INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.488

A Review On: Content Based Image Retrieval Using Intelligence Techniques

Sakshi Makwane, V S Mahalle , Dr. D R Dhotre

PG Student, Dept. of Computer Science and Engineering, SSGMCE, Shegaon, India

Assistant Professor, Dept. of Computer Science and Engineering, SSGMCE, Shegaon, India

Head of Department, Dept. of Computer Science and Engineering, SSGMCE, Shegaon, India

ABSTRACT: Traditionally content based image retrieval is done by using text based approached that is user have to query by metadata, name , context etc which is not very efficient and useful in the digital world to resolve this problem , the new approached is proposed that is visual based image retrieval by using the visual feature of the image like color, texture ,shape etc this can be done by using different ways such as machine learning, deep learning by using CNN algorithm to extract the feature of the image and reduce the computational time as well as cost . In this paper the different proposed system developed by different researcher used in CBIR is stated.

KEYWORDS: CBIR ;Machine learning ; CNN; deep learning

I. INTRODUCTION

CBIR aims at obtaining images that are relevant to a query image from a large collection based on their visual content. Given the feature representations of the images to be searched and the query, the output of the CBIR procedure constitutes in a search in the feature space, in order to retrieve a ranked set of images in terms of a similarity to the query representation. A key issue concerning CBIR is to extract meaningful information from raw data in order to eliminate the so-called semantic-gap . The semantic-gap refers to the difference between the low level representations of images (i.e. pixels) and their higher level concepts (e.g. persons, objects, actions, etc.)[1]. To resolve this challenge the new techniques are proposed, these machine learning ,deep learning different algorithm are used to extract the feature from image such as CNN,K means Clustering, KNN ,ANN ,cosine distance etc. In CBIR, visual image contents are represented as image features, which are extracted using automatically done feature extraction methods. Thus human intervention is eliminated. The feature extraction methods are computationally expensive and have also large dimensionality and these methods tend to be domain specific. A lot of research scope for simplifying these algorithms need to be addressed [6]..

Convolutional networks have been tremendously successful in practical applications. The name "convolutional neural network" indicates that the network employs a mathematical operation called convolution. Convolution is a specialized kind of linear operation. Convolutional networks are simply neural networks that use convolution in place of general matrix multiplication in at least one of their layers[2].Machine Learning from examples means we have a tendency to attempt to construct an machine (i.e. a PC program) that may be taught to carry out a chore by observant examples. Naturally, the list uses the guidance examples to create a model of the globe that permits reliable predictions[3] Machine learning within the field of technology that offers computers the flexibility to be told while not being specifically programme. The essential premise of machine learning is to build algorithms which will obtain computer file relate degreed use practical math scrutiny to envisage an output worth with an suitable vary.[3]

Convolutional neural networks or ConvNets is a neural network that uses a convolution method to extract activation values from a volume for another volume layer. ConvNets in a simple sense is a sequence of layers, where each layer of ConvNets, convert one activation volume to another volume, with different functions. There are 3 main types of layers that have three main layers, namely convolution layer (conv layer), pooling layer, and fully connected layer [4].

One important infiltrate technique is recognized as "deep learning", which includes a family of machine learning algorithms that attempt to mold high-level abstractions in data by utilizing deep architectures compiled of multiple non-linear transformations . Contrasting usual machine learning methods, deep learning imitates the human brain that is arranged in a deep architecture and processes information through multiple stages of transformation and representation. By exploring deep architectures to learn features at multiple level of abstracts from data automatically, deep learning methods permit a system to learn complex functions that directly map raw sensory input data to the output, without relying on human-crafted features using domain knowledge.[1]

Deep learning is one of the classifications of soft computing phenomenon in which extraction of data from millions of segregated images can be retrieved using this phenomenon . The retrieval performance of a content-based image retrieval system crucially depends on the feature representation and similarity measurement, which have been extensively studied by multimedia researchers for decades Although a variety of techniques have been proposed, it remains one of the most challenging problems in current content-based image retrieval (CBIR) research, which is mainly due to the well-known "semantic gap" issue that exists between low-level image pixels captured by machines and high-level semantic concept perceived by humans. From a high-level perspective, such challenge can be rooted to the fundamental challenge of artificial intelligence (AI) that is, how to build and train intelligent machines like human to tackle real-world tasks [5].

II. LITERATURE REVIEW

The following section describes the contributions of the various researchers in the area CBIR.

