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A Hybrid Approach for Improving Content Based Image Retrieval Systems

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ABSTRACT

In recent years, as there has been an explosive increase in digital image storages, the necessity for effective techniques for providing quality image retrieval results within a search time that is acceptable to users is felt. Image retrieval being considered as a wide area of research, techniques like Text Based Image Retrieval(TBIR), Content Based Image Retrieval (CBIR), etc are undergoing developments and are being studied. The previous techniques have few limitations with respect to semantic gap between the machine description and human perception. We propose to develop a hybrid Image Retrieval System using Text Based Image Retrieval(TBIR) and Content Based Image Retrieval(CBIR) that would provide more accurate image retrieval results closer to human perception.[4]

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I. INTRODUCTION

There has been advancement in technology and computer department in recent times. These advancements have lead to conveniences for usage of digital data and its storage. Interests of researchers are captured in this filed because of the want for accessing the digital data based on its content. There are miscellaneous areas wherein image databases are now employed. A few of them are advertising, art, entertainment, history, medicine and many more. Two different methods for retrieving images are Text-based and content-based retrieval methods. All the key features from an image are extracted in order to extract it in both approaches. The extraction of the indices of an image in first approach is done manually, while they are extracted automatically in the second approach. Text- based image retrieval faces two hitches when the image database is of large size. Huge amount of labour required in manual annotation is the first problem and different results of annotation for a particular image which is caused by the subjectivity of human perception is the other one. Indexing is applied to a particular image using its feature content instead of its keywords in content-based image retrieval. Hence the research being done in content-based image retrieval systems is paced up due the text based indexing. [4] [2]

Based on overall appearance, different applications require various techniques for comparison between different pairs of images. For instance if any user wants all identical images related to a particular image from the search engines storage. [3] A common solution to this above stated problem is the use of color histograms which are used in

many systems. Color histogram is a representation of colors in an image which is used by the systems to compare color features of different images.
In this paper we attempt to increase the efficiency by improving the relevance of the output images using the hybrid approach.

II. Related Tools

01 Language: Java J2SE and JDK

J2SE (Java 2 Standard Edition) Java would be the required as language for development of the project. JDK is the development kit used to compile java programs.

02 IDE: NetBeans

Just like visual studio provides development environment for VB and .Net, NetBeans provides an integrated development environment (IDE) for Java.

03 Database / Data Library

Serialized Objects / Serialization - Database in Java In case the project needs database this is how it is handled in java.

A. First step is to use data structures like Vectors and Lists. These come under Java Collections API

B. Secondly we declare our own classes using these data structures. E.g. a class Student to hold all the student information. Now these classes need to be pre-compiled and called within Java application as libraries. This is called as a Java Class Library

C. Now class objects cannot be saved to hard drive directly. We need to convert these objects to bytes so that they can be saved to hard drive. To do this we must use a concept called as Serialization. Basically it is a concept where in objects are converted to byte streams so that they can be saved to hard drive or sent via internet and vice versa. The reverse process is called as deSerialization.

D. Finally to save these bytes to hard drive or to send them via network we need Java I/O.

03 Client-Server Architecture using Serialized Objects / Serialization

In case the project needs client-server communication this is how it is handled in java.

