Pak. J. Biotechnol. Vol. 13 special issue II **(International Conference on Engineering and Technology Systems (ICET'16) Pp. 87 - 95 (2016)**

A REVIEW OF LUMINANCE AND COLOR INVARIANTS BASED PARTIAL MEDICAL IMAGE RETRIEVAL SYSTEMS

Lakshmi R Nair and Kamalraj Subramaniam
Department of Electronics and Communication Engineering, Karpagam Academy of Higher Education, Coimbatore, India
lakshmi688@gmail.com, kamalrajece@gmail.com

ABSTRACT
The color of the surface is a very significant feature in classification and recognition process of the object. Additionally, the color of the object differs due to variation in illumination and condition of the surface. Research on analyzing appropriate methods for medical information retrieval is highly significant in this scenario. With the rapid growth of medical dataset in specific to the digital library is becoming a difficult issue towards search based data/image retrieval. For obtaining the best method for image retrieval, an extensive study of the previous literature is required. This paper describes an overview of estimation procedures related to RGB images' color invariants that are prevalent currently and also provides a user interactive approach for efficient image retrieval system. Additionally,contributed towards enhancing the performance of partial image retrieval system at various illumination stages.

Keywords: Image retrieval system,color invariants, feature extraction,image processing

I. INTRODUCTION

As the part of image databases augments, it is indispensable that there is an enhancement in image retrieval [1]. Subsequently, the term image retrieval process is a search, browse and retrieve an image from huge set of database like digital library [2]. Maximum accepted and outmoded modes of image retrieval utilize some technique of totaling metadata like keywords, captioning, or descriptions of the images so that reco-very can be accomplished in a better way than annota-tion which consumes more time, is arduous and a costly chore. Furthermore, in existing most of them has focu-sed towards annotating the image in automatic manner. This is the main motive for investigation on multimedia systems and image retrieval has been given incredible significance all through the last few decades. The multi-media databases handle text, audio, video and image data that would deliver us with a massive quantity of data which has altered our way of life in a better way[3].

Nowadays, hospitals and medical research centers create numerous digital images of varied modalities on a daily basis. Moreover, with the expansion of World Wide Web, numerous medical images are currently obtainable in online archives and book of maps. Like- wise, Clinical diagnosis and preparation, assessment of therapy are frequently sustained by quite a lot of imaging modalities [4]. Diverse modalities generally arrange for integrative information. Subsequently, MRS (Magnetic Resonance Spectroscopy), SPECT (Single Photon Emission Computed Tomography) and PET (positron emission tomography) make functional infor-mation available, but demarcate anatomy below par, However, MRI (Magnetic Resonance Imaging), X-ray , CT (computed tomography), and ultrasound images illustrate features of anatomy ,but very less information is made available.

An appropriate procedure for the reclaiming procedure is necessary for maneuvering these images in databases meritoriously and proficiently. Image retrieval consists of two major methodologies[1]. The text-oriented approach or methodology is the first one, where the image is elucidated as an array of free text or keywords. The queries are based on probabilistic match or precise of the query text. The retrieval query is the second methodology which is grounded based on the visual content of an image which includes colors, image patterns, and textures, contours of the image object and information regarding the location. As a result, content-based image retrieval can be regarded asthe capability to recover related images on the basis of the morpholo-gical content of the images as per the user defined image query.

Additionally, color is an imperative descriptor for demonstrating the lineaments of the object and disco-vering the matching object in image matching/retrieval. On the other hand, the ostensible color of objects can vary radically depending on the object surface,light source, and observation condition. Furthermore, color invariants rely upon the surface color of the object. These invariants can be assessed vigorously irrespective of the lighting circumstances. Robust results were revea-led by the usage of color invariants for the utilization of object with scene image matching approach [5]. This research will scrutinize and evaluate the attribute of the invariants, approximation method from RGB colors, and invariant factor for image retrieval. In this manner, it proposes to augment the sensitivity of object identi-fication based on the different lighting situations.

II. COLOR MODELS

The term color model defined based on the come certain specification. For instance, the color represented as tuples. The persistence of this model, simplifying the specification of different color based on the some assured or/and common standard.

A reproducible depiction of color is given to themselves by these models, predominantly in digital demonstrations like the digital printing/digital electronic display [6]. The procedure of selection of finest color representation encompasses the knowledge of how the color signals are created and the kind of information that are required for these signals [7]. The various color models are described as follows.

A.RGB (Red,Green, Blue)Color Model

The RGB color model is named as an additive model since the other colors are created from the combination this colors.However, it is not perceptually uniform, for instance, a similar variety of shading is not generally saw

as a same variety estimation of the components [8]. As such, this implies the apparent varieties are measured by a man, is constantly fluctuated from the accurate expanse.

