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Content Based Image Retrieval Using Artificial Neural Network

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Abstract: *Digital Image Processing domain is constantly contributing to make digital era more concise. Specifically Image Retrieval is the trending research area now-a-days. The main problem is, with the increasing volume of digital data the complexity of searching a specific image and retrieving the particular data associated with it is increasing. In recent years the content based image retrieval system has been developing at enormous speed. This paper color , gray level co-occurrence and histogram features are obtain better retrieval efficiency from large database using these feature vectors near about similarly matched images are retrieved. We have retrieved using Euclidian distance and ANN, among of both ANN Shows better result compare to Euclidian Distance based image retrieval.*

Keywords: Digital Image Processing, ANN

I. Introduction

Very massive collections of images are growing quickly because of arrival of cheaper storage devices and also the internet. Finding an image from a huge set of images is very challenging task. One solution to this problem is to label images manually. But it is too expensive, time consuming and not feasible for several applications. Moreover, the labeling process depends on the semantic accuracy in describing the image. Therefore, many content based image retrieval systems are developed to extract low levels features for describing the image content [1].

In free browsing method one have to go through the entire database till the required data sample is found. Next in the concept based method which is also termed as the text based retrieval method some predefined data have been attached with image or audio file and by comparing that data finally the retrieval is carried out. Lastly in the content based retrieval method the search of specific content of the information is carried out and then the main image is extracted. The technologies present mostly uses the concept based and the content based image retrieval scheme. The attachment of predefined data to a typical data file is a tedious job as, it requires human intervention also so much time consuming.

In the content based image retrieval method a typical feature is taken into consideration. Feature can be defined as an attribute that can capture a definite visual property of an image.

II. Literature Review

An approach is proposed for retrieval based on combination of color, texture and edge features of image. Performance evaluation of studied image retrieval techniques and proposed technique is done using parameters like sensitivity, Specificity, Retrieval score, Error rate and accuracy[2]. In this image retrieval system extraction is based on the averaging method clustering image, revised averaging algorithm to reduce the complexity of extraction and efficiency[3]. Gabor wavelet transform is mostly combining of features of image and the Gabor Wavelet Transform is degrade into distinct scaling and orientation with various of filters to minimize the unwanted information of the images[4]. In this methodology only the color feature get extracted from image and at first image is divided into 16 equal sized segment after that the average value of each color component is considered into account[5].

III. Proposed Method

Content based image retrieval (CBIR), also known as query by image content (QBIC) and content-based visual information retrieval (CBVIR) is the application of computer vision techniques to the image retrieval problem, that is, the problem of

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searching for digital images in large databases. Content-based image retrieval is opposed to traditional concept-based approaches. "Content based" means that the search analyzes the contents of the image rather than the metadata such as keywords, tags, or descriptions associated with the image. The term "content" in this context might refer to colors, shapes, textures, or any other information that can be derived from the image itself. CBIR is desirable because searches that rely purely on metadata are dependent on annotation quality and completeness. Having humans manually annotate images by entering keywords or metadata in a large database can be time consuming and may not capture the keywords desired to describe the image. The evaluation of the effectiveness of keyword image search is subjective and has not been well-defined. The overview and functionality of the system is represented in the given block procedure to be followed is:

- User will provide the query formation as input image. Then the visual sable content is described.
- Further then feature vector depicts extracting image features to a distinguishable extent
- Then similarity matching is done to obtain the result that is similar.
- Similarly from image database proceed the following steps and then compare both the feature vector result of query and image database using Artificial Neural Network.
- Finally the comparison of both are indexed and retrieved and provides relevant feedback.

3.1 Color Feature

- Color feature is the most significant one in searching collections of color images of arbitrary subject matter. Color plays very important role in the human visual perception mechanism. All methods for representing color feature of an image can be classified into two groups: color histograms and statistical methods of color representation.