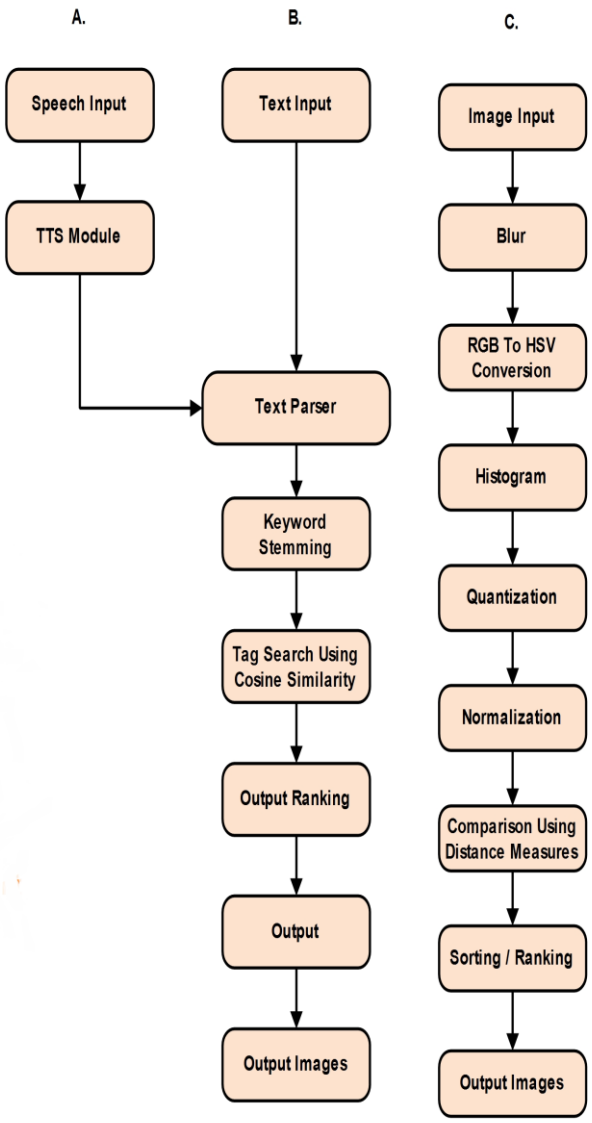
A. First step is to use data structures like Vectors and Lists. These come under Java Collections API.

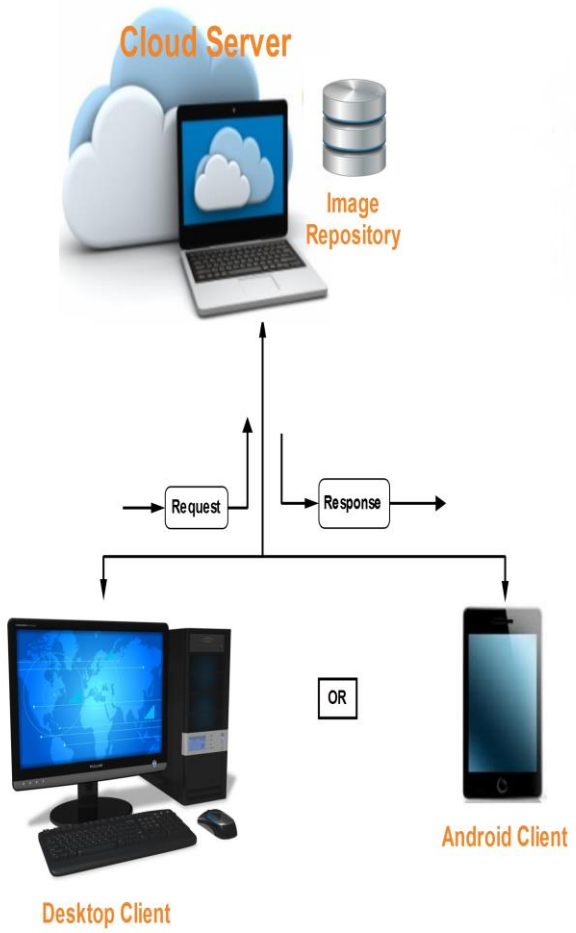
B. Secondly we declare our own classes using these data structures. E.g. a class Student to hold all the student information. Now these classes need to be pre-compiled and called within Java application as libraries. This is called as a Java Class Library

C. Now class objects cannot be sent via network directly. We need to convert these objects to bytes so that they can be sent/received. To do this we must use a concept called as Serialization. Basically it is a concept where in objects are converted to byte streams so that they can be sent via network and vice versa. The reverse process is called as deSerialization.

D. Finally to send these bytes them via network we need Java Networking.

04 GUI - AWT & SWING are used for GUI design.





III. Architecture and Working

Indexing and searching are the two operating phases of content-based image retrieval systems. For every image in the database, in the indexing phase, a feature vector is computed which captures all the suitable attributes and is stored into a visual feature database. A content vector for a particular query is calculated in the searching phase, when a query is made by a user. The content vector is then matched up with the vectors in the content database using a similarity criterion. From that database, the images which are most identical to the input query are given back to the particular user. The image database contains all the images which are to be retrieved. The feature database contains all the features of images which are to be mined from them. A graphical query interface of the retrieval system is used for communicating to the user. The retrieval results are displayed once the necessary features are collected. Suitable features are extracted from the query image by the query processing module. The feature vector of query is compared with the vectors of the feature database by the similarity measurement module and the most identical images are identified. Almost all the image retrieval systems take a significant feedback from its users wherein the retrieval performance is improved due to the human and computer interaction. A powerful tool is created by the relevant feedback for introducing the user subjectivity and tuning of the similarity function parameters into the retrieval system.

