Application of Chebyshev Distance and Minkowski Distance to CBIR Using Color Histogram

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***Abstract*— Vast growth in computer technology results in the vast growth of digital images because of which we require powerful content based image retrieval. content based image retrieval works on automatic indexing retrieval. Indexing retrieval is perform on visual patterns and semantic features. However user face difficulties while describing their information to content based image retrieval. In this paper we study method based on color histogram approach. The efficiency of this method is calculated and results are shown. The focus of this paper is to make content based image retrieval method more effectual. More developments are required to create better performance in image retrieval.**

I. INTRODUCTION

Content based image retrieval performs on the low level features such as color texture and shape.we can differentiate images by their visual description depending on color shape and texture color is the more specific feature it can be described by color histogram. Image color histogram gives the quantity of color sprayed in an image. Color histogram indicates the no of pixels of particular color ranges. Image retrieval is done by two methods TEXT-BASED and CONTENT BASED approach. Mostly used technique is textual description and categorizing of images. Downside of these methods is people may relate the same image unlikely due to which problem arise while retrieving it again[1]. It is also takes time while dealing with huge database. The resolution to this problem is content based image retrieval.CBIR retrieves the images based on the features extracted from images such as texture shape and color without taking in to account the description given to the images. In past years many CBIR techniques are developed, the common motive for them is to extract a desire image[2]. It is very easy work for human comparing the two images and determining whether they are same or not but for computers it becomes different task issue. Color histogram is used in various CBIR approaches.Reaserchers proves that CBIR has drawbacks. Two drawbacks in text based image retrieval are, we manually gives the description to the images which is very time consuming and costly[3]. Second different human will give different description for the same image. Additionally there are several images also which we cannot define in words. Because of these two issues we require more efficient technique like CBIR.

II. FEATURE EXTRACTION

Feature extraction of an image is based on two techniques in first one we can extract the textual information or keywords and in second we can extract the features based on color shape and texture. These extracted features of query image and images from database are stored in database[3].

A. Color

Color is an most important visual factor in an image. . there are many color spaces models are available we are using RGB Color spaces model. Histogram of an query image is created and then it is compared with the histogram of other images in database[4]. Depending upon this comparison most matching histogram image is retrieved.

B. Shape

In image any object is identified by its shape there are many shape descriptors are available but some of it not able to explain variations in shapes for ex. shape of an object is from its various views it may be scaled or rotated or made any changes[5]. We can use entire shape region for shape detection for which we require region based descriptors[5].

C. Texture

When we see towards image without considering its color we can see only structural arrangement this structural arrangement is call as texture of an image. We can find out texture of an image by converting texture in to two dimensional gray level variation. Edge detection is simple texture detection techniques in which only edge pixels are consider which gives the hint of the pattern of the texture[6].

III. COLOR HISTOGRAM

Color histogram shows the color distribution of each color in histogram format. Histogram showing color level for three color R G B is called as three color histogram's Three color histogram shows the brightness distribution for each color individually.grey scale histogram can be used to identify the object for this color image is transferred to grey level image[9]. Histogram values are calculated and according to which images are extracted from the database[7]. Following figure shows the RGB content for an image.

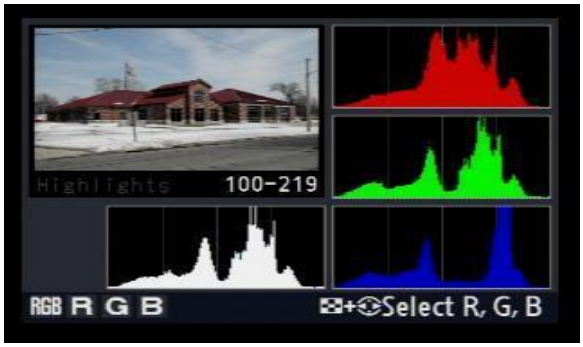

Fig 1 : R,G,B Content

IV. PRAPOSED ALGORITHM

Following Fig shows the flowchart of proposed algorithm in which features are extracted for the images from the database on the basis of color shape and texture and are stored[8]. Then features are extracted for the query image and these features are compared with the features from the database. Comparison between these features is done by similarity measurement techniques.

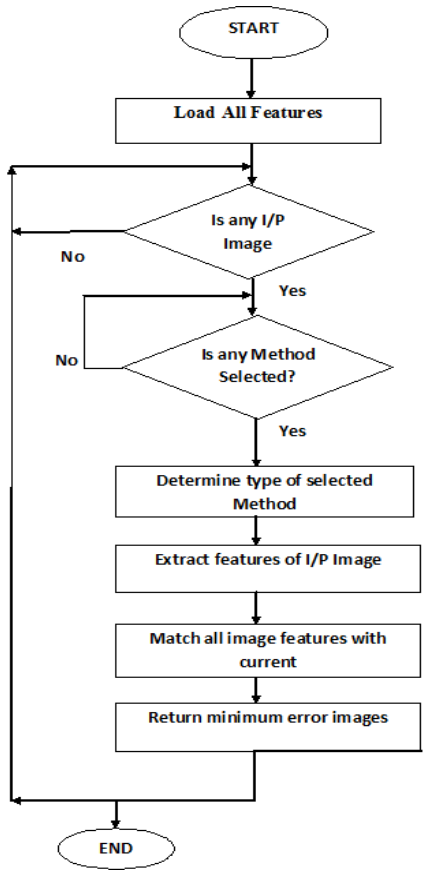

Fig 2 : Flow chart of algorithm

The various steps involved in implementation of content based image retrieval are as follows.