B.HSV Color Model

HSV model is proposed to improve RGB model, and it is similar to the color sensing properties of human vision. The term HSV defines hue, saturation and value for the colors. The HSV colors are derived from a combination of these primary colors which characterizes the chromatic component in this model. The predominance of specific hue in color is represented by saturation and value as intensity.

C. RGI Model

RGI model is the conversions of various color models like RGB, HSV. These models are implemented in simple image processing for calculating the new pixel value to identify the object to increase brightness. But it is not proper due to the transformation of one color model to other it can be either RGB to HSV and so on. is very complicated and nonlinear in comparison to the transformation formulas among the other color models [9]. There are other different color spaces such as YCbCr Color Space which is used in MPEG video compression standards; here Y-luminance, Cb-chroma-ticity and Cr-red chromaticity.

III. MEDICAL IMAGE RETRIEVAL SYSTEMS

The medical image framework contains four main parts namely, Web user, Database Management System (DBMS), warehouse, and medical image resources. To retrieve data from DBMS data previously Web user send query message. After reception of query message requested data will be retrieved from the DBMS database. Since automatically system could updates and retrieves the collective data from the medical images also keep stored in warehouses. After search and retrie-val are completed; the system will display the result to the web user.Figure 1 represents architecture for medical image retrieval.

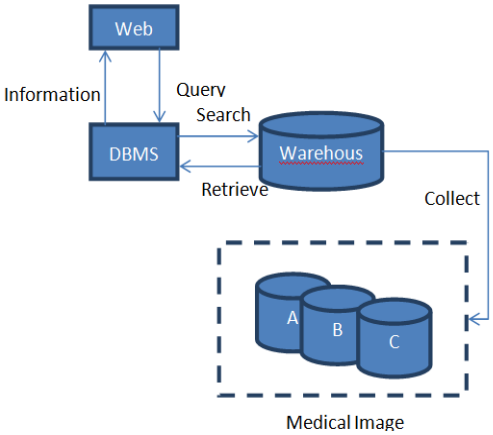

Fig 1. Source: Adopted from Yusof [10]

IV. PARTIAL IMAGE MATCHING

A pivotal role is played by image matching or registration in different applications like multi-modality medical imaging and multispectral image analysis [11]. The part of matching is to include manifold bases of object information into a distinct image. The matching problem arisesin the establishment of the obscure change parameters essential to guide one picture with the other. Various picture coordinating exploration endeavors have been focused on calculations for coordinating of pictures enveloping a total perspective of the question structure that requires being matched [4, 12] while partial view approaches has established with lesser degree of consideration [13]. Various applications are available in which a partial object matching is essential, either since obstructed objects or due to ima-ging modality restrictions. For instance, the imaging modality of PET provides a partial vision whereas the MR (Magnetic Resonance) modality delivers a compre-hensive 3-D view of the brain. Search-based image matching methods employ a ceaseless technique to progress the preliminary guess of unknown transform parameters.

V. LITERATURE REVIEW

The impartial of the review is to find and explore the benefits of image retrieval system and to identify the limitations of existing algorithms and techniques. Also, the review finds the gaps in existing research and techniques and identifies possible solutions to overcome these holes. The text-based indexing consists of more strength comprising the capability to signify both pre-cise and general instantiations of an object at fluctuating levels of difficulty. Glitches with at ext-based approach to images have impelled cumulative interest in the progress of image-based solutions [14]. Frequently, this is described as content-based image retrieval (CBIR). CBIR depends on the classification of original elements like color, shape, and texture which can be axiomatically extricated from numerous images.

The CBIR based studies are discussed as follows.

There are many kinds of image retrieval system. The present study has classified different categories such as shape, texture based image of retrieval systems, color, feature extraction method, genetic algorithm methods based medical images likeretrieval method and retrieval systems.

A. Color, shape, and texture-based image retrieval system

Shih and Chen[15]developed a color image retrieval technique on the basis of the primitives of color instants. To authenticate the performance, two trial databases from Corel are made use of to examine in contrast the performances of the projected with other prevailing ones. Neumann and Gegenfurtner [16] generated an image indexing system based on certain properties of beginnings of human vision. They made use of a color space related to radial histograms. The manifestations were assessed by associating the calculated similarity values with human conclusions quantitatively and empirically in a 2AFC design.

Neumann and Gegenfurtner [17] suggested a technique which connects indexing features with noncognitive and physical importance consequently indirectly integrating high-level knowledge into low-level characteristics. It instigated a measurable-effectual system

which develops the power and simultaneously conserves the uncomplicatedness of basic color indexing. Qiu and Lam [18] projected a region-based image retrieval system with elevated syntactic color names. A visceral color is demarcated as the low-level color feature for each segmented region and is transformed into a seman-tic color name. In this manner, the system condensed the 'semantic gap' between numerical image features and the abundance of human semantics.Investigational out-comes established the significant performance of the projected system in comparison to outmoded CBIR systems.