IV. Methodology

The above system architecture (figure 4.1) is explained as follows:-

1. 1. Speech Input:-

   Voice input can be a natural way to communicate your intent. Voice is especially good at traversing complex interfaces because it lets users cut through nested menus with one command. Speech recognition (SR) is the inter-disciplinary sub-field of computational linguistics that develops methodologies and technologies that enables the recognition and translation of spoken language into text by computers. It is also known as "automatic speech recognition" (ASR), "computer speech recognition", or just "speech to text" (STT). It incorporates knowledge and research in the linguistics, computer science, and electrical engineering fields.

2. Text Input:-

   Text input is a basic component that allows the user to enter text. Text input is probably the simplest example of a component whose state naturally changes over time.

3. Image Input:-

   Image Input is a basic component that allows the user to enter image as in input. This increases the efficiency of the system to provide more relevant images as the output.

4. STT module:-

   STT module is a module that converts speech to text which is received by the system as the user.

5. Text parser:-

   Text parsing is a variation of parsing which refers to the action of breaking a stream of text into different

components, and capturing the relationship between those components.

6. Keyword Stemming:-

Keyword Stemming is about finding the root word from your query. Keyword is nothing else other than the word that we search for, and keyword stemming is bringing up the variants for the keyword by adding prefixes or suffixes to it. It is also done by stripping the suffixes or prefixes. It is a technique used by the search engines.

7. Output Ranking:-

The images retrieved as output can be ranked as per their relevance with respect to the user query. This helps in improving the relevance of the resultant images.

8. Output:-

Output will be in the form of images as per the relevance of the user query. Thus this system will improve the efficiency of the output images.

9. Output images:-

If the resultant image is the required output, then exit the system else the user has to select a relevant image from output images which is then given for further processing.

10. Blurring:-

This technique used in image processing is a widely used effect in graphics software, typically to reduce image noise and reduce details.

11. RGB to HSV Conversion

Color vision can be processed using RGB color space or HSV color space. RGB color space describes colors in terms of the amount of red, green, and blue present. HSV color space describes colors in terms of the Hue, Saturation, and Value. In situations where color description plays an integral role, the HSV color model is often preferred over the RGB model. The HSV model describes colors similarly to how the human eye tends to perceive color. RGB defines color in terms of a combination of primary colors, where as, HSV describes color using more familiar comparisons such as color, vibrancy and brightness.

12. Histogram:-

A diagram consisting of rectangles whose area is proportional to the frequency of a variable and whose width is equal to class interval.

13. Quantization:-

Quantization, involved in image processing, is a lossy compression technique achieved by compressing a range of values to a single quantum value. When the number of discrete symbols in a given stream is reduced, the stream becomes more compressible. For example, reducing the number of colors required to represent a digital image makes it possible to reduce its file size.

14. Normalization:-

In image processing normalization is a process that changes the range of pixel intensity values. Applications include photographs with poor contrast due to glare. Normalization is sometimes called contrast stretching or histogram stretching.

15. Comparison using distance measures:-

Estimation of image similarity is an important problem of image analysis. Measures of similarity between two images are useful for the comparison of algorithms devoted to noise reduction, image matching, image coding and restoration.

V. CONCLUSION

We have presented a possible solution that nearly fulfils the requirements of the user's demand for precise image retrieval. The working as discussed in the above section uses the concepts of content based image retrieval, text parsing, keyword stemming, blurring, histogram, RGB to HSV conversion, normalization and ranking that helps the users retrieve appropriate images efficiently. We can conclude that the integration of Text Based Image Retrieval(TBIR) and Content Based Image Retrieval(CBIR) helps in improving the precision and recall measures by producing more relevant images as the output.

VI. **Future Scope**

The system can be further enhanced by incorporating detection of the 'texture' feature of images giving more refined results. As future work, we intend to incorporate Fourier descriptors to enhance the relevance furthermore. Another improvement that can be done is to enhance the overall quality and efficiency of the admin application and user application to make it more interactive.

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