1. Take any image from the database as a query image
2. Select any similarity measurement technique.
3. Extract the features of query image.
4. Match all features of query image with database features.
5. After extracting all the features the best matching image will be represented as an output image.
6. Load the database and read the image.

V. SIMILARITY MEASUREMENT TECHNIQUES

A. Chebyshev *Distance*

Chebyshev distance is also known as the maximum metric. Another term is the **chessboard distance**, as it can be illustrated on the real number plane as the number of moves needed by a chess king to travel from one point to the other. The Chebyshev distance

between two vectors or points *p* and *q*, with standard coordinates p_i and q_i, respectively, is

$$D_{\text{Chebyshev}}(p,q) := \max_i(|p_i - q_i|).$$ .....Eq 1

B. Minkowski distance

In a normed vector space distance between two points is calculated by Minkowski distance It is generalization of both the Euclidean distance and the Manhattan distance.

$$d_{ij} = \{|x_i - x_j|^n + |y_i - y_j|^n\}^{1/n}.$$ .... Eq. 2

When n=1.it becomes city-block distance, when n=2 it becomes city block distance.Chebyshev distance is a special case of Minkowski distance with n=100 taking limit.

VI. EXPERIMENTAL ANALYSIS AND RESULT

Database of 1000 images of 10 types is created query image is provided according to which similar images are retrieved and displayed. Performance of Chebyshev Distance and Minkowski distance is measured depending upon this retrieval. These test images are shown in Fig.

Fig 3:Test Images

The image of 'Dinosaur' and 'road in jungle' is used as query image and images are retrieved for it using Chebyshev *Distance* And Minkowski distance techniques these results are shown in Fig.

Fig.4: Retrieval result for Chebyshev *Distance*

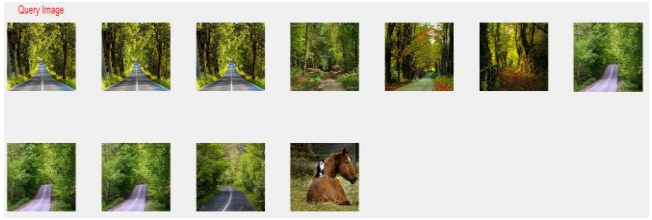

Fig.5: Retrieval result for Minkowski distance

To calculate the retrieval efficiency we are using the standard parameter such as precision and recall [5].

Precision = Number of relevant images retrieved / Total number of retrieved images ……. (4)

Precision is calculated a high precision value shows a good performance in retrieval. The performance of Chebyshev Distance *and* Minkowski distance is tabulated in following tables.

Table 1 : Calculation of precision for chebyshev

Images	**Precision (%)** Chebyshev Distance				
	N = 1	**N = 5**	**N = 10**	**N = 15**	**N = 20**
69	100.00	100.00	100.00	93.33	90.00
146	100.00	100.00	80.00	80.00	85.00
200	100.00	40.00	50.00	60.00	60.00
320	100.00	80.00	80.00	80.00	75.00
405	100.00	100.00	90.00	93.33	100.00
530	100.00	100.00	100.00	100.00	100.00
609	100.00	80.00	80.00	73.33	93.33
700	100.00	100.00	100.00	100.00	100.00
827	100.00	100.00	80.00	66.66	70.00
922	100.00	100.00	100.00	100.00	95.00

Table 2 : Calculation of precision for minikowaski

Images	**Precision (%)** Minkowski distance				
	N = 1	**N = 5**	**N = 10**	**N = 15**	**N = 20**
69	100.00	40.00	100.00	93.33	90.00
146	100.00	100.00	80.00	80.00	85.00
200	100.00	40.00	50.00	60.00	60.00
320	100.00	80.00	80.00	80.00	75.00
405	100.00	100.00	90.00	93.33	100.00
530	100.00	100.00	100.00	100.00	100.00
609	100.00	80.00	80.00	73.33	93.33
700	100.00	100.00	100.00	100.00	100.00
827	100.00	100.00	80.00	66.66	70.00
922	100.00	100.00	100.00	100.00	95.00

Recall = Number of relevant images retrieved / Total number of relevant images

Table 3 : Calculation of recall

Images	Recall(%)	
	Chebyshev	Minkowski
69	85.00	70.00
146	62.50	60.00
200	70.00	55.00
320	66.25	58.75
405	76.25	70.00
530	85.00	58.75
609	81.25	37.50
700	70.00	60.00
827	83.75	58.75
922	76.25	62.50

VII. CONCLUSION

Single feature of an image is not sufficient to explain the data of an image we need to include the information provided by other features also to achieve high retrieval efficiency. We proposed method which retrieves the images based on color, shape and texture features. For similarity matching between features of two images we also need an efficient matching technique. We use three different techniques Chebyshev *Distance* and Minkowski distance. Experimental results revels that performance of Chebyshev *Distance* techniques is high as compared with Minkowski distance techniques.

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