Matching process between all images input (test images) and reference image after that turn to the histogram.

The second method for building images relay on image analysis by using two system of human visual, The first return of any images in recognition building system to the primary colors red, green and blue, then using these color for matching to building recognition. Another method depending upon opponent system for analysis of any images to L (luminance), (R-G) red green chrominance and (B-Y) blue-yellow chrominance, represented as arrays and determine the nearest array which have maximum ratio of matching, and this array belong to the certain image which consider nearest to the reference image.

4. Technical of recognition

In the fact, there are many approaches which using in image recognition domain. The features extraction from image consider one of these techniques as well as there are methods depend on divided image to many blocks then choice the nearest block which is have max matching ratio[5],[9]. There is another methods rally on important features such as regions the most gray levels, edge detection , contrast, brightness,...etc. The object of research is focus on techniques set in building image recognition during use histogram, and methods for distributed of main colors for image : RGB and using Opponent, these ways don't use image data directly, but depending features extraction from image that's decrease from time processing and increase perfect results then help to pass many of barriers between reference image and test images[7],[10][11].

4.1 Histogram

The brightness characteristic of an image can be concisely display with a tool known as brightness histogram. In general terms, histogram is a distribution graph of a set of numbers. The brightness histogram is distribution graph of the gray levels of pixels within an image. It provides a graphical representation of how many pixels within an image fall into the various gray-level steps. A histogram appears as a graph with "brightness" on the horizontal axis from 0 to 255 (for an 8-bit gray scale) and "number of pixels" on vertical axis[4],[7],[12].

To find look up the brightness on horizontal axis, follow the bar graph up , and read off the number of pixels on the vertical axis. Because all pixels must have some brightness defining them, the number of pixels in each brightness column adds up to the total number of pixels in the image. The following figure explain histogram operation :

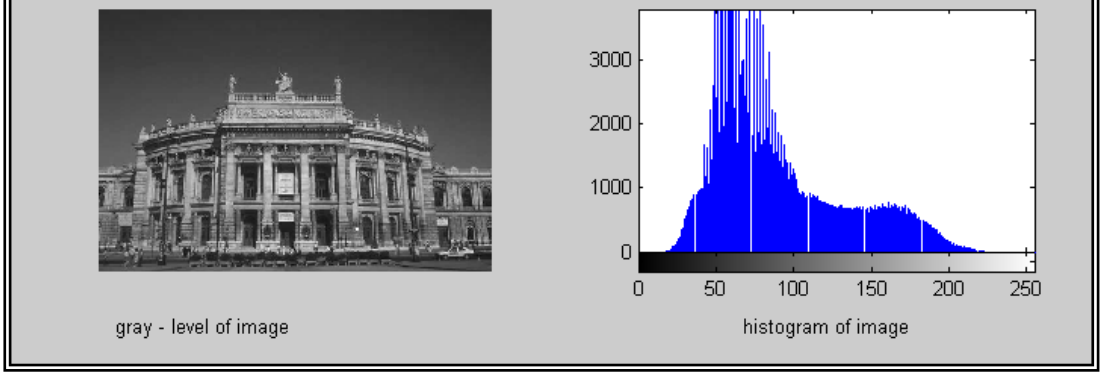

Fig. (1.2) Show histogram operation

4.2 RGB

Color images can be modeled as three-band monochrome image data, Where each band of image corresponds to different color. The actual information stored in the brightness information in each spectral band. Typically , color images represented as red, green, and blue; or RGB images. Figure (1.3) shows color of images[5].