 Prameela Devi. Chillakuru, T. Kumanan , et al. [7] proposed the Efficient Density-based Clustering Algorithm (EDBC) for CBIR technique that will enhance scalability, reduce the user search time, and lower the maintenance cost. The experiments are implemented in Java and system configuration as Intel Core 2.93GHz, 4GB RAM with Windows 10. The flow of data of the proposed technique is it collects the unstructured dataset like images for content with quality based retrieval images using a data mining approach. The smoothing filter is employed to filter the unwanted information from an image. In the future, researchers can use different kinds of features along with existing features and machine learning techniques like neural network classification in the successful recovery of media. One such direction for further investigation of this method is to customize this in handling other media types like video and audio through a texture based retrieval technique.

T. Christy Bobby [8] has recommended the new technique for identifying fractures or any other disorder caused in the thigh bone in human body .In this work, human femur radiographic bone images are classified using morphometric features derived from the segmented bone. Femur bone structure from 2D X-ray radiograph is segmented using active contour method and morphometric measurements. From the measured morphometric distances, six morphometric ratios are calculated. These ratios are examined to discriminate normal and abnormal bone and used for classification. Neural network based statistical tools such as Extreme Learning Machine (ELM) and Evolutionary Extreme Learning Machine (E-ELM) are utilized to automate the classification. The scope of this paper is it appears that classification of femur image using morphometric analysis could be used as an index for image analysis using Content Based Image Retrival (CBIR) system and gross abnormality detection.

Muhammad Azam, Nizar Bouguila [9] propose the bounded Laplace mixture model (BLMM), new modeling scheme for wavelet coefficients based on BLMM and apply it to image clustering and content based image retrieval (CBIR). The clustering stage is also performed by BLMM. BLMM is applied for feature extraction. The model parameters adapted from proposed model, reflect the image features of wavelet domain for each subspace and selected to formulate the feature space which is further used in clustering and CBIR. In future we can extend it for more data handling model.

The MPEG-7 and Edge Directivity Descriptor is used to take out the feature vectors of a particular image from the image database. An effective graphical user interface with the essential utility for the purpose of implementation of

different images in the form of image gallery discussed. Scope of improvement in this method is where we can increase the number of sections in the GUI. Is proposed by Meenaakshi N. Munjal , Shaveta Bhatia [10].

Karthik K, Sowmya Kamath S [11] proposed an efficient CBMIR (content based medical image retrieval) model that is built on multi-level feature sets extracted from medical images. Four different feature extraction techniques are used to optimally represent images in a multi-dimensional feature space, for facilitating classification using supervised machine learning algorithms and top-k similar image retrieval. In future the technique can be improve by the hybrid feature representation further to deal with the class imbalance problem also the suitability of deep neural networks for improving classification and retrieval.

Narasimha Yadav R.P , Pavithra .L.K, et al. [12] proposed different algorithm used to retrieve the feature from the image the researchers used Wang's dataset and applied Zernike Moments. This technique is implement on supervised and unsupervised algorithm for image retrieval .The supervised learning algorithms named as Support Vector Machine (SVM) K-Nearest Neighbour (KNN), Naïve-Bayes and Random Forest are trained by this feature vectors are used for class prediction. Subsequently, highest probability class images are grouped to reduce the search space for similar images. The distance measure is used to calculate the similarity between the user query and newly grouped images. The future scope of this work will consider local image descriptors for supervised and unsupervised learning to improve the image retrieval rate.

A novel method for handwritten numeral image extraction is proposed based on Random Forest(RF) and Histogram of Oriented Gradient(HOG) .The main contribution of the proposed method is to consider the advantage of HOG and RF. The new method extract the impactful information of image ,and reduce the input dimension. Therefore, the method can effectively improve the accuracy of handwriting recognition. And the training speed of classifier is faster than multi-layer neural network is demonstrated by Jianquan Ouyang ,Qianlei Hu [13]. In future proposed method can be apply to larger data. Moreover, it will be deployed in smart phones.

Farzad Sabahi, M. Omair Ahmad, et al. [14] proposed a new frame work for retrieving image more efficiently based on image hashing and random forest, which is fast and offers high performance. The proposed framework consists of a multi-key image hashing technique based on discrete cosine transform (DCT) and discrete wavelet transform (DWT) and random forest based on normalized B+ Tree (NB+ Tree), which reduces the high dimensional input vectors to one-dimension, which in turn improves the time complexity significantly and speed. In addition, the proposed scheme maintains a fast scaling with increasing size of the data sets while preserving high accuracy. In future work and improvement include faster hashing technique and optimization of the random forest.