Stottinger et al., [19] suggested the usage of color data using interest point prediction approach. Addition-ally, multi-channel images are explored, and various color spaces are evaluatedusing Harris corner detector. The experimental results shows the enhanced perfor-mance image retrieval using boosting salient colors with color data. Wang and Wu[20] presented a fuzzy domi-nant color selection clustering algorithm to reduce the dimensionalities and the quantization errors of color histogram. To improve the exactness of retrieving, they combined the region-based shape feature and texture feature. The proposed experimental result will show and that the average hit ratio is more than the color histo-gram quantization methods and look-up-table method.

Sajjanhar et al., [21] projected a new CBIR system by means of a new semantic classification to elucidate the features of intra-region color. The planned semantic groupmatches the prevailing elevated descriptions. The simulation results shows the outcomes of established the efficiency of the anticipated approach. Mamatha and Ananth [22] focussed on emerging image indexing methods that have the ability to recover the imageon the basis of their contents. By making use of colors as the content, CBIR system used for the low-resolution rural image and high-resolution urban image which was assimilated from satellites. The outcome displayed that approximation of the features and accessible resources from the metaphors has been prepared by means of the color spectral graphs.

Singhai and Shandilya [23] projected an appraisal of numerous CBIR systems. They similarly presented the elements like color histogram,neuro-fuzzy technique, texture and edge density for precise and operative CBIR System.The fuzzy inference combined various features perfectly in CBIR and showed the user's subjective requirements. The experiments obtained good perfor-mance and demonstrated the efficiency and robustness of the system.

Deshpande and Borse [24] suggested a technique which practices both color and texture characteristics for image retrieval. RGB is transformed to YCbCr and HSV space,for low-level feature color for obtaining improved outcomes.Here the image was retrieved with texture using co-occurrence matrix. The low-level features to be utilized hinge on the applications. Color feature displayed improved result for natural images whereas for textured images co-occurrence matrix will provide anenhanced result.

Saad et al., [25] projected an image retrieval frame-work based on the texture and color information towards create the trajectories features for accomplish the image feature matching. Furthermore, assimilated the YCbCr color histogram that symbolizes the edge histogram as a local descriptor and global feature towards augment the retrieval outcomes. It was revealed by the experimental effort that the projected method progresses the accuracy and recollection of retrieval outcomes compared to further methods testified in work.

Mehta et al., [26] proposed a Color- Texture Based Image Retrieval System. It detects similar images from image database by Quadratic Distance Metric. The search is enhanced by using Pyramid Structure WT- Wavelet transform model, energy level calculation and it could compare the texture feature and which is used in euclidean distance equations. The proposed experimen-tal results are shown, this method is much better to compare with the previous methods which use color-texture feature individually for image retrieval.

Patil [27] proposed CBIR with relevance feedback method and often incommensurate features into a unique framework. Bhagat and Atique [28] compared the various techniques of image analysis through image ranking by CBIR method. This component gives the rank to the yield picture as indicated by the likenesses between stored and input query image.

Haridas and Thanamani [29] uses various methods for CBIR System such as RGB Color Histogram, Gabor Feature, and Tamura Texture. These methods are tested based on Precision, Recall, and Accuracy rate. The results show that Gabor Feature method is more effi-cient when comparing with other methods. Lingadalli and Ramesh [30] proposed an algorithm which incorporates all three features like shape, texture and color to enhance the accuracy and overall performance of retrieval of images. From here, through the GLCM (Grey Level Co-occurrence Matrix) technique text features are extracted. Then the feature matching proce-dure is based on the Canberra distance.

Bhute and Meshram [31] proposed the efficient CBIR systems which employ the color,shape and texture information of the image to improve the retrieval process. For facilitating speed of the retrieval antipole-tree algorithm is used for indexing the images. Addi-tionally, they have discussed a comprehensive survey that highlights popular methods and algorithms for evaluation relevant to the proposed and exciting field of image retrieval.

Hui Yu et al., [32] projected an indigenous Fourier transform that is on the basis of texture demonstration and originates distinctive maps for defining diverse facets of co-occurrence associations of image pixels in every channel of thecolor space. Consequences reveal that this novel aspect can accomplish decent retrieval performance for CBIR. Furthermore, the presentation of the projected aspect is compared to the RGB based and

HSV-based features along with grayscale texture features.

Ksantini et al., [33] projected an interrogating technique for CBIR system. Acolor image is divided into two separate portions by using the multispectral gradient which is the homogeneous color regions and the color image edges and their surroundings and is used to calculate the extent of similarity between two color images using one-dimensional pseudo-metric, Daube-chies-8 decomposition and compression of the extracted histograms. This querying technique is invariant to the query color image object alterations and color concen-trations.

