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CAPSULE IMAGE RETRIEVAL USING EDGE BASED ALGORITHMS

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Abstract: Many CBIR systems have been developed, but the problem of retrieving images on the basis of their pixel content remains largely unsolved. Different implementations of CBIR make use of different types of user queries. Query by example is a query technique that involves providing the CBIR system with an example image that it will then base its search upon. A preexisting image may be supplied by the user or chosen from a random set. The user draws a rough approximation of the image they are looking for, for example with blobs of color or general shapes. This query technique removes the difficulties that can arise when trying to describe images with words. Various shape methods have been employed to increase the efficiency of the Image retrieval algorithms. This paper uses capsule image database and similarity measure was verified by using several edge detection techniques.

Keywords: CBIR, shape methods, edge detection

INTRODUCTION

Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. Usually Image Processing system includes treating images as two dimensional signals while applying already set signal processing methods to them. The purpose of image processing is divided into 5 groups. They are:
1. Visualization - Observe the objects that are not visible.
2. Image sharpening and restoration - To create a better image.
3. Image retrieval - Seek for the image of interest.
4 Measurement of pattern – Measures various objects in an image.
5. Image Recognition – Distinguish the objects in an image

The two types of methods used for Image Processing are Analog and Digital Image Processing. Analog or visual techniques of image processing can be used for the hard copies like printouts and photographs. Image analysts use various fundamentals of interpretation while using these visual techniques. The image processing is not just confined to area that has to be studied but on knowledge of analyst. Association is another important tool in image processing through visual techniques. So analysts apply a combination of personal knowledge and collateral data to image processing. Digital Processing techniques help in manipulation of the digital images by using computers. As raw data from imaging sensors from satellite platform contains deficiencies. To get over such flaws and to get originality of information, it has to undergo various phases of processing. The three general phases that all types of data have to undergo while using digital technique are Pre- processing, enhancement and display, information extraction.

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 searching for digital images in large databases (see this survey for a recent scientific overview of the CBIR field)[1][2]. 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.

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The evaluation of the effectiveness of keyword image search is subjective and has not been well-defined. In the same regard, CBIR systems have similar challenges in defining success [3].

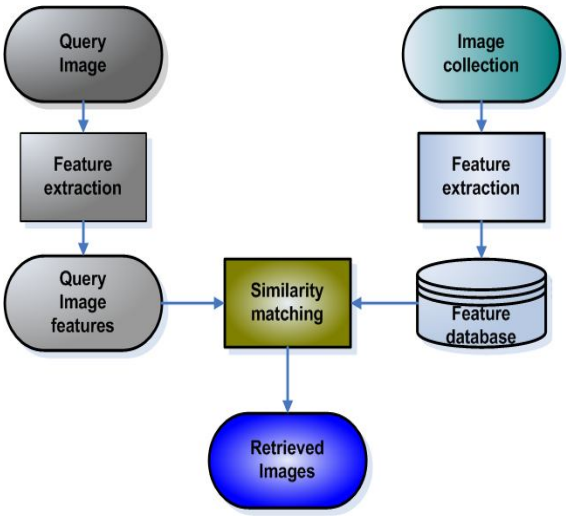

Fig 1: Block Diagram of CBIR

The interest in CBIR has grown because of the limitations inherent in metadata-based systems, as well as the large range of possible uses for efficient image retrieval. Textual information about images can be easily searched using existing technology, but this requires humans to manually describe each image in the database. This can be impractical for very large databases or for images that are generated automatically, e.g. those from surveillance cameras. It is also possible to miss images that use different synonyms in their descriptions. Systems based on categorizing images in semantic classes like "cat" as a subclass of "animal" can avoid the miscategorization problem, but will require more effort by a user to find images that might be "cats", but are only classified as an "animal". Many standards have been developed to categorize images, but all still face scaling and miscategorization issues. Initial CBIR systems were developed to search databases based on image color, texture, and shape properties [4]. After these systems were developed, the need for user-friendly interfaces became apparent. Therefore, efforts in the CBIR field started to include human-centered design that tried to meet the needs of the user performing the search. This typically means inclusion of: query methods that may allow descriptive semantics, queries that may involve user feedback, systems that may include machine learning, and systems that may understand user satisfaction levels [5][6].

CBIR TECHNIQUES

Query techniques:
Different implementations of CBIR make use of different types of user queries.
Query by example is a query technique that involves providing the CBIR system with an example image that it will then base its search upon. The underlying search algorithms may vary depending on the application, but result images should all share common elements with the provided example [7]. This query technique removes the difficulties that can arise when trying to describe images with words.