Graphics file formats store RGB images as 24-bit images, Where the red, green, and blue components are 8-bits each. RGB color information is transformed in to mathematical space that separates the image information better than RGB [4],[5] and [13]. In this research is used color space model which is opponent color space.

a) Color image **b)gray-scale image** **c) Monochrome Image**

Fig. (1.3) Show Three type of image format

4.3 Opponent color space

One model of HVS that is called opponent color space. This space is represented by three components : the luminance (L), red-green chrominance (R-G), and blue-yellow chrominance (B-Y) color components space [5],[6].fig1.4 shows the opponent space with its components. The following relations derive the L, R-G and B-Y components from the RGB space , and :

$$L = (R + G) / 3 + B \quad \ldots(1)$$

$$(R-G) = R - G \quad \ldots(2)$$

$$(B-Y) = (R + G)/2 - B \quad \ldots(3)$$

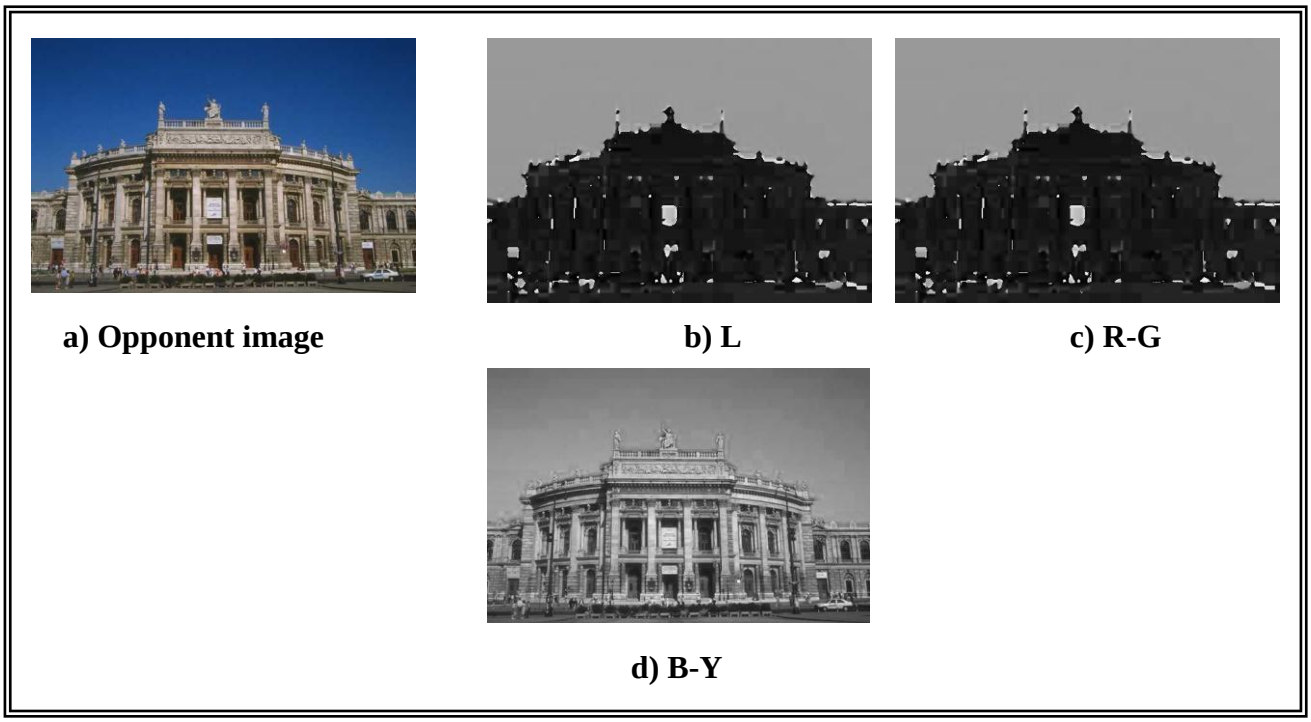

Fig. 1.4 show opponent image components

It is the process of finding the similar ratio more than image, and some times we have ability of finding the different ratio, then compute matching. There is important aim in many fields of computer vision. There are many techniques which generation format as in the following [7] :

a. **Finger Print.**
b. **Face recognition.**
c. **Building recognition.**

d. **In medicine field.**

e. **Geology science.**

The research is focus on building recognition, and we can clear the matching system in the following figure:-