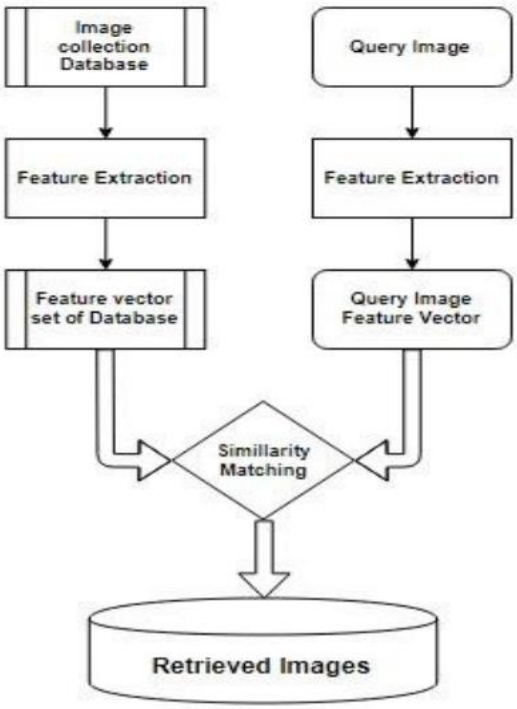

Figure: Block Diagram

3.3 Texture

Texture gives us information on structural arrangement of surfaces and objects on the image. Texture is not defined for a separate pixel; it depends on the distribution of intensity over the image. Texture possesses periodicity and scalability properties; it can be described by main homogeneity, ASM, energy, correlation, dissimilarity, contrast, and sharpness. Texture analysis plays an important role in comparison of images supplementing the color feature.

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3.4 Histogram Feature

The histogram is a popular graphing tool. It is used to summarize discrete or continuous data that are measured on an interval scale. It is often used to illustrate the major features of the distribution of the data in a convenient form. A histogram divides up the range of possible values in a data set into classes or groups. For each group, a rectangle is constructed with a base length equal to the range of values in that specific group, and an area proportional to the number of observations falling into that group. This means that the rectangles will be drawn of non-uniform height.

Color Histogram Color histogram serves as an effective representation of the color content of an image [J. Smith, 1997]. It is easy to compute and effective in characterizing both the global and local distribution of colors in an image. Figure 1.3 is colored image of a cyclist and there is an image next to the histograms for its red, green, and blue values, respectively.

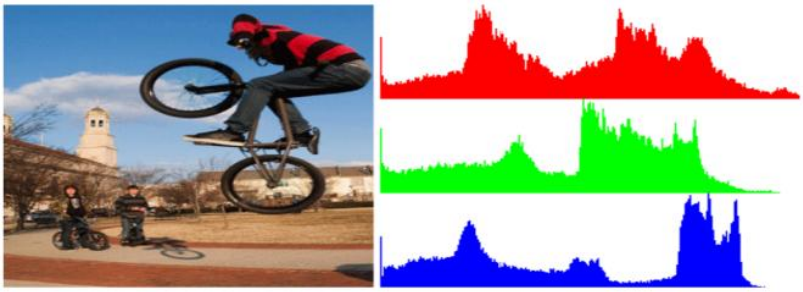
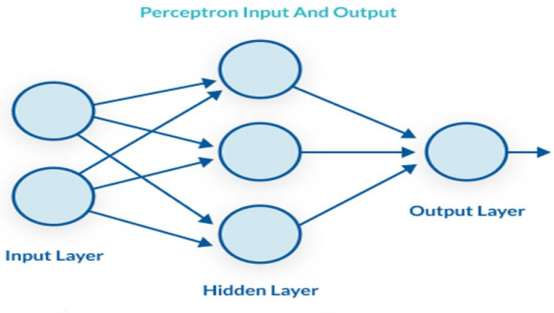


Figure 1: Histogram Representation

3.5 Multilayer Perceptron

A multilayer perceptron (MLP) is a perceptron that teams up with additional perceptrons, stacked in several layers, to solve complex problems. The diagram below shows an MLP with three layers. Each perceptron in the first layer on the left (the input layer), sends outputs to all the perceptrons in the second layer (the hidden layer), and all perceptrons in the second layer send outputs to the final layer on the right (the output layer).



Each perceptron sends multiple signals, one signal going to each perceptron in the next layer. For each signal, the perceptron uses different weights. In the diagram above, every line going from a perceptron in one layer to the next layer represents a different output. Each layer can have a large number of perceptrons, and there can be multiple layers, so the multilayer perceptron can quickly become a very complex system. The multilayer perceptron has another, more common name—a neural network. A three-layer MLP, like the diagram above, is called a Non-Deep or Shallow Neural Network.

An MLP with four or more layers is called a Deep Neural Network. One difference between an MLP and a neural network is that in the classic perceptron, the decision function is a step function and the output is binary. In neural networks that evolved from MLPs, other activation functions can be used which result in outputs of real values, usually between 0 and 1 or between -1 and 1. This allows for probability-based predictions or classification of items into multiple labels.

