Image identification with Speech Interface : A Learning Application for Small Kids

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ABSTRACT – In this work we have develope a learning application for small kids.This is an approach to achieve good image retreival performance on android platform. The system is able to recognize image and subsequently generate voice as name of image. The content base image retrieval plays an important role in image retreival metthod. The colour feature extraction is done by colour coherence vector(CCV). Each pixel from the queried image is given to colour bucket to check whether it is coherent or incoherent. A colour coherent vector stores the number of coherent versus incoherent pixel with each colour. By seperating coherent pixels from incoherent pixel, CCV's provide finer distinctions than colour histograms. The texture feature extraction is done by co-occurance matrix. Dspeech engine is used to convert text into voice.

KEYWORDS - Feature Extraction, Image Retrieval, Similarity matching, Gray Level Co-occurance Matrix(GLCM), Content Based Image Retrieval (CBIR)

I. INTRODUCTION

In the smart era, digitization is growing in every sector. It is very easy to grasp the world with image rather than orally and theoretically. Actually it is very helpful for small kids. They will able learn and understand image by visualization. To avoid textual description CBIR techniques are developed, it will retrieve image from its features in their contents like texture, colour.

II. RELATED WORK

Fatemeh Alemdara and Mohammad Rera Kevyanpoura introduces a comparative study on three feature extraction techniques that based on color feature. Each technique is applied to retrieve images from WANG database. The comparison is done by measuring the accuracy, the error rate and elapsed time. The paper shows that HSV color. Histogram is the most efficient feature extraction technique. Indeed, the correlation coefficient is best feature similarity measure method.

In order to overcome the difficulties of text based search, Content Based Image Retrieval System was proposed in 1990. The CBIR system has wide application in various fields, in Biomedicine fields. E.g. X-ray, CT, medical diagnosis and security filtering, art galleries.

The recent work also introduced Content Based Image Retrieval based on color and texture feature. The group of researchers initiated experiments on CBIR system based on color and textures also generic algorithm to improve the performance of CBIR in android mobile system based on color and textures and also algorithm to improve the performance of CBIR in android mobile system. The color feature extraction done using color histogram while texture feature extraction done by Gray Level Concurrence Matrix (GLCM).

III. TEXTURE FEATURES

An important feature of an image is texture. In image processing three approaches are developed to describe the texture of particular region these are structural, statistical and spectral. The common second order statistic is Gray Level Co-occurrence matrix. It include image features such as entropy, homogeneity. The texture feature describes smoothness and uniformity.

A. Gray Level Co-Occurrence Matrix(GLCM)

Harlick in 1973 proposed GLCM method for extraction of texture features from images. He suggested about 14 features that can be used for image feature extraction, such as Contrast, Correlation, Inverse difference moment, Entropy, Difference Variance, Energy, Entropy, Contrast, Correlation and Homogeneity. A GLCM is based on conditional probability density function.

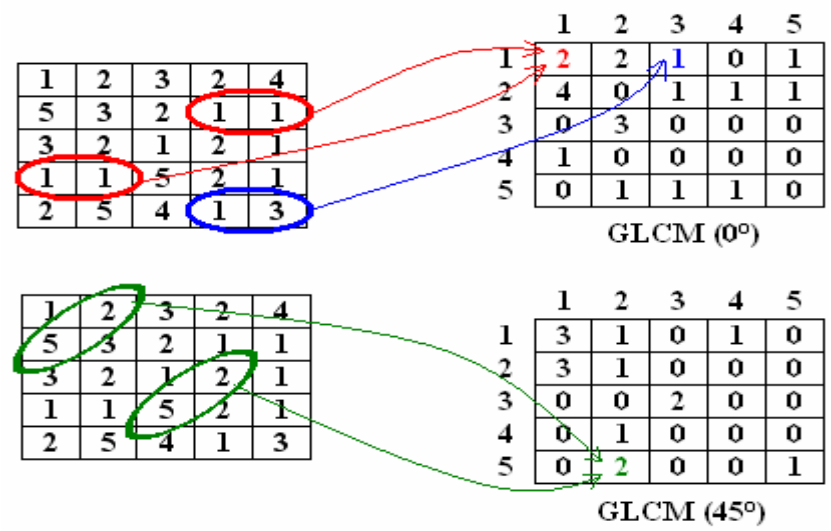

Fig 1. Image region Gray Level Co-Occurrence Matrix

A GLCM is represented as a Matrix. In which the number of rows and columns is equal to the number of gray level in the image. The matrix contains element P(a,b | d, θ). This gives the relative occutances of tow pixels, separated with distance d. The θ gives the direction with particular angle. Further the texture featured are calculated with the help of generated Gray Level Co-Occurrence Matrix.

