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Content Based Image Retrieval on Medical Applications

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Abstract: The Content Based Image Retrieval (CBIR) mode of Image processing and retrieving is applied for many applications such as police and investigation departments, press and media, fabric designers, engineering field, art, and medicine. Out of those mentioned areas, medicinal field gets more benefits from CBIR. A multi-speciality hospital can generate plenty of images on daily basis in way of X-rays, biopsies, MRI and CT scans. This paper reviews the features employed in Text, shape and colourim medical application.

Keywords: *Content based image retrieval, Image processing, biomedical application*

I. INTRODUCTION

Medical imaging records are highly increasing and necessity to store large amount of data in the medical field. These images are utilized in varied domains like medical teaching, medical research and medical diagnostics [1]. Therefore, the doctor can easily analyse large amount of image database to sense the formation of tumours and abnormalities in magnetic resonance images or x-rays. But it may differ based on the image content, and absence of textual data. In order to improve the methods for fast and effective analysis the researches proposed various techniques, but still there are numerous problems associated with the semantic implication of CBIR and retrieval efficiency in huge databanks. These problems become prominent when the patterns of searching (sub-pattern matching) on medical images having only the gray level matter[2]. These queries need many comparisons and highly consuming the effective time. Hence, methods that reduce the time of computation of comparison and increasing the performance rate are to be developed and implemented in particular in the medical field [3]. One of the proven methods with promising result in content based image retrieval (CBIR) which is when applied to medical diagnostic field is commonly referred as content based medical image retrieval (CBMIR). Further this paper represents the review and feature of image processing based on Content Based Image Retrieval (CBIR).

II. FEATURES USED IN CBIR

Image feature can be described by the pattern/design which was recognized by user in image processing technique. This information would be changed into vector space by the features in the vision of computers. The features can be divided into two groups namely local and global features [4]. It includes convex/concave parts,

branches, number of endpoints, and joints. Also, it describes the number of holes, connectivity and profile of projection. The image extraction plays a vital role as equally as the image selection and segmentation. Further, there are many techniques available for feature extraction which divides into three major clusters of feature extraction involves Global transformation and series expansion features, geometrical and topological features and the statistical features[5].

Texture feature

A textual description is like the keyword, image description, and text which are specified in case of textual queries. The text-based information is covered under metadata description and the time of image retrieving can be reduced with metadata instead of matching all stored images[6]. The texture feature based on image region i.e., the surface of an image and it is characterized by the direction, contrast and coarseness. On the basis of texture properties, the surface of the image is divided in subdivision and labelling done through the similarity of categorization. Texture synthetic procedures are applied in mapping of textures for making large textures from small one that yields real views of the image[7]. In every image, the surface texture may vary from object to object and make image retrieval a cumbersome one. To organize the MRI brain images that are similar, a self-organization map is use on local texture features. It is highly similar to retrieved image that are matching with the input image by correlating the pixels [8]. The CBIR was incorporated with difference in intensity of local neighbourhood for effective description of texture. The middle pixel in 3X3 window of an image was equated with the other neighbours left, only one pixel for one time to generate a pattern of binary bit. The effect of adjacent neighbours of a specific pixel was disregarded in binary encoding [9].

Shape feature

The physical profile of any object is characterized by the shape of the images. The shape can be described by moment, region and border. The shape matching, measurement and object realization are done from the shape description these are the numerous techniques for shape representation. Further, it grouped as one-dimensional, spatial interrelation feature, polygonal approximation, and shape transform domains. The shape is considered as a low-level feature and basic shape-centric retrieval of images comprises the measuring of shape similarity marked by the features [10]. The technique that uses shape as main information for retrieving the images has been the only type through which people can recognise the images. Two methods are prevailing to retrieve the features related to shape, which are boundary dependent shape feature extraction and region based shape extraction. The boundary dependent technique is centred on exterior boundary although the region based procedure is dependent on the whole region [11]. Texture has got no prescribed definition; nonetheless instinctively it delivers a degree of properties such as smoothness, coarseness and regularity. It plays a part in human pictorial insight and understanding. Texture classification and image segmentation are challenging tasks that is based on neighbourhood [12]. It provides necessary data for classifying the images since it describe the constituents of multiple real world images. The texture supports in relating the high level semantics for the retrieval of medical images.