IV. Structure of a Perceptron

The perceptron, or neuron in a neural network, has a simple but ingenious structure. It consists of four parts, illustrated below.

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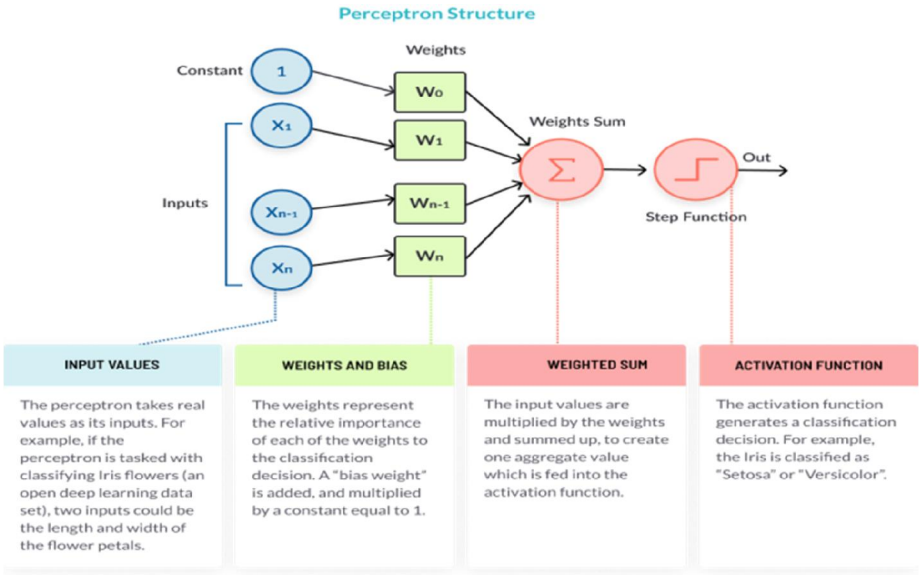
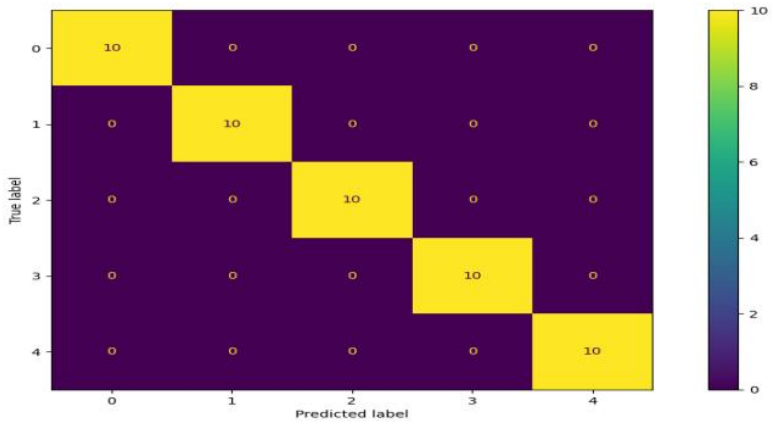


Figure 3: Structure of Perceptron in MLP

V. CONCLUSION

This report reviewed the main components of a content based image retrieval system, including image feature representation, indexing, query processing and query-image matching and user's interaction, while highlighting the current state of the art and the key-challenges. It has been acknowledged that it remains much room for potential improvement in the development of content based image retrieval system due to semantic gap between image similarity outcome and user's perception. We have used machine learning concept for image retrieval which shows the promising result. As compared with equilidian distance result, ANN shows better image retrieval.

VI. RESULT



Confusion Matrix of ANN

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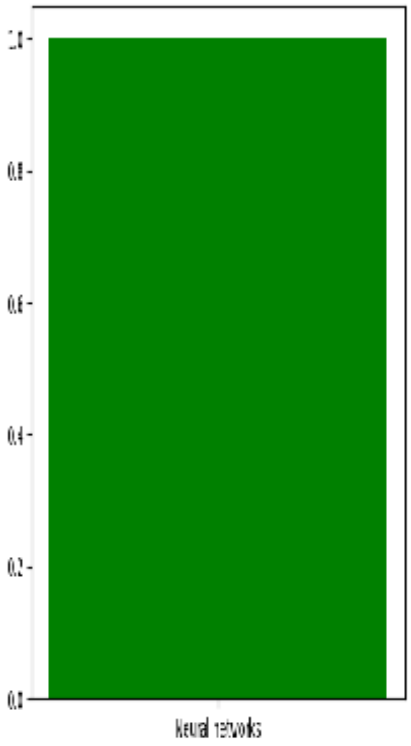