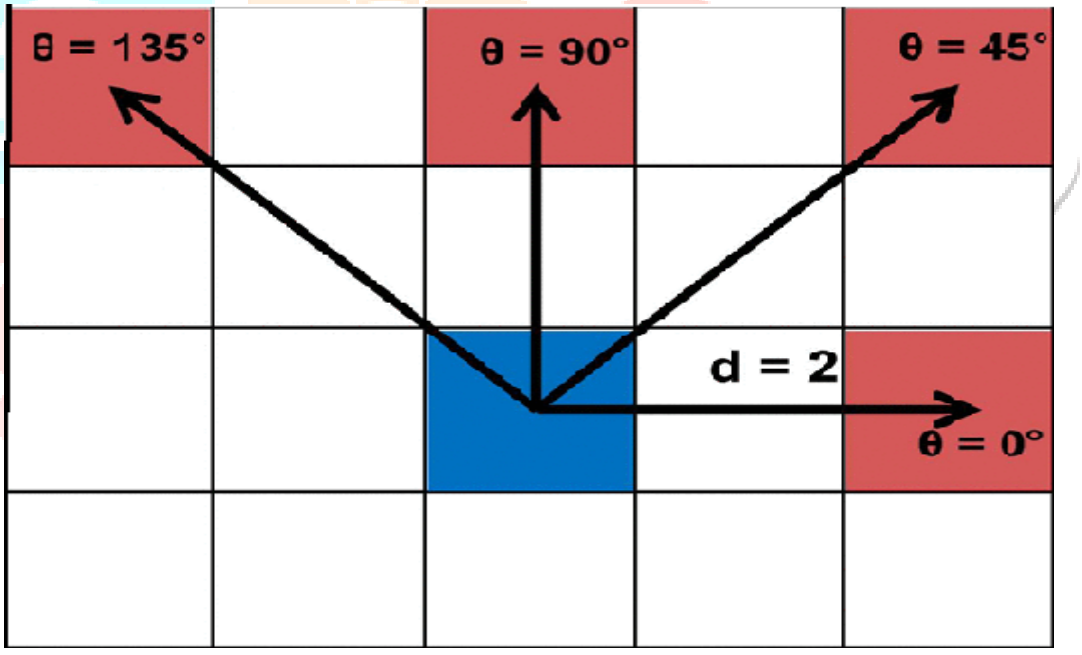

Fig. 2. Spatial relationship of pixels

B. Gray Level Co-Occurance Matrix Algorithm

The algorithm can be given as follows

i. Count total number of pixel pairs having first pixel a and second pixel value b at distance d with some angle θ respect to first pixel.
ii. Enter the total count of pixel pairs in a-th two and b-th row column of Gray Level Co- Occurance Matrix P[a,b].
iii. The GLCM P[a,b] is non-symmetric. It is not necessary to have same number of rows and columns in original matrix and gray level matrix.
iv. The normalization of matrix P[a,b] can be done in order to simplify the calculations. Normalization can be done by dividing all pairs by total number of pairs of pixel.
v. Normalized GLCM can be given as:

$$N[a,b] = \frac{p[a,b]}{\sum_a \sum_b p[a,b]} \quad (1)$$

C. TEXTURE FEATURES EXTRACTION PARAMETERS

1. Entropy: It measures the randomness which can be used for texture analysis of an image.

$$\mathbf{T} = \sum_a \sum_b \big(k(a,b)\big) \log\big(k(a,b)\big) \quad (2)$$

2. Energy : It is the sum of squared values in the GLCM.

$$E = \sum_a \sum_b (k(a,b))^2 \quad (3)$$

3. Contrast : It is the difference in visual properties which makes one object distinguishable from other object and background also.

$$\mathbf{C} = \sum_{\mathbf{a}} \sum_{\mathbf{b}} (\mathbf{a}-\mathbf{b})^2 (\mathbf{k}(\mathbf{a},\mathbf{b})) \quad (4)$$

4. Homogenity : It represents uniformity in size, color, shape.

$$H = \sum_a \sum_b \frac{k(a,b)}{1+|a-b|} \quad (5)$$

IV. COLOR FEATURE EXTRACTION

Color is again one of the crucial feature of an image. There were many colour feature extraction techniques are discovered like Color Histogram, Color Coherence Vector (CCV). CCV descriptors contain information about color spatial distribution.

A. Color Coherence Vector

In Color Coherence Vector (CCV) each pixel is characterised as either coherent or incoherent. Coherent pixels are part of large similarity colored region. Coherent pixels are included in big connected components while incoherent pixels are included in small connected components.