Colour feature

Colour plays a major role in extracting data from images. It consists of histograms which often utilised in content based retrieval systems [13, 14]. This histogram is applicable for global characterisation but it is not suitable for noise handling process. In order to overcome these limitations, other colour features will be applied for image retrieving [15]. These feature selection

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depends on the results of image segmentation based on colours, but different colours are provided which will not suitable for average image retrieval. Most of the content-based image retrieval systems use images that are not pre-processed. The use of colour data by based on the prediction technique has been suggested by [16]. The CBIR approach is the combination of colour and texture was carried out by energy measurement of all colours and wavelet sub band along with standard deviation. The image is disintegrated into two sub bands twice with the use of wavelet transform. A feature dataset of 640 VisTex colour images was designed to assess the efficacy of the suggested methods [17].

III. MEDICAL APPLICATIONS OF CONTENT-BASED IMAGE RETRIEVAL

Most of the schemes for image retrieval are computationally expensive because of feature vector of large magnitude and the issues like semantic gap particularly with X-rays [18]. This creates a demand for generating an extremely dynamic and computationally efficient retrieval scheme. A high accuracy for X-ray image interpretation is needed by the Radiologists who are diagnostic when a study involves rising volume of images, which is exceptionally true with cross-sectional studies. The CBIR may help for correct interpretation for retrieval of image by indexing on the basis of similarities. The support is provided by taking into account the content and meta-data of the image [19]. Semantic annotation practise could be used to define the images with semantic/medicinal terms which were derived either from the reports of the radiologists or projected by features of the image [20]. Enhancement pattern and shape of lesions are some of the semantic info about the image. Adding necessary semantic contents to the CBIR spanned the gap between the meaning and pictorial description of the image. This involved, ontology-extracted annotation of semantic terms and image-pair similarity assessment through Hierarchical Semantic-Based Distance (HSBD) attached with a measure of ontology [21].

Alzheimer's disease (AD) is the brain-degenerative disease which leads to loss of memory of aged people. The Magnetic Resonance Images (MRI) of such kind of patients could be compared with the existing dataset using CBIR technique and this helped in diagnosis and early stage detection of this disorder using the various tools of classification of images like Capsule Network (CapsNets) with 3-dimensional provision and Convolution Neural Network (CNN) that incorporated 3-dimensional auto-encoder [22]. In many countries the project based on breast cancer is lethal next to lung cancer. Anyhow, it could be treated and cured by early stage testing. The X-ray image of breast is called mammogram, which checks for breast cancer in women folk having no signs or indications of the disease. In addition, it is helpful for checking for a lump or other sign of breast cancer. The mammogram diagnosis is challenging and leads to unwanted following up in quite a many time. The CBIR along with Computer Aided Diagnosis had been applied to characterize the mammographic images for easing the process of arriving at a decision for the radiologists [23].

CBIR method had been utilized for creating the huge records of Computed Tomography (CT) medical data of large brain. Few of the core categories of CT image cases consist of Atrophy, Cystis, Normal brain, Trauma or haemorrhage, tumor, stroke and other. To ascertain that related regions of anatomy alone had been compared in matching images, the schemes of registering and normalizing were applied. The non-Negative Tensor Factorization (NTF) method was utilized for abstracting the feature vector corresponding to all individual images, which was the heart of CBIR [24-27].

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The various formats of medical data comprising the images of Ultra Sound (US), Computer Tomography (CT), X-ray and Magnetic Resonance Images (MRI) are grouped as biomedical images and retrieval of these kinds of images are supportive in medical diagnostics. The vital role in image retrieval is played in the step of extraction of feature. A local Tenary Co-occurrence Patterns (LTCoP) is a procedural method applied for abstraction of features in retrieval of biomedical images. The gray values of adjoining neighbours the pixel centre calculates the alike ternary edges; the co-occurrence of which is encoded with LTCoP. The derivatives of first order of specific direction are encrypted with a typical Local Derivative Pattern (LDP) which is a rotational non-variant [28-31] .The biomedical images retrieval were processed with the conversion of color-space of query and the target images from red-Green-Blue to L*a*b color-space from which the features of Phase Congruency (PC) was abstracted. The corner-edge mapping of the provided image was delivered by the abstracted features. The Scale Invariant Feature Transform (SIFT) is utilized to derive the vital points by processing the map [32-37].

IV. CONCLUSION

This paper based on Content Based Image Retrieval (CBIR) within the application of medical image processing. Further, it explains different reviews and methods of image processing like colour, shape, feature and texture with the help of large database. Finally, various formats of applications and diseases are concluded.

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