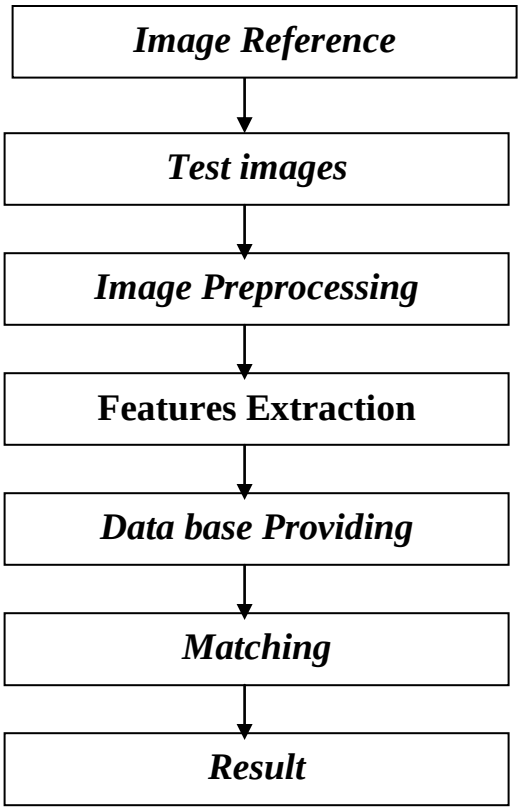

Fig. (1.5) clear matching System

Image reference represent main image which is consider fundamental in the matching with the another images (test). The preprocessing represent universal of image sizes and contrast balance and perform some of operations in order to increase recognition, Features extraction express of them by using histogram , and human visual system (RGB, Opponent). These features using as primary components in suggestion system instead of using all data of any image in this system. Data base providing represent all features are extraction from images input and save in data base (Reference data in suggestion system) [7].

6. Algorithms :

The research include two algorithms for recognize many images which design by students. Later compare then with reference image. Algorithms depend on

certain properties from images that was use in recognition method as the following :

6.1 Recognition by using histogram:

In this approach , we will use histogram for each input images as well as reference image and matching perform operation on them. The detection of matching ratio required histogram drawing and convert image to gray level in previously. Finally these approach will has ability of deal with image that have rotate or merrier in certain angle.

```
Recognition By Using histogram algorithm
   Image Reading (BR1,BR2,…,BRn)
   Image Preprocessing (BR1,BR2,…,BRn)
  Convert Image to histogram (BR1,BR2,…,BRn,H1,H2,…,Hn)
  Data base building (H1,H2,…,Hn,DBH)
  For I = 1 to n
    Matching (H1,DBH(I),ma)
    Match(I) = ma
  End for
End Recognition By Using histogram algorithm
```

BR1 : Reference image.

BR2,BR3,…,BRn : Test Images

H1 : Histogram Of reference Image

Ma : The ratio matching between any image in database and input image.

Match : Matrix of matching ratio.

DBH : Data base of System.

6.2 Recognition by using human visual system

This algorithm will not require convert image from color to gray-level, we know the convert operation causes lose a lot of important details which we can't recognize it without use recognition in computer vision ; therefore , we depend on two color system for built algorithm as the following :

6.2.1 Recognition by using RGB

These approach will analysis each images (test and reference images) to three essential color red, green, and blue then the matching operation is performing on all images in system , each image will have table consist of three fields and we choice maximum matching ratio among these test images.