B.Image Matching and feedback based image retrieval

Xu [34] presented a method for extracting vertebral outlines for image recovery and utilizations and shape matching strategies distinguish the nearness of foremost osteophytes by utilizing X-ray images. The MOT (Mul-tiple Open Triangle) shape representation techniques are utilized for halfway shape matching, and CGDP (Corner -Guided Dynamic Programming) system was utilized to look in complete interims for coordinating correlation. The MOT strategy showed higher recovery precision than other existing methodologies, and the recovery speed is improved with the utilization of CGDP.

Funkhouser and Shilane[35]retrieved the similar shape of object from 3D object database using priority-driven search technique. Further, this approach provides the ranked list of target object using database of target and query objects. They proved, compared to existing shape matching approach, this technique offers better classification rates.The experimental results shows, this approach. However, this system identified only partial matches, so the system is unable to validate the optimal match.

Neumann and Gegenfuetner [36] appraise an image indexing system on the basis of certainly recognized properties of the formative years of human vision. They quantitatively calculated the association between the similarity order prompted by the manifestations and apparent similarity. As against the preceding assessment methods, they quantitatively measured computed both for the scarce best-matching images and similarly for relatively distinct images. The outcomes display that the rank orders prompted by the guides forecast the apparent resemblance between images.

Grigorova et al., [37] planned a flexible retrieval approach based on the theory of RF, which forms a connection concerning low-level aspects and high-level models. The aim is to discover a cluster of beneficial systems authorizing to a user query whereas at the same time preserving a feature vector size in order to acquire improved matching and lesser complication. Consequ-ences are attained from diverse image databases, and two completely dissimilar feature sets reveal that the suggested algorithm outdoes formerly suggested techni-ques.

Pandey et al., [38] projected a novel matching modus operand to discover the similar worth between query color image and database color image by using the spatiogram, histogram, and bins. This technique employed both HSVand RGB color space. Three conditions are used for the definition of color resem-blance between two images.If outcomes are 1, then images color zone flawless match, relatively if it is less than 1,or greater than 0.5 then color resemblance are decent and lastly if it is less than 0.5 then color resemblance is pitiable. The resemblance between compressed color image was also delivered by this method; 90 degrees revolve the RGB color image , HSV color image.

Janani and Chezian [39] proposed an image mining technique which is used to mine knowledge from the image. The image mining process is to retrieve compa-rable images from the massive database. Instead of exact matching, CBIR is to findout the visual and similarities between the query images and images database, the survey of different image mining techniques are presen-ted in this paper.

Pinjarkar et al., [40] discussed the different metho-dologies used in the research area of CBIR techniques using RF. This study could cover the various parameters and evaluate a different kind of analysis, and the results are analyzed in an experimental manner. From the results of the various methods analyzed, it can be conc-luded that to enhance retrieval performance the resear-chers have to design CBIR methods to increase the standard evaluation parameters values like convergence ratio, precision or accuracy.

C.Feature Extraction method

Barbu et al., [41] proposed a technique for extraction of color feature using content based image recognition technique. Further they aimed to cluster the set of digital image in different illumination condition based on the similarity color approach. Finally, the color features are clustered by unsupervised automatic classification appro-ach. Bai et al., [42] presented new technologies for retrieval based image color extension. Further, its used for extraction of texture information with the extraction of DCT domain. The experimental results are shown in VisTex database that the proposed metho-dology performance was higher than the refered approa-ches which are reported in the recently published literature.

Madhura and Dheeraj[43] proposed an approach for hybrid feature extraction which overcomes the manual problems occurred in CBIR system. The image is retrieved by combined with color and texture feature ,the color space and which gives the best result as analyzed by using recall and precision graph.The experimental results showed that the precision and recall for horses,food image and buses, categories of HSV color space give good results than other color spaces.

Datta et al., [44] discussed a brief survey about CBIR Feature. They have some guidelines for building practical, real-world systems and compiled research trends in CBIR approach. The trends show that feature extraction and RF has established application oriented features. Jain et al., [45] proposed a new image retrieval

system that works on color image features to explain the content of an image region. Additionally, they evaluate the proposed CBIR systems with CM, RGBC, HA, ED and DM. These methods boost the retrieval precision of proposed system. The experimental results are shown to achieve better compared to existing method such as FIRM, Simplicity, Edge Based method, and Histogram.

D.GA-based image retrieval system

Gudivada et al., [46] projected a technique for inflexible global matching of incomplete viewimages. This technique exploited a genetic algorithm (GA) to hunt for the transformation parameter space and a distance transform to compute a decent match of measure. In consequence, thedifficulty of partial image registration has been resolved by upholdingthe processed images around the edge.

