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A Survey on Content Based Image Retrieval using Classification Techniques

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ABSTRACT
In the past years due to the progress of digital technology in producing digital cameras and availability of high-speed Internet connections, the amount of digital images has been grown rapidly. Those factors have provided a fast and simple way to generate and propagate visual content worldwide. Fully automatic extraction of visual as well as textual contents of an image for retrieving the similar images is really a challenging task for a machine. Such task is complex yet efficient for several applications, for instance, to help the visually impaired person to understand the image contents (i.e. visual or textual) and to help a tourist to read the contents given in another language. In this paper we presents the comparative study for the content based retrieval and classification for various number of application using the machine learning, data mining and other techniques.

Keywords: Image classification, Image retrieval, Neural network, Hashing, color classification.

INTRODUCTION
Image classification is to assign one or more category labels to an image. It is one of the most fundamental problems in computer vision and pattern recognition, and has a wide range of applications, e.g., video surveillance, image and video retrieval, web content analysis, human-computer inter- action, and biometrics [6].

Image classification is basically the task of classifying the number of images into (semantic) categories based on the available training data. The objective of digital image classification procedure is to categorize the pixels in an image into land over cover classes [1]. The output is thematic image with a limited number of feature classes as opposed to a continuous image with varying shades of gray or varying colors representing a continuous range of spectral reflectance [4].

The range of digital numbers in different bands for particular features is known as a spectral pattern or spectral signature. A spectral pattern can be composed of adjacent pixels or widely separated pixels. Digital image classification technique can generally be classified into two types: Unsupervised classification Techniques and Supervised classification Techniques [12].

Feature extraction involves simplifying the amount of resources required to describe a large set of data accurately [9]. In image processing, a different set of features can be used to extract the visual information from a given image. Because digital mammography images are specific, not all visual features can be used to correctly describe the relevant image patch. All classes of suspected tissue are different by their shape and tissue composition. This is why the most suitable visual feature descriptors for this kind of images are based on shape and texture [11]. Most systems perform feature extraction as a pre- processing step, obtaining global image features like color histogram or local descriptors like shape and texture.

In image retrieval and classification approach of using content based image retrieval tasks being one of the reasons of high dimensionality of the feature space. Color image retrieval is done on features extracted from histograms of color components. The benefit of using color image histograms are better efficiency, and insensitivity to small changes in camera view-point i.e. translation and rotation [8]. There are two types of ants that have different search strategies and refreshing mechanisms. The stochastic ants identify new categories, construct the category tables and determine the clustering centre of each category. The Intellectual ants classify the image pixels using their search advancing strategies, with the guidance of the information provided by stochastic ants. Comparing

with the traditional ant colony algorithms, this algorithm provides a more effective and accurate approach for automatic image retrieval.

The content based image classification systems can be widely classified as color, texture, shape, motion etc. Color based image classification is an important alternative and complement to traditional text-based image searching and can greatly enhance the accuracy of the information being returned [13]. It aims to develop an efficient visual- Content-based technique to search, browse and classify relevant images from large-scale digital image collections. Most proposed CBIC techniques automatically extract low-level features (e.g. color, texture, shapes and layout of objects) to measure the similarities among images by comparing the feature differences. Supervised classification is appropriate when we want to identify relatively few classes, when we have selected training sites that can be verified with ground truth data, or when we can identify distinct, homogeneous regions that represent each class [4].

In present scenario, content-based image classification has become research focus of multimedia Information retrieval. Usually, low-level visual features of images, such as color, texture, and shape, are used to describe images and to measure the content similarity between two images. Traditionally, Euclidean distances are used to measure the similarity between the query and the images in the database. The smaller the distance, the more similar the pattern to the query. Though the traditional query method is easy to implement, CBIR is still inaccessible for common people due to the dissatisfactory query performance.

The rest of this paper is organized as follows in the first section we describe an introduction of about the content based image classification introduction. In section II we discuss about the wavelet transform function. In section III we discuss about the texture classification. In section IV we present rich literature for content based image classification. In section V we discuss about the problem formulation and statement as we getting from the rich literature survey, finally in section VI we conclude the about our paper which is based on the literature survey and specify the future scope.