Semantic retrieval:
Semantic retrieval starts with a user making a request like "find pictures of Abraham Lincoln"[8]. This type of open-ended task is very difficult for computers to perform - Lincoln may not always be facing the camera or in the same pose. Many CBIR systems therefore generally make use of lower-level features like texture, color, and shape. These features are either used in combination with interfaces that allow easier input of the criteria or with databases that have already been trained to match features (such as faces, fingerprints, or shape matching). However, in general, image retrieval requires human feedback in order to identify higher-level concepts.

Relevance Feedback (Human Interaction)
Combining CBIR search techniques available with the wide range of potential users and their intent can be a difficult task [9]. An aspect of making CBIR successful relies entirely on the ability to understand the user intent. CBIR systems can make use of relevance feedback, where the user progressively refines the search results by marking images in the results as "relevant", "not relevant", or "neutral" to the search query, then repeating the search with the new information. Examples of this type of interface have been developed.

Iterative/Machine Learning:
Machine learning and application of iterative techniques are becoming more common in CBIR [10].

Other query methods
Other query methods include browsing for example images, navigating customized/hierarchical categories, querying by image region (rather than the entire image), querying by multiple example images, querying by visual sketch, querying by direct

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specification of image features, and multimodal queries (e.g. combining touch, voice, etc.)

Content comparison using image distance measures
The most common method for comparing two images in content-based image retrieval (typically an example image and an image from the database) is using an image distance measure [11][12]. An image distance measure compares the similarity of two images in various dimensions such as color, texture, shape, and others. For example a distance of 0 signifies an exact match with the query, with respect to the dimensions that were considered. As one may intuitively gather, a value greater than 0 indicates various degrees of similarities between the images. Search results then can be sorted based on their distance to the queried image. Many measures of image distance (Similarity Models) have been developed.

METHODOLOGY

CBIR or Content Based Image Retrieval is the retrieval of images based on visual features such as colour, texture and shape[13] .Reasons for its development are that in many large image databases, traditional methods of image indexing have proven to be insufficient, laborious, and extremely time consuming. These old methods of image indexing, ranging from storing an image in the database and associating it with a keyword or number, to associating it with a categorized description, have become obsolete. This is not CBIR. In CBIR, each image that is stored in the database has its features extracted and compared to the features of the query image. It involves two steps:
(a)Feature Extraction: The first step in the process is extracting image features to a distinguishable extent.
(b)Matching: The second step involves matching these features to yield a result that is visually similar.

The steps involved in the proposed method are as following
Step 1: Perform necessary operations on IDEAL image
Step 2: Convert IDEAL image into grey scale image and obtain edge of the gray level image
Step 3: Read stored images from location and identify variable to count the number of Accepted and Rejected images in the database
Step 4: Fetch images one by one and checks for the errors. If any error is found, image is stored in folder named as "REJECTED". Else, the image is stored in folder named as "ACCEPTED".
Step 5: Obtain the edge of the image using several edge detecting operators and if Correlation =1 indicating images are perfectly matched

RESULT ANALYSIS

Usually people use capsules to recover from the diseases they are suffering from. Everyone wants an undefected medicine. To supply undefected capsules the supplier needs to check the defects before supplying them. The MATLAB code developed performs correlation between the ideal capsule with the captured capsule and differentiate then as ACCEPTED and REJECTED ones. Fig 1 shows the capsule image database and Fig 2 shows result of the Matlab code indicating the number of capsule images accepted and the number of capsule images rejected. The database consists of images of single capsules only downloaded from www.google.co.in/images.The work can also be extended by detecting defects in multiple capsule images and pharmaceutical drugs

Fig 1: Capsule image stored in the database

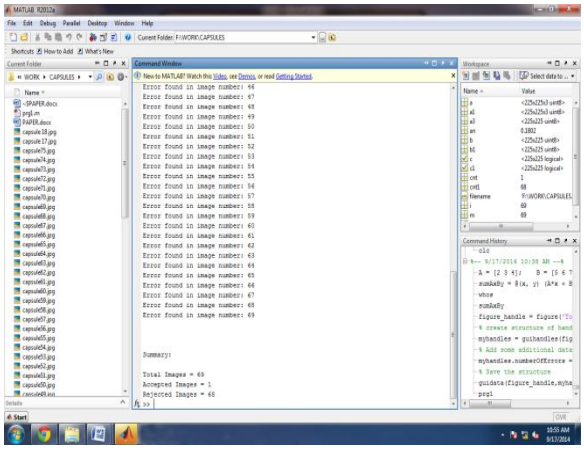

Fig 2: Result showing the number of accepted and rejected images

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