Chang et al., [47] projected an effectual GA-based image retrieval approach where the user RF based on ROI is engaged to optimize the retrieval effectiveness. The user RF is utilized to direct the progressive search. Furthermore, the retrieval performance is improved by mining association rules from the recorded feedback. The experimental consequences reveal the efficiency and adaptability of the method concerning retrieval precision and recall rates. Poupghassem and Daneshvar [48] planned RF methodology with CBIR outline.The figure and texture characteristics are designated and regularized by a new GA-based feature reduction and optimization algorithm in the feature space. The investigational outcomes displayed the competence of projected agenda associated with the methods accessible in the literature.

E. Image retrieval in medical application

Glatard et al., [49]examined medical image features and appraised Gabor-filter based features abstraction for medical images indexing and cataloging. This research establishedinthe tangible instance of cardiac imaging that this technique could be utilized for retrieval by comparison queries, indexing, and to a certain degree, clinically taking out pertinent data out of the images. Lam et al., [50] applied a CBIR scheme for pulmonary CT nodules. They examined and assessed numerous texture models and similarity measures on nodule size, radiologist contract on the modules and the quantity of retrieved modules' texture behavior. The outcomes were formed by 90 thoracic CT scans composed by the Lung Image Database Consortium.

Li et al., [51] suggested a CBIR system for recognition of TBI(traumatic brain injury) using CT images. In TBI framework, bin-based binary feature vectors are characterized by features of neurotic image. The Jaccard-Needham measure was utilized by them as the comparison measurement. On this ground, a 3D similarity is calculated by working out the similarity mark between two sequences of CT slices. The nDCG is utilized to appraise the system presentation, which displayed the system products equitable retrieval outcomes. Oberoi and Singh [52] calculated a CBIR System for Medical Databases on the basis of numerous methods such as Euclidean and Canberra distance, Haar Wavelet transformation and Fourier descriptor. Also they evaluated the performance of these approach using endoscopy, skull and dental images.

Chi et al., [53] presented an automatic methodology to facilitates the characteristics of multiphase CT images and also focused on the FLL (Focal Liver Lesions). This study used a preconstructed database of FLLs is used to decision-making and support radiologists in characterization of FLL. The experimental results showed that multiphase CT images could be used in CBIR for FLL's classification. Finally, compared the single stage CT images, this technique provide better performance.

Kumar and Kumaraswamy [54] investigated medical image retrieval from a database. In which, the features are extracted by DST (Discrete Sine Transform), and found relevant images using booster classifier approach. Experimental results showed that the classification accuracy achieved is fairly good.

TABLE- 1: **Summary of Studies.**

Authors	**Technique**	**Features of current techniques**	**Research gap**
Gudivada et al., [46]	global rigid matching of partial view images	Images, Genetic algorithm	Need to improve matching accuracy and speed
Shih and Chen [15]	Colour based CBIR	Primitives of color moments	Used only color feature
Lou et al., [55]	CBIR-region based retrieval	Perpetual color used	To extract distinct semantic multiple types of low-level image features are required
Glatard et al., [49]	Indexing and Classification	Cardiac images Texture features	Needs effective query tools
Ksantini et al., [33]	CBIR	used multispectral gradient LAB color space simple and fast querying method	Statistical method needed to improve for larger color image databases.

Funkhouser and Shilane [35]	Priority-driven search algorithm	3D objects Shape feature Improved search time and retrieval performance	Need simple methods random sampling, compression, and indexing to speed up
Xu [34]	shape matching method	X-Ray images, MOT shape representation Retrieval speed improved using Corner - Guided dynamic programming.	Can be used in other medical images.
Li et al., [51]	CBIR	TBI-CT images	Require improvement in indexing method and user interface
Lam et al., [50]	CBIR	Pulmonary CT nodules Texture feature	Needed improvement using customized queries" approach Accuracy needed to improve by taking semantic contents
Grigorova et al., [37]	CBIR-Relevance feedback method	Images, High-level and low-level features used	Needed optimum feature replace-ment rules for feature adaption
Sajjanhar et al., [21]	CBIR	Intra-region color properties RGB and HSV color space	Quantized only two values, for better performance more level of quantization is needed
Wang and Wu [20]	CBIR-color image retrieval	Clustering approach based on fuzzy dominant for extraction of feature using Color, shape, texture	Needed to add RF Not adjusted weighted values of color, shape, texture features according to the characteristics of query image/region
Barbu et al., [41]	CBIR	Color feature Classification-K-Means	Not used Color based image indexing
Pandey et al., [38]	CBIR	color matching method Used histogram and spatio-gram	Not find the similarity between different image formats, jpeg, png, tif.
Deshpande and Borse [24]	CBIR	Images, Color, texture feature Combination HSV space and YCbCr color space used	Number of Database images are not mentioned
Oberoi and Singh [52]	CBIR-Medical databases	Haar Wavelet transformation, Euclidean distance, Fourier descriptor, Canberra distance Endoscopy, Dental and Skull imag es.	Requires enhancement of image and GUI
Pinjarkar et al., [40]	CBIR- RF	Comparison of various CBIR systems with RF	Technique is not applied in multimedia retrieval/ multi-media recommendation applications
Bhute and Meshram [31]	CBIR	Color, texture and shape features antipole-tree algori-thm for indexing	Needed to use additional features
Madhura and Dheeraj [43]	CBIR	Images Color and Texture Features Combination of three color space used GLCM	more efficient color spaces and distance measures needed to improve the performance of color
Chi et al. [53]	CBIR- automatic characterization of FLLs	Multiphase CT images, Feature extraction–Texture, Density Detection method-hybrid generative discrimina -tive FLL Registration approach	Not used shape features.