II WAVELET TRANSFORM

Wavelet transform [18] is a signal processing technique that decomposes a signal or image into different frequency sub-bands at number of levels and multiple resolutions. In every level of decomposition, the high-frequency sub-band captures the details of the signal or images for example, the edge information in an image. The low frequency sub-band is a sub-sampled version of the original image, with similar statistical and spatial properties as the original signal. As a result, the low-frequency sub-band can be further decomposed into higher levels of resolution, and it helps in representing spatial objects in different coarser levels of accuracy in multi resolution sub-bands. So, the wavelet transform decomposes a signal $f(x)$ with a family of functions obtained through dilations and translations of a kernel function $\psi(x)$, called the mother wavelet which is localized in both spatial and frequency domains.

III TEXTURE CLASSIFICATION

Texture is also one of the important types of classification and is being widely intensively used in pattern recognition. Although texture perception indicates that humans discriminate natural texture patterns in three important dimensions i.e. repetitiveness, directionality, and granularity [9]. Texture can be evaluated as being fine, coarse, or smooth; rippled, molled, irregular, or lineated. For example, in the humid tropics, fine texture on radar imagery can be indicative of nonresistant fine-grain sedimentary rocks and unconsolidated sediments, while a coarse texture can be indicative of coarser grained sedimentary rocks. A massive texture with high-contrast components may be indicative of Igneous rocks. A hummocky texture can be indicative of eroded igneous rocks. However these features approximate the three important dimensions of human texture perception mentioned earlier.

Texture is an innate property of virtually all surfaces the grain of wood, the weave of a fabric, the pattern of crops in a field, etc. It contains important information about the structural arrangement of surfaces and their relationship to the surrounding environment. Although it is quite easy for human observers to recognize and describe in empirical terms, texture has been extremely refractory to precise definition and to analysis by digital computers. Since the textural properties of images appear to carry useful information for discrimination purposes, it is important to develop features for texture.This approach extracts two sets of texture feature vectors for the structured texture pattern and the random texture pattern, with a posterior probability value indicating the confidence level. The distance function is designed to consider both the structured part and the random part, weighted by the confidence values.

Textures are represented by texels which are then placed into a number of sets, depending on how many textures are detected in the image. These sets not only define the texture, but also where in the image the texture is located. Texture is a difficult concept to

represent. The identification of specific textures in an image is achieved primarily by modelling texture as a two-dimensional gray level variation. The relative brightness of pairs of pixels is computed such that degree of contrast, regularity, coarseness and directionality may be estimated. However, the problem is in identifying patterns of co-pixel variation and associating them with particular classes of textures such as “silky, or rough”. The ability to Match texture similarity is useful more often in distinguishing areas in images with similar colors. A variety of techniques has been used for measuring texture similarity; the best established rely on comparing values of what are known as second order statics calculated from query image and stored images [11].

IV COMPARATIVE STUDY ANALYSIS

Ref No.	Author Name	Publication	Year	Title	Objective of paper
[1]	Lei Zhu, Jialie Shen, Liang Xie, and Zhiyong Cheng	IEEE	2017	Unsupervised Visual Hashing with Semantic Assistant for Content-Based Image Retrieval	[1] In this study, they propose a novel unsupervised visual hashing approach called semantic-assisted visual hashing (SAVH). Distinguished from semi-supervised and supervised visual hashing, its core idea is to effectively extract the rich semantics latently embedded in auxiliary texts of images to boost the effectiveness of visual hashing without any explicit semantic labels.
[2]	Pengcheng Wu, Steven C. H. Hoi, Peilin Zhao, Chunyan Miao, Zhi-Yong Liu	IEEE	2016	Online Multi-modal Distance Metric Learning with Application to Image Retrieval	Author investigate a novel scheme of online multi-modal distance metric learning (OMDML), which explores a unified two-level online learning scheme: (i) it learns to optimize a distance metric on each individual feature space; and (ii) then it learns to find the optimal combination of diverse types of features.
[3]	Li Liu, Mengyang Yu, Ling Shao	IEEE	2015	Multiview Alignment Hashing for Efficient Image Search	Author present a novel unsupervised multi-view alignment hashing approach based on regularized kernel nonnegative matrix factorization, which can find a compact representation uncovering the hidden semantics and simultaneously respecting the joint probability distribution of data. In particular, we aim to seek a matrix factorization to effectively fuse the multiple information sources meanwhile discarding the feature redundancy.
[4]	Xi Li, Xueyi Zhao, Zhongfei Zhang, Fei Wu, Yueting	IEEE	2016	Joint Multi-label Classification With Community-Aware Label	in this paper they have proposed a joint learning scheme for simultaneously modeling label graph learning and multi-label classification. The proposed learning scheme explicitly models the inter-label correlations by label graph learning, which is jointly optimized with multi-label