6.2.2 Recognition by using opponent color space

In this way , we will depending on opponent color space for recognize building images set. Algorithm as following:

```
Algorithm recognition by using HVS
  Image Reading (BR1,BR2,…,BRn)
  Image Preprocessing (BR1,BR2,…,BRn)
Convert Image to HVS (BR1,BR2,…,BRn,X1,Y1,Z1,X2,Y2,Z2,X3,Y3,Z3…,
Xn,Yn,Zn)
  Data base building (X1,Y1,Z1,X2,Y2,Z2,X3,Y3,Z3…, Xn, Yn, Zn, DBHVS)
  For i = 1 to n
    Matching (DBHVS(i), X1, Y1, Z1,ma)
    Match(i) = ma
  End for
End Recognition By Using HVS algorithm
```

BR1 : Reference image.
BR2,BR3,…,BRn : Test Images
X_i, Y_i, Z_i : They mean either Red, Green and blue or L, R-G and R-Y in all image in system.
DBHVS : It's mean data base either in RGB system opponent color space for test image.
Matching : Procedure for compute the best matching ratio among reference and test image by depending human visual system, The way which is used for matching called surface[8], which can be use as matching score between two images vectors. This way is depending on the equation (3).
Match : array contain matching ratio for all test images.

$$E_D = \sqrt{\frac{N}{1 / N \sum_{i=1} D(Im_1(i), Im_2(i))}} \quad \text{... (4)}$$

Where D represent the distance between reference image pixel (im_1) and the input image

pixel (im_2).

N The numbers of pixel in images.

7. Experiments

In this experiment we will take set of images are acquire from many student by digital camera, these image are getting in difference angles from reference image, as well as using images are drawing via student, such as the last test images. Finally the table (1.1) and table (1.2) clear the results of many test images (column1,column2) with reference image in figure (1.7) :

Name of image	Test(1)In Histogram			Test(1) In RGB			Test(1) In Opponent	Final Result
		R	G	B	L	B-G	B-Y	
1	23.047	14.365	20.049	20.049	100	81.213	14.365	100
2	21.875	62.427	64.575	65.7	1.1174	83.987	62.427	83.987
3	21.0938	100	78.307	78.307	100	78.307	100	100
4	17.9688	35.831	28.599	28.599	100	59.175	35.831	100
5	10.5469	80.197	81.213	81.213	100	94.45	80.197	100
6	2.7344	14.365	11.66	11.66	100	57.992	14.365	100
7	5.4688	40.922	47.982	42.948	81.998	57.201	47.982	81.998
8	10.9375	41.255	46.863	42.265	47.982	93.011	41.255	93.011
9	10.5469	54.842	46.495	49.902	71.958	49.502	54.842	71.958

Table (1.1) clear recognition ratio between reference image and test images (column1) in fig.(1.7)

Name of image	Test(2)In Histogram			Test(2)In RGB			Test(2)In Opponent	Final Result
		R	G	B	L	B-G	B-Y	
1	23.047	17.395	24.593	24.593	100	91.604	17.395	100
2	21.875	62.427	64.575	65.7	1.1174	83.987	62.427	83.987
3	20.7031	47.982	58.936	58.936	100	68.069	47.982	100
4	19.1406	39.609	31.401	31.401	100	59.175	39.609	100
5	12.5	62.427	47.233	47.233	100	59.942	62.427	100
6	1.9531	27.78	22.288	22.288	100	58.511	27.78	100
7	7.0313	34.023	35.831	32.263	81.43	57.251	35.831	81.43
8	11.3281	65.7	68.689	68.069	35.831	98.767	65.7	98.767
9	12.5	40.591	39.935	62.952	71.976	31.685	40.591	71.976

Table (1.2) clear recognition ratio between reference image and test images (column2) in fig.(1.7)