Bhagat and Atique [28]	Web based CBIR	Color, texture, and shape	Needed multi-dimensional indexing structures quadtrees, grid files, and binary trees Needed to improve ranking scheme using RF
Haridas and Thanamani [29]	CBIR	RGB Color Histogram, Gabor Feature, Tamura Texture	connect semantic web-based image retrieval and facial recognition
Chang et al., [47]	CBIR	genetic algorithm RF	the spatial relationship among regions was not considered Method needed to improve by combining the GA-based recommendations with semantic information
Jain et al., [45]	CBIR	Histogram analysis, Diagonal mean, columnarmean, color image analysis, Euclidean distance	Required pre-classification and semantic images
Hui Yu et al., [32]	CBIR	HSV color space, color texture moments	Not discussed unique maps and interpreting properties
Lingadalli and Ramesh [30]	CBIR	HSV color space Color, shape, and texture feature matching -Canberra distance	Needed to implement GLCM with a different angle at different distances and in HSV color space different levels of H, S,V to generate histogram bins.

From all these studies, it is understood that image retrieving system is most effective. Additionally, a summary of methods/ techniques and limitation of the previous study are discussed in Table 1.The study accomplished that still there is a need for a significantly better system for image retrieval in terms of both relevance and response time. This review suggests some future scope for achieving a better system in image retrieval process which is discussed in the following section.

VI. CONCLUSION

In this study, an analysis and review of the existing method based on concepts of image retrieval system were conducted. The use visual feature such as color, texture and shape feature vector to match the image which can able to give better region. From all the study, it was understood that image retrieving system is the most effective. Furthermore, we have studied the existing approach towards image retrieval system. Each of this approach has its individual contribution, merits and demerits. Additionally, employed towards discerning an effective retrieval approach self-possessed with challenges and limitations. Finally, the significant amount of work has been done in medical application but still there is a need for a significantly better system to image retrieval in terms of both relevance and response time.

ACKNOWLEDGEMENT

The authors would like to thank the entire research congress team of Karpagam University, Coimbatore for their continuous support and encouragement.

REFERENCES

[1] P. L. Stanchev, General Image Retrieval Model, in *Proceeding 27th Conference of the union of the Bulgarian P*p. 63–71 (1998).

[2] M. Sundaresan and K. G. Srinivasagan, Design of Image Retrieval Efficacy System Based on CBIR, *Int. J. Adv. Res. Comput. Sci. Softw. Eng.* 3(4): 48–53 (2013).

[3] S. Deb and Y. Zhang, An Overview of Content-based Image Retrieval Techniques, *Proceedings of the 18th International Conference on Advanced Information Networking and Application (*2004).

[4] V. den Elsen, E.-J. Pol and M. Viergever, Medical Image matching-A Review with classification, *IEEE Engineering Medicine and Biology* Pp. 26–39 (1993).

[5] W. Matsumoto, Joint Use of Luminance and Color Invariants in Partial Image Retrieval (2013).

[6] E.L. van den Broek, T. Kok, T.E. Schouten and L. G. Vuurpijl, Human-Centered Content-Based Image Retrieval, *Proceedings of SPIE* vol. 6806, p. 68061L–68061L–12 (2008).

[7] H. K. Kelda and P. Kaur, A Review: Color Models in Image Processing, *Int.J.Computer Technol. Appl.* 5(2): 319–322 (2014).

[8] K. Meskaldji, S. Boucherkha and S. Chikhi, Color quantization and its impact on color histogram based image retrieval accuracy, *First International Conference on Networked Digital Technologies* Pp. 515–517 (2009).

[9] H. K. Kelda and P. Kaur, A Review: Color Models in Image Processing, *Int.J.Computer Technol. Appl.* 5(2) 319–322 (2014).

[10] M. K. Yusof, Effectiveness of Dominant Color Descriptor Technique in Medical Image Retrieval Application. *Int. J. Medical, Heal. Biomed. Bioeng. Pharm. Eng.* 4(4):161–163 (2010).