	Zhuang, Jingdong Wang, Xuelong Li			Graph Learning	classification.
[6]	Chesti Altaff Hussain, D. Venkata Rao, S. Aruna Masthani	International Conference on Computational Modeling and Security	2016	Robust Pre-processing Technique Based on Saliency Detection for Content Based Image Retrieval Systems	The paper aims at improving the performance of content based image retrieval using saliency detection approach. Several methods have been developed to extract the saliency information from an image. They use the state of the art Quaternion transform for to detect the saliency. The paper focuses on the content based image retrieval systems based on scale invariant feature transform and region segmentation.
[8]	Menglin Jiang, Shaoting Zhang, Junzhou Huang, Lin Yang, Dimitris N. Metaxas	Medical Image Analysis	2016	Scalable histopathological image analysis via supervised hashing with multiple features	In this paper in response, they exploit joint kernel-based supervised hashing (JKSH) to integrate complementary features in a hashing framework. Specifically, hashing functions are designed based on linearly combined kernel functions associated with individual features. Supervised information is incorporated to bridge the semantic gap between low-level features and high-level diagnosis.
[10]	G. Maheshwari, Prajitha.P	Journal of Network Communications and Emerging Technologies	2018	Visual and Text Hashing Method with Semantic Association with Multi Intention Feature Mining Algorithms	In proposed system a novel unsupervised visual hashing scheme, termed as semantic-assisted visual and Text hashing (SAVTH), to effectively perform visual hashing learning with semantic assistance. The main concept of the proposed work is to extract images from the website automatically from the noisy associated texts, and stores them in the repository for future image and text based searches.
[11]	Malay Kumar Kundu, Manish Chowdhury, Samuel Rota Bulo	Elsevier Ltd.	2014	A graph-based relevance feedback mechanism in content-based image Retrieval	In this article they propose a new CBIR system based on RF. Their system exploits feature representations for the images given in terms of first-order statistics computed from NSCT. This approach indeed guarantees a better preservation of the main cues of the images as NSCT is a flexible multi-scale, multi-directional and shift-invariant image decomposition method.

Table 1: Shows the comparative study of Image Classification Techniques.

V PROBLEM STATEMENT

Content retrieval from text and image search is one of the most fundamental problems in the search engines from huge sized database and machine learning research communities. The design and evaluation of an image retrieval system rely on properly defined visual features with suitable similarity matching metrics as well as correct normalization functions. Various author are using mostly un-supervised and supervised learning for the efficient content based image retrieval and classification, apart from the data mining tools some researches also used the evolutionary algorithm. In order to mine the images in the database appropriately based on given query, indexing has been done by using ranked feature indexing (RFI) which defined keyword relevance of user query as a connectivity measure between query states modeled after the user queries has been issued [10]. After performing RFI, An effective binary code has been generated and resulted by textual and visual hashing and thus the intrinsic structure of images is captured. After the rich literature survey we found the various problems and in our future work we will try to resolve all these issues or problem.

VI CONCLUSIONS AND FUTURE WORK

Advances in multimedia technologies for creating and sharing digital contents have triggered an exponential increase of image collections. In order to deal with these collections, it is necessary to develop methods for efficiently indexing and retrieving these data. A common task for CBIR systems is to retrieve the most similar images to a query pattern defined by users. In this paper we investigate the various research paper and their analytical and experimental comparative study for the efficient content based image classification, here the content include text, image, color, region, shape and texture etc. In future work we proposed the model for the efficient image classification using some advanced methods and generate the best results than the existing techniques.

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