S.Sindu, Dr.R.Kousalya [15] proposed a technique as enormous quantity of digital images are stored in database there is a need for retrieving the relevant image. Content - based image recovery is carried out in two phases in this research work. In the first phase Convolutional Neural Network(CNN) is used for detecting the images. CNN are capable of detecting multiple objects each belonging to different class by processing the image in a single pass. Convolution Neural Network is used to solve the multiple class detection problem. In the second phase once the objects are detected, relevant images are retrieved by using relevance ranking where priority is assigned within same class of images. As in proposed method the color feature is used to extract the relevant image, in future shape and texture feature can be used to extract the relevant image.

Sudeep D. Thepade, Madhura M. Kalbhor[16] proposed a method by using different machine learning algorithm with Hartley transform function it stated that it gives the accurate and efficient prediction of image . The system uses the content as transformed fractional coeficients to generate the feature vector for image class peridication using Sine and Hartley transforms. Machine learning algoritms alias Random Forest, SVM, Simple logicts are employed for proposed image category prediction method. The paper also proposes ensembling of these machine learning alogorithms with majority voting at decision level for improved image category prediction. In future by extending the size of coefficient function used in proposed work the efficiency for retrieving image can be increase.

Effat Naaz, Dr. Arun Kumar T [17] demonstrated a novel approach to content-based image retrieval by application of genetic algorithm that optimizes the weights gained from features extractions of an image and then integrating with machine learning techniques such as clustering that handles the ambiguity, uncertainty and imprecision when accessing the multimedia data that addresses the limitations of both traditional distance based metrics and traditional classifier grounded retrieval approaches. The proposed approach reduces the overall search time of finding the image with accuracy. The scope of this method is that different clustering algorithm can be used.

Mayank R. Kapadia, Dr. Chirag N. Paunwala [18] proposed a technique for the most important parts of the CBIR system are the computational complexity and the retrieval accuracy. The machine learning helps to improve the accuracy of the system. In this paper, Convolution Neural Network (CNN) is used due to the property of direct feature extraction from the image. Computer vision techniques are used to extract low-level features from the image while CNN is used to extract high-level features from the image. The CNN extract the features from the image as well as to classify the image which removes unnecessary images and increase retrieval accuracy. As the number of convolution layers increases the more high-level features can be extracted. To enhance the working of the system increase the convolution layer large numbers of convolution layers to extract more abstract features and to improve the retrieval performance.

Content Based Image Classification (CBIC) has scaled heights due to efficient applications of machine learning algorithms. The success of any classification algorithm has its pivotal contribution from the feature extraction technique adopted during descriptor designing from images. The authors have attempted to implement the hybrid approach of machine learning with two different feature extraction techniques. The work has explored both the early fusion and late fusion to experiment the possibilities of enhanced classification decision. The approaches are contrasted against each other for the measure of efficiency. The observation divulges superiority of the fusion based techniques over the individual techniques in terms of classification performances proposed by Sachin R. Jadhav, Rik Das et al. [19]. Therefore, by extend the research work in future towards designing of such light-weight techniques which will be useful and proficient for day to day usage for content based image classification.

Charulata Leuva [20] proposed retrieve image effectively by using relevance feedback, however the usual relevance responses to something or helpful returned information method to support the user question based on the representative image selection and weight ranking of the images retrieved .The Support Vector Machine(SVM) has been used to support the learning process to reduce the semantic gap between the user and the CBIR system.SVM can classify the data into relevance training set and Gabor Filtering will extract the feature from the given image dataset. It can also improve the performance of CBIR. Also solve the imbalance training set. In future this work can be enhanced to retrieve the audio and video file by using these features or modifying them. Also here we have done only binary classification using SVM; we can extend it further using Multi-class SVM and classify more features at a time.

Dao Thi Thuy Quynh [21] developed a supervised SVM method that solve the two issues that first, the imbalance of the training set .Second, the size of the training set is very small compared to the dimension of the feature.Propose the image retrieval method, SVMITS (SVM-based relevant feedback for class imbalance training set), to overcome the above limitations and the second is through reducing the number of dimensions of the features. Finally done resampling techniques, dimension reduction, and ensemble-based learning techniques to improve the accuracy of image retrieval using SVM-based relevant feedback. If the different algorithm with combination of proposed algorithm used in future it will increase the efficiency of the system to retrieve the similar image as query image.