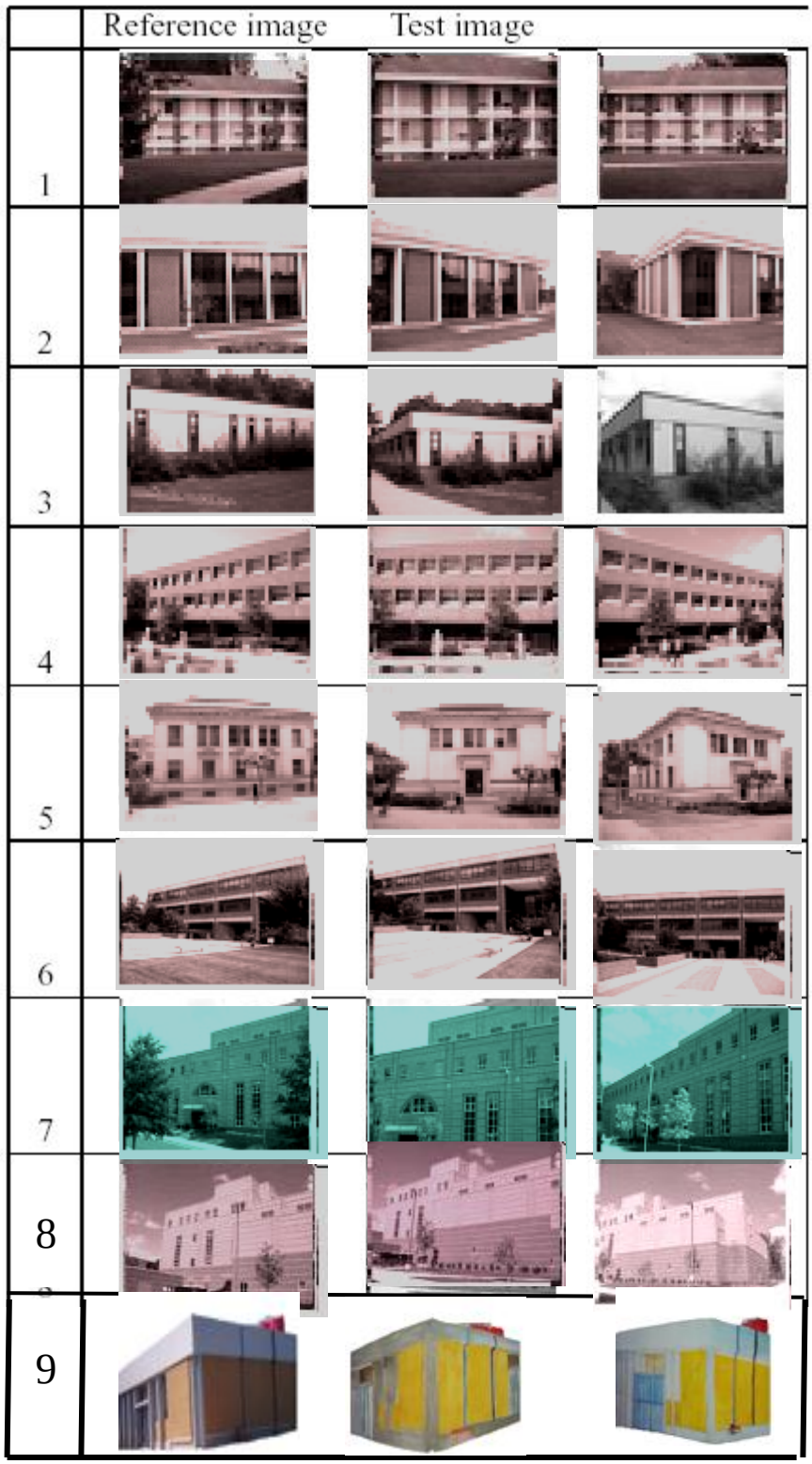

Fig. (1.7) clear set of tests and references images

8. Conclusion

From experiment results we can remember some important points :

1- we using some approaches which treatment with part of image data instead of using all of them. Throughout depending on histogram and essential color extraction for image, that is increase of perfect process and obtain on the best result.

2- The nature of images which we want recognition them may be difference in merrier, rotat and some time contains movement parts, the approaches in this research passed this problem which is come with input image.

3- Experiments results, we note the most thing influence of the results recognition at finding noise in the image.

The main object of this research is to explain the suggested methods in the field of image recognition and writing its algorithms, and make as a very explains surface matching using these methods in order to be a basis for future studies about the activity and the table of each methods and the extant of its use at matching.

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