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# Survey on Various Biomedical CBIR Methods

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***Abstract*— Every year a large number of researches has occurred on image retrieval. CBIR stands for content based image retrieval i.e. images are retrieved from databases on basis of contents rather than textual references. This paper refers to various CBIR methods in medical fields. It also include certain referential points to some feature descriptors that paved way to flourish researches in this fields. . The effectiveness of content based image retrieval lies on the feature extraction method. This paper refers the CBIR methods based on the analysis of feature descriptors. There are different methods which focus on various properties like, intensity, spatio-temporal features etc.***

***Keywords*— CBIR, Databases, Feature Descriptors, Feature Extraction, Intensity.***

## I. INTRODUCTION

In CBIR the images are retrieved from databases on basis of their contents. In olden days, retrieval was based on text references, keywords etc. CBIR was developed to resolve the problem of searching digital images from large databases. Within the blink of an eye, the size of medical databases has increased, with population and time. Along with the advent of internet and modern technologies, there is a need of a system for efficient image retrieval with minimal time and space complexity.

CBIR is a platform were researches has emerged out as a breakthrough during the recent times. The CBIR utilizes visual contents of an image such as color, texture, shape, faces, spatial layout, etc, to represent and index the image database. These features can then be classified as general features which may include color, texture, and shape, and domain-specific features such as human faces, fingerprints, etc. [local tetra]. In a small database CBIR may not play a vital role, but as the size of data increases, search among them, should retrieve the images effectively.

Scientists and researches has spent a large amount of time and effort to improvise CBIR. They have also proposed a relevance feedback mechanism were user can select positive and negative images separately and fed them back to system. The effectiveness of content based image retrieval depends on the feature extraction method. The efficiency of the system increases with the meaning of extracted features. As the time passed, the researches has flourished on this topic. For a decent retrieval the success lies in developing the similarity metrics for effective ranking. In CBIR systems, features are computed automatically for the characterization of images present in the databases. But an undeniable fact is that, the application of this concept has always experienced a limitation in its success. The paper includes a detailed survey on content based image retrieval.

## II. LITERATURE SURVEY

In [1] method, human observers are used to train examples i.e. they provide the images for training. The similarity between query image and database is identified with the help of neural networks or support vector machine. In this system, a combination of binary classifier and regression module is included to increase the system efficiency. The idea of relevance feedback was also included to have an active human interaction.

The fact of increased accuracy cannot be denied for the above mentioned system, leading to an improvement of performance in terms of efficiency of retrieval. Another advantage to be mentioned is that system remained insensitive to the change of parameters. It is also undeniable is that two stage learning was better than one stage principle, thus contributing to enhanced speed, even though it contributed to increased complexity.

In [2] an image retrieval method in CT databases was proposed. A new feature descriptor was identified, which was a wavelet function, hence the name local wavelet pattern (LWP). This method stands out from others because, unlike other existing systems it does not use the intensity values directly. The intensity values are converted to wavelet function using 1 D Haar function. It also includes the relationship between center pixel and it's surrounding neighbors. It encodes local neighboring information with local wavelet decomposition. The neighborhood around a center pixel is extracted, and the center pixel is transformed for range matching. Finally the difference between neighborhood and center pixel contributes to development of feature vector.

The main advantage of the above mentioned system is that it encodes the relationship between the center and neighboring pixels. The noticeable factor is that precision and recall is high on comparison with other existing methods.

It is sure that the retrieval of images from medical databases are quite complex. The retrieved images must match the query image visually, otherwise user may not accept the results. Beyond visual similarity, when it comes to the

 

case of tissues, ligaments and cells, the semantic similarity is the primary to consider. It is because the internal cellular structure is quite complex to understand. For pathological reasons or cellular disorientation identification, semantic similarity plays a major role.

In [3] both visual and semantic similarity is confined to proposed method. In the work mentioned here, the author first preprocess the input, to isolate brain tissue from non-brain ones, such as skull, skin, etc [4] [5], followed by an appropriate algorithm. Both spatial and non-spatial features are used for LBP and KLT. KLT are selected from the regions that have greater intensity variations in both horizontal and vertical directions, indicating the inclusion of corner. Thus KLT and LBP are used as the basic underlying comparison step here.

Some of the honorable mentions of feature descriptors proposed so far are local binary pattern (LBP) [6], local ternary pattern (LTP) [9] which is evolved from LBP, and local tetra pattern (LTrP) [7]. All these uses the intensity values of pixels as input to their respective functions. The tremendous growth of digital libraries has always kept a demand of efficient feature descriptor with high accuracy and performance rate. A wide variety of changes are done to LBP, which makes it to stand as a base foundation for all feature descriptors mentioned till now. The researches grew even bigger by including it's derivatives in different orders.

LBP was introduced by Ojala et al. The value of a particular pixel is computed by comparing the grey value of that particular pixel and it's neighbors. The intensity values are converted to binary values based on the intensity difference.

In LTP, binary values of 0's and 1's are extended to the value of {-1, 0, 1}. A threshold width t is considered. The designation of values 1, 0 or -1 depends on this t. The value of 0 is assigned between the width of ±t. If the value is greater than the sum of grey value of center pixel and width t then +1 is assigned. Similarly if the value is less than the difference of center pixel and width t then -1 is assigned.

In local tetra patterns (LTrP) [7], all LBP, LTP and LDP [6] [9] [10] are included as baseline principle. For the calculation of LTrP the directionality of center pixel and surrounding pixels are considered. Based on the specified directions values such as 0, 2, 3, 4 are assigned. Depending on these values the tetra patterns are generated. Thus, it is seen that as the name suggests LBP encodes in 0's and 1's, whereas LTP uses three values and finally LTrP uses four values for encoding.

## III. RESULT ANALYSIS

The inclusion of relevance feedback in [1] improved the retrieval efficiency a lot. More than that it allowed user interaction with the system. In [3] two-stage analyser and classifier was used which greatly contributed to effectiveness compared to one stage. A perfect analysis of various feature descriptors are given in [2] by Dubey et al. The precision and recall is calculated for various databases, which includes NEMA-CT. The precision of LBP, LTP, LTrP and LWP are 65.03, 62.09, 57.82 and 83.00 respectively. While the recall of above mentioned methods are 19.51, 18.54, 17.29 and 24.87 respectively.

Table I Performance evaluvation of lbp ,ltp, Ltrp, lwp from [2] specified by dubey et.al

| **Performance** | **Method** | | | |
|---|---|---|---|---|
| | LBP | LTP | LTrP | LWP |
| **ARP (%)** | 65.03 | 62.09 | 57.82 | 83.00 |
| **ARR (%)** | 19.51 | 18.54 | 17.29 | 24.87 |

## IV. CONCLUSION

Describing a method for generation of feature vector to perform an effective retrieval performance and to include more information about image is found to be a broad area where many studies and researches have been carried out. Various systems that can effectively and significantly, benefit the solution of the retrieval problem, by eliminating complexity, semantically correct, and effectively, were studied. It could be seen that majority of the works focused on simply taking the intensity values directly without applying any transformations. The resulting images contain more irrelevant visual artifacts and noise. But now inclusion of a much more effective encoding information method for the biomedical images could significantly produce a better output. However, the existing methods can get a compromising output. This classical observation are the main highlights of this literature survey

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