Accuracy bar graph of ANN

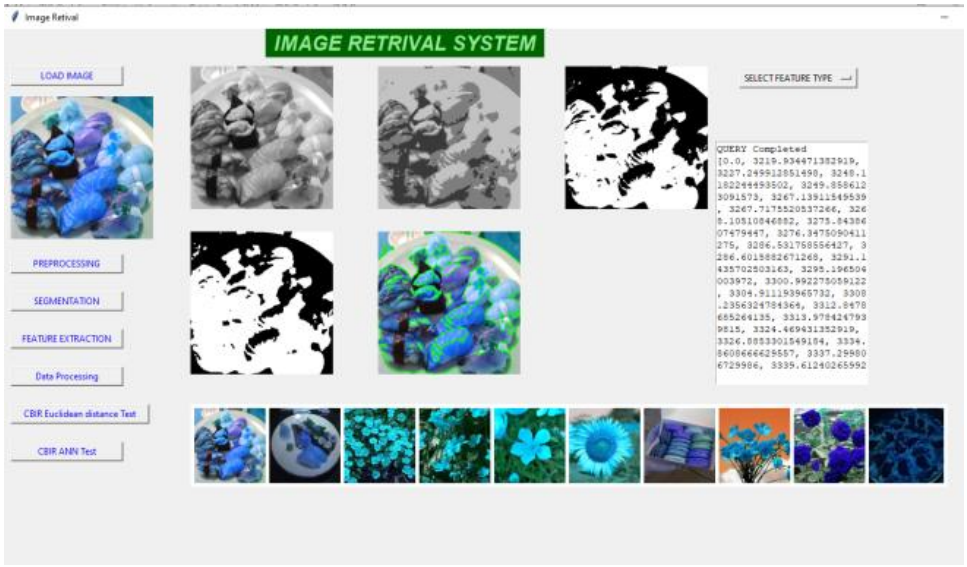

Figure 4: Output result using Euclidian Distance

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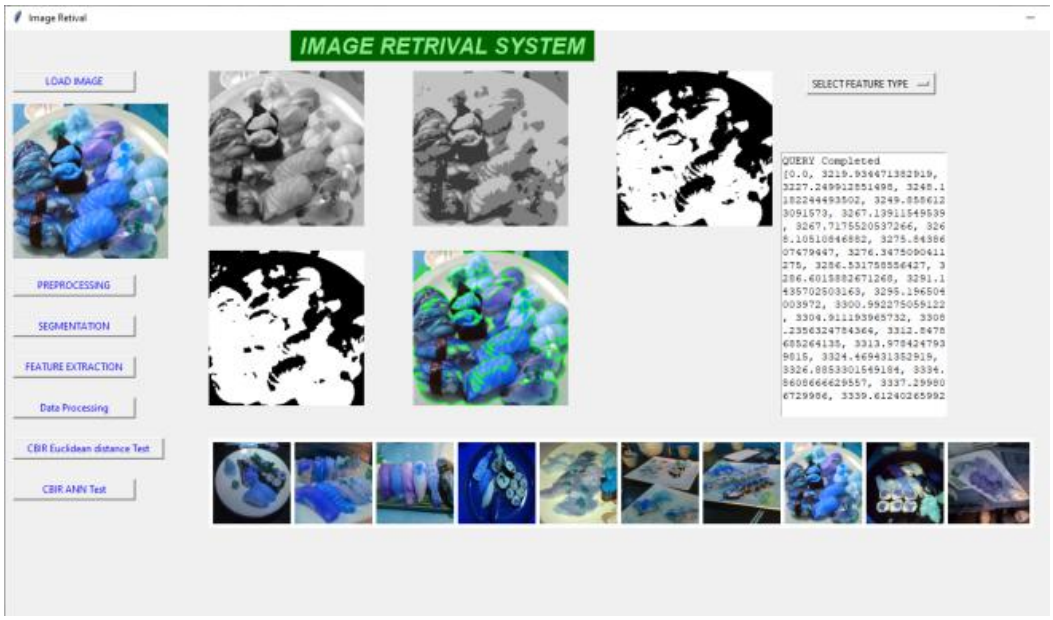

Figure 5: Output Result using MLP

When the user gives the query image the color , Histogram and GLCM feature is extracted and compared with the feature of the images in the database. Features are compared with the color and texture feature in the database. As stated above the all features are extracted and stored in the database.

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