[11] K. Simunic and S. Loncaric, A Genetic Search-based Partial Image Matching (2001).

[12] L. G. Brown, A Survey of Image Registration Techniques, Columbia University (1991).

[13] S. Loncaric and A. P. Dhawan, 3-D Brain Image Registration Using Optimal Morphological Processing, *10th ISBE'94*, Pp. 83–86 (1994).

[14] A. A. Goodrum, Image Information Retrieval: An Overview of Current Research. *Spec. Issue Information Sci. Res.* 3(2): (2000).

[15] J.-L. Shih and L.-H. Chen, Colour image retrieval based on primitives of color moments, *IEE Proc. - Vision, Image, Signal Process.* 149(6): 370 (2002).

[16] D. Neumann and K. R. Gegenfurtner, Perception-Based Image Retrieval, Germany (2002).

[17] D. Neumann and K. R. Gegenfuetner, Image Retrieval and Perceptual Similarity, *ACM Trans. Appl. Percept.* 3(1): 31–47 (2006).

[18] G. Qiu and K.-M. Lam, Frequency Layered Color Indexing for Content-Based Image Retrieval. *IEEE Trans. IMAGE Process.* 12(1): 102–103 (2012).

[19] J. Stottinger, N. Sebe, T. Gevers and A. Hanbury, Colour Interest Points for Image Retrieval, *Computer Vision Winter Workshop Pp. 1-8 (2007).*

[20] S.-J. Wang and Y. S. Wu, Color Image Retrieval Using a Fuzzy Dominant Color Selection Clustering Algorithm. *Journal fo C.C.I.T.* 37(1): 47–56 (2008).

[21] A. Sajjanhar, G. Luo, D. Zhang, W. Zhou and Y.P. P. Chen, Image retrieval based on the semantics of intra-region color properties, *Proceedings of 2008 IEEE 8th International Conference on Computer and Information Technology, Institute of Electrical and Electronics Engineers p*p. 338–343 (2008).

[22] Y. N. Mamatha and A. Ananth, Content Based Image Retrieval of Satellite Imageries Using Soft Query Based Color Composite Techniques. *Int. J. Comput. Appl.* 7(5): 40–45 (2010).

[23] N. Singhai and S. K. Shandilya, A Survey On: Content Based Image Retrieval Systems. *Int. J. Comput. Appl.* 4(2): 22–26 (2010).

[24] G. Deshpande and M. Borse, Image Retrieval with the use of Color and Texture Feature. *Int. J. Comput. Sci.Inf. Technol.* 2(3): 1018–1021 (2011).

[25] M. H. Saad, H. I. Saleh, H. Kondor and M. Ashour, Image Retrieval Based on Integration Between YCbCr Color Histogram and Texture Feature. *Int. J. Comput. Theory Eng.* 3(5): 701–706 (2011).

[26] R. Mehta, N. Mishra and S. Sharma, Color - Texture based Image Retrieval System. *Int. J. Comput. Appl.* 24(5): 24–23 (2011).

[27] S. M. Patil, Content Based Image Reteieval Using Color, Texture & Shape. *Int. J. Comput. Sci. Eng. Technol.* 3(9): 404–410 (2012).

[28] A. P. Bhagat and M. Atique, Web Based Image Retrieval System Using Color, Texture, and Shape Analysis: Comparative Analysis. *Int. J. Adv. Comput. Res.* 3(3/12): 58–66 (2013).

[29] K. Haridas and A. S. Thanamani, Well-Organized Content-based Image Retrieval System in RGB Color Histogram, Tamura Texture and Gabor Feature. *Int. J. Adv. Res. Comput. Commun. Eng.* 3(10): 8242–8248 (2014).

[30] R. K. Lingadalli and N. Ramesh, Content Based Image Retrieval using Color, Shape and Texture. *Int. Adv. Res. J. Sci. Eng. Technol.* 2(6): 40–45 (2015).

[31] A. N. Bhute and B. B. Meshram, Content Based Image Indexing and Retrieval. *Int. J. Graph. Image Process* 3(4): 235–246 (2013).

[32] Hui Yu, Mingjing Li, Hong-Jiang Zhang and Jufu Feng, Color texture moments for content-based image retrieval, *Proceedings International Conf. on Image Processing* vol. 1: pp. 929–932 (2002).

[33] R. Ksantini, D. Ziou and F. Dubeau, Image Retrieval Based on Region Separation and Multi-resolution Analysis. *Int. J. Wavelets, Multiresolution Inf. Process* 4(1): 147–175 (2006).

[34] X. Xu, Shape Matching, Relevance Feedback, and Indexing with Application to Spine X-Ray Image Retrieval, Brigham Young University (2006).

[35] T. Funkhouser and P. Shilane, Partial Matching of 3D Shapes with Priority-Driven Search, *Eurographics Symposium on Geometry Processing* Pp. 131–142 (2006).

[36] D. Neumann and K.R. Gegenfuetner, Image Retrieval and Perceptual Similarity. *ACM Trans. Appl. Percept.* 3(1): 31–47 (2006).

[37] A. Grigorova, F. G. B. De Natale, C. Dagli and T. S. Huang, Content-Based Image Retrieval by Feature Adaptation and Relevance Feedback. *IEEE Trans. Multimed.* 9(6): 1183–1192 (2007).

[38] K. K. Pandey, N. Mishra and H. kumar Sharma, Enhanced of color matching algorithm for image retrieval. *Int. J. Comput. Sci. Issues* 8(3/2): 529–532 (2011).

[39] M. Janani and R. M. Chezian, A Surevey on Coontent Based Image Reteivel System. *Int. J. Adv. Res. Comput. Eng. Technol.* 1(5): 266–269 (2012).

[40] L. Pinjarkar, M. Sharma, and K. Mehta, Comparison and Analysis of Content Based Image Retrieval Systems Based On Relevance Feedback. *J. Emerg. Trends Comput. Inf. Sci.* 3(6): 833–837 (2012).

[41] T. Barbu, A. Ciobanu and M. Costin, Unsupervised Color - Based Image Recognition Using a Lab Feature Extraction Technique. *Bul. Institute Politeh. Iaşi* 57(61): 33–41 (2011).

[42] C. Bai, K. Kpalma and J. Ronsin, Color Textured Image Retrieval by Combining Texture and Color Features, *20th European Signal Processing Conference* Pp. 170–174 (2012).

[43] C. Madhura and D. Dheeraj, Feature Extraction for Image Retrieval Using Color Spaces and GLCM. *Int. J. Innov. Technol. Explor. Eng.* 3(2): 159–162 (2013).

[44] R. Datta, J. Li and J. Z. Wang, Content-Based Image Retrieval - Approaches and Trends of the New Age, ACM, Singapore (2005).

[45] R. Jain, S. K. Sinha, and M. Kumar, A New Image Retrieval System Based on CBIR. *Int. J. Emerg. Technol. Adv. Eng.* 5(2): 1001–107 (2015).

[46] V.N. Gudivada, V.V. Raghavan and K. Vanapipat, A Unified Approach to Data Modeling and Retrieval for a Class of Image Database Applications. *IEEE Transactions on Data and Knowledge Engineering* Pp. 37–78 (1994).

[47] T.-W. Chang, Y.-P. Huang and F. E. Sandnes, A GA-Based Fuzzy Recommender System for Region-Based Image Retrieval. *Int. J. Fuzzy Syst.* 16(3): 290–302 (2014).

[48] H. Poupghassem and S. Daneshvar, A framework for medical image retrieval using merging-based classification with dependency probability-based relevance feedback. *Turkish J. Electr. Eng. Comput. Sci.* 21: 882 – 896 (2013).

[49] T. Glatard, J. Montagnat and I. E. Magnin, Texture based medical image indexing and retrieval, *Proceedings of the 6th ACM SIGMM international workshop on Multimedia information retrieval - MIR '04*, Pp. 135–142 (2004).

[50] M. Lam, T. Disney, M. Pham, D. Raicu, J. Furst and R. Susomboon, Content-based image retrieval for pulmonary computed tomography module images, *Proceeding of SPIE-the International Society for Optical Engineering P*p. 1–12 (2007).

[51] S. Li, T. Gong, J. Wang, R. Liu, C. L. Tan, T. Y. Leong, B. C. Pang, C. C. T. Lim, C. K. Lee, Q. Tian and Z. Zhang, TBIdoc: 3D Content-based CT Image Retrieval System for Traumatic Brain Injury, *SPIE Proceedings Medical Imaging 2010: Computer-Aided Diagnosis P*p. 1–10 (2010).

[52] A. Oberoi and M. Singh, Content Based Image Retrieval System for Medical Databases (CBIR-MD) - Lucratively tested on Endoscopy, Dental and Skull Images. *Int. J. Comput. Sci. Issues* 9(3): 300–306 (2012).

[53] Y. Chi, J. Zhou, S. K. Venkatesh, Q. Tian and J. Liu, Content-based image retrieval of multiphase CT images for focal liver lesion characterization. *Med. Phys.*40(10): 103502 (2013).

[54] S. Kumar and Y. S. Kumaraswamy, A Boosting FrameWork for Improved Content Based Image Retrieval, *Indian J. Sci. Technol.* 6(4): 4312–4316, (2013).

[55] W. Lou, W. Liu and Y. Fang, SPREAD: Enhancing Data Confidentiality in Mobile Ad Hoc Networks, *IEEE INFOCOM* (2004).