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Multi Dimensional comparison techniques of image for image retrieval

Arati D.K, Dr. Parveen Kumar

***Abstract*— Databases for multimedia have been drastically changed in recent past. In order to increase efficiency to retrieve the desired images from a large different formats of image database, the development of a content-based image retrieval (CBIR) technique has become an important research domain. Image retrieval is possible using prominent algorithmic and comparison approach where images are extracted to make comparison with query image.**

This paper proposes image features are compared based on pair wise Euclidean distance between query image and database image based on various methods like city block, minkowski, chebychev, cosine, correlation, spearman.

***Index Terms*— city block, minkowski, chebychev, cosine, correlation, spearman**

I. INTRODUCTION

Human vision is the most advanced and important among all our senses, and as such it gathers a majority of information or data from the real world by visual sense. The era has experienced unparalleled growth in the availability , number and importance of images in all dimensions of life. As the huge size and large diversity of collections of digital image collections have grown fast, an efficient image retrieval method is becoming increasingly significant and important too. From large image databases it is difficult to search and retrieve images with traditional text searches because the process of user based annotation has become very tedious and time consuming, as the text often fails to convey the rich structure of images. A prominent content-based retrieval system solves this problem significantly, where the retrieval is based on the automatic matching of the feature of the query image with that of the image database through some image-image similar parameters evaluation. Therefore, images will be indexed based to their own visual content parameters, such as texture, shape and color or any other feature or a combination of set of visual features.

Color Histogram is one of the widely used techniques for the colour feature extraction in colour-based image retrieval. Color Histogram is a process for describing the color content in the image. It is constructed by counting the number of pixels of each color. There are two conventional techniques for the colour-based image retrieval: Global Color Histograms (GCH) that represents image with single histogram and Local Color Histograms (LCH) that divides image into fixed blocks and there after constructs its color histogram for each block. Global Color Histograms lacks in capturing the content of images adequately, whereas Local Color Histograms contain more information and also enable the colour distances among regions between images to be compared [Gaurav Jaswal *et al*., 2012].

Arati D.K, Research Scholar ,Computer Science and Engineering, NIMS University , Jaipur. Rajasthan, India.

Dr. Parveen Kumar, Professor,(CSE), NIMS University , Jaipur. Rajasthan, India.

II. OBJECTIVES OF RESEARCH WORK.

Based on the research background and the related issues, the objectives of this research have been formulated as follow:

1. Very first step in proposed work is creation of database of features that are extracted .
2. Instead of extracting features of database images after receiving query image will be time consuming so we will store features itself in database which will enable much faster execution and obtaining retrieved image.
3. A simple GUI will be created for creating, updating, and loading database.
4. Select query image and various comparison methods are applied and display retrieved images.

5. Features of query image are extracted. Feature vector from stored database is retrieved and it will be compared one by one , to determine degree of closeness of images. Then these comparison results are sorted in descending order.

6. First 'n' images will be displayed as result which shows close match to query image.

III. COMPARATIVE ANALYSIS AND STATISTICAL CONSIDERATIONS

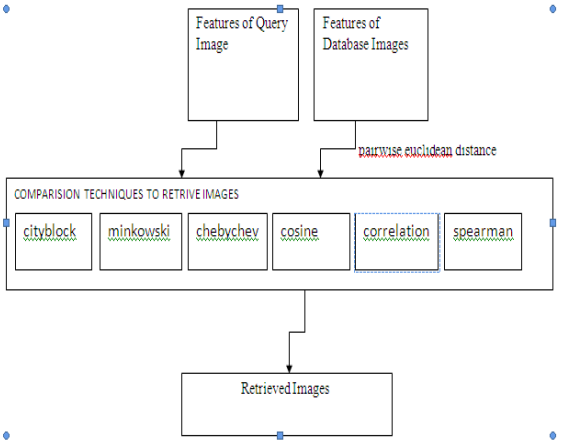

Fig 1: Comparative Analysis

Following pairwise distance calculation methods play major role in finding correct match between query image and database image

Given an *mx*-by-*n* data matrix X, which is treated as *mx* (1-by-*n*) row vectors x_1, x_2, ..., x_{mx}, and *my*-by-*n* data matrix Y, which is treated as *my* (1-by-*n*) row vectors y_1, y_2, ...,y_{my},

the various distances between the vector x_s and y_t are defined as follows:

- **Euclidean distance**

$$d_{st}^2 = (x_s - y_t)(x_s - y_t)'$$

Notice that the Euclidean distance is a special case of the Minkowski metric, where p=2.

- **Standardized Euclidean distance**

$$d_{st}^2 = (x_s - y_t)V^{-1}(x_s - y_t)'$$

where V is the *n*-by-*n* diagonal matrix whose *j*th diagonal element is $S(j)^2$, where S is the vector of standard deviations.

- **Mahalanobis distance**

$$d_{st}^2 = (x_s - y_t)C^{-1}(x_s - y_t)'$$

where C is the covariance matrix.

- **City block metric**

$$d_{st} = \sum_{j=1}^{n} \left| x_{sj} - y_{tj} \right|$$

Notice that the city block distance is a special case of the Minkowski metric, where p=1.

- **Minkowski metric**

$$d_{st} = \sqrt[p]{\sum_{j=1}^{n} \left| x_{sj} - y_{tj} \right|^p}$$

Notice that for the special case of p = 1, the Minkowski metric gives the City Block metric, for the special case of p = 2, the Minkowski metric gives the Euclidean distance, and for the special case of p=∞, the Minkowski metric gives the Chebychev distance.

- **Chebychev distance**

$$d_{st} = \max_j \left\{ \left| x_{sj} - y_{tj} \right| \right\}$$

Notice that the Chebychev distance is a special case of the Minkowski metric, where p=∞.

- **Cosine distance**

$$d_{st} = \left(1 - \frac{x_s y_t'}{\sqrt{(x_s x_s')(y_t y_t')}} \right)$$

- Correlation distance

$$d_{st} = 1 - \frac{(x_s - \bar{x}_s)(y_t - \bar{y}_t)'}{\sqrt{(x_s - \bar{x}_s)(x_s - \bar{x}_s)'}\sqrt{(y_t - \bar{y}_t)(y_t - \bar{y}_t)'}}$$

where

$$\bar{x}_s = \frac{1}{n}\sum_j x_{sj}$$ and

$$\bar{y}_t = \frac{1}{n}\sum_j y_{tj}$$

1. <u>Merits.</u>

- Robust Comparison Methods of image retrieval
- Analysis of efficient method.
- Time efficient techniques

2. <u>Demerits.</u>

- Manual comparison.

3. <u>APPLICATIONS:</u>

- Medical Imaging.
- Scientific Databases.
- World Wide Web.

IV. CONCLUSION.

This paper proposes to retrieve images with efficient algorithm for classification and retrieval. The above mentioned techniques of comparison will provide an idea that which algorithm /algorithms will be retrieving most relevant images matching with the query image. Image retrieval parameters should be chosen in such a manner so that retrieval algorithm retrieve most relevant images. Further after implementation we can calculate precision and recall.

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