Dhanraj R. Dhotre, Dr. G.R. Bamnote [22] accomplished a different type of technique for retrieval of image by using hybrid approach of features such as Texture and Color is presented. The color feature is extracted through Color Histogram and texture is extracted using Haar Wavelet Transformation. The combination of these features is robust to scaling and translation of objects in an image. The proposed system has demonstrated a promising and faster retrieval method on an image database containing general-purpose color images. In this paper only two are used to retrieve the image efficiently the more feature other than texture and color we can use different feature of image in future like shape , etc in the proposed system to make it working efficient.   Table1: Summary of methods used in CBIR

III. CONCLUSIONS

This paper studies the work proposed by various researchers   in the area of CBIR based upon Deep learning , machine learning and different algorithms . These learning methods resolve the challenges in CBIR system to retrieve the image efficiently and accurately . These techniques show how to reduce not just the computational time but also cost and also used relevance feedback method with different algorithm. In this paper each technique can be improve in future by combining various technique as stated in the paper.

REFERENCES

[1] Maria Tzelepi, Anastasios Tefas," Fully unsupervised optimization of CNN features towards Content Based Image Retrieval", 978-1-5386-0951-4/18/$31.00 ©2018 IEEE

[2] R. Tamilkodi and G. Roseline Nesa Kumari," A Novel Approach towards Machine Learning in Image Retrieval" International Journal of Pure and Applied Mathematics Volume 119 No. 15 2018, 1081-1097

[3] Latika Pinjarkar, Manisha Sharma,," Content-Based Image Retrieval using Deep Learning: A Comprehensive Survey" International Journal of Advanced in Management, Technology and Engineering Sciences Volume 8, Issue III, MARCH/2018 ISSN NO : 2249-7455

[4] Zakhayu Rian, Viny Christanti, Janson Hendryli," ContentBased Image Retrieval using Convolutional Neural Networks", 2019 IEEE International Conference on Signals and Systems (ICSigSys)

[5] R. Rani Saritha , Varghese Paul , P. Ganesh Kumar ,"Content based image retrieval using deep learning process", Springer Science+Business Media, LLC, part of Springer Nature 2018

[6] Aasia Ali, Sanjay Sharma," Content Based Image Retrieval using Feature Extraction with Machine Learning", International Conference on Intelligent Computing and Control Systems
ICICCS 2017, 978-1-5386-2745-7/17/$31.00 ©2017 IEEE

[7] Prameela Devi. Chillakuru, T. Kumanan, CH. Sarada Devi," Content based Retrieval Management Systems in Web Engineering", International Journal Recent Technology and Engineering (IJRTE ISSN: 2277-3878, Volume-8, Issue-2S11, September

[8] T. Christy Bobby ," Estimation of Femur Morphometric Features for CBIR Application "2017 3rd International Conference on Biosignals, images and instrumentation (ICBSII), 16-18 March 2017, Chennai. 978-1-5090-4980-6/17/$31.00 @ 2017 IEEE

[9] Muhammad Azam, Nizar Bouguila ,"Bounded Laplace Mixture Model with Applications to Image Clustering and Content Based Image Retrieval" , 2018 17th IEEE International Conference on Machine Learning and Applications, 978-1-53866805-4/18/$31.00 ©2018 IEEE DOI 10.1109/ICMLA.2018.00090

[10] Meenaakshi N. Munjal, Shaveta Bhatia ,"A Novel Technique for Effective Image Gallery Search using Content Based Image Retrieval System", 2019 International Conference on Machine Learning, Big Data, Cloud and Parallel Computing (Com-IT-Con), India, 14th -16th Feb 2019

[11] Karthik K, Sowmya Kamath S," A Hybrid Feature Modeling Approach for Content-Based Medical Image Retrieval", 2018 IEEE 13th International Conference on Industrial and Information Systems (ICIIS).

[12] Narasimha Yadav R.P, Pavithra .L.K, Sree Sharmila .T," Analysis of Supervised and Unsupervised learning in Content Based Multimedia Retrieval", 2nd ICCCPS 2018 , 978-1-53861141-8/18/$31.00 2018 IEEE

[13] Jianquan Ouyang,Qianlei Hu," Combining Extreme   Learning Machine ,RF and HOG for Feature Extraction", 2017 IEEE Third International Conference on Multimedia Big Data, 978-1-5090-6549-3/17 $31.00 © 2017 IEEE DOI 10.1109/BigMM.2017.60

[14] Farzad Sabahi, Student Member, IEEE, M. Omair Ahmad, Fellow, IEEE, and M.N.S. Swamy, Fellow, IEEE." Perceptual Image Hashing Using Random Forest for Content-based Image Retrieval", 978-1-5386-4859-9/18/$31.00 ©2018 IEEE

[15] S.Sindu," Two Phase Content Based