B. Color Coherent Vector Algorithm

The color Coherence Vector Algorithm can be stated as :

1. Blur the image by replacing each pixel's value with the average value of the 8 adjacent pixels surrounding that pixel.
2. Discretize the Color- space into n distinct Color.
3. The computation of coherent or incoherent pixel is done in following steps.
4. Determine the tqu's value (a user defined value, normally about 1% of image size).
5. Any Connected Component has number of pixels more than or equal to tau then its pixels are considered as coherent and others are incoherent.
6. For each color there are two values
   a. C is number of coherent pixels.
   b. N is number of incoherent pixels.

C. Similarity Matching Algorithm

Similarity matching plays a very important role in CBIR system. It evaluates the amount of similarities between multiple images in order to retrieve from database.Euclidian distance is one of the technique to measure the similarity. It can be given as:

$$ED = \sqrt{\sum_{i=1}^{N} (p_i - q_i)^2} \quad (6)$$

V. ANDROID OPERATING SYSTEM(OS)

In today's world near about all mobile phones supports android operating system. The current smartphones supports iOS, Windows, Android and Black Berry OS. The today's smartphones supports various services like internet, email, communication via infrared or Bluetooth, storage of contacts and notes and multimedia. Android is basically developed by Google. Here in this work we are using Android OS for retrieving images in mobile phones.

A. CBIR in Android

Content Based Image Retreival system takes query image as an input and the database images. The feature of query image is get compare with database in order to retrieve the relevant images.

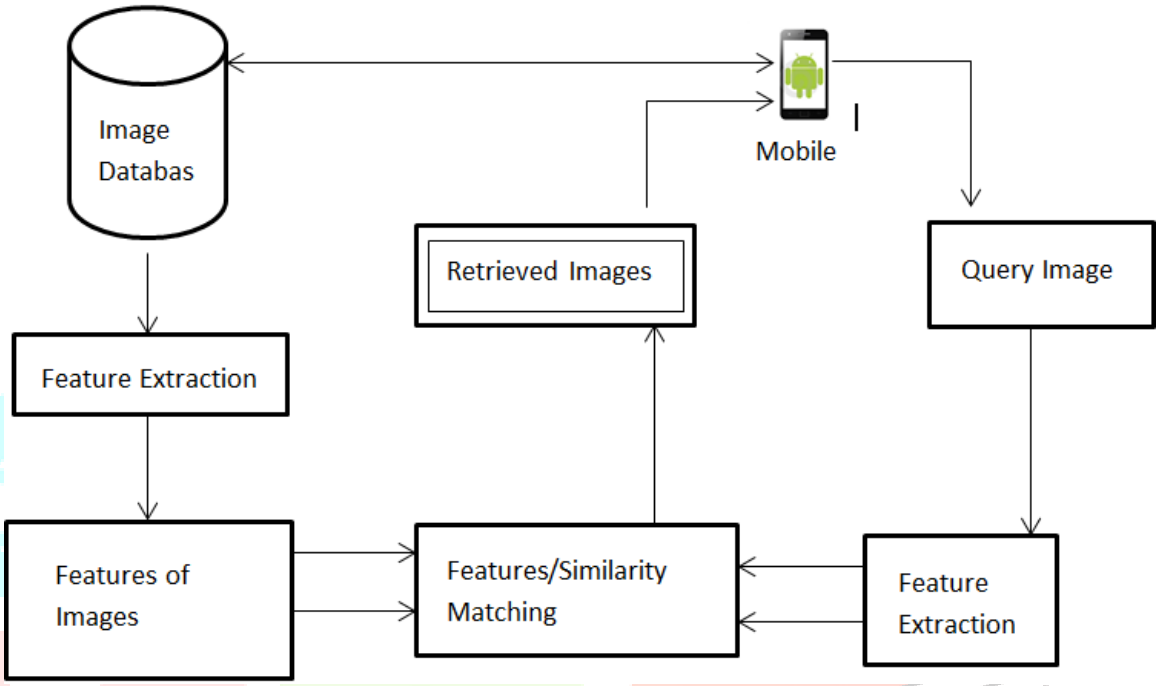

Fig 3. CBIR Android Architecture

VI. CONCLUSION AND FUTURE SCOPE

The proposed system is developed for small kids. The proposed algorithm is content based image retrieval for Android mobile environment. The image retrieval is based on integration of color coherence vector and Co-occurrence matrix. Euclidian distance is used to find similarity. The system identifies images and respectively generates the voice as an output, followed by the similar images. It is expected that proposed system will generate more reliable and similar results. The various distance matrics are used as a classifier to find similarity. The integrated method of color and texture give better result than the single color image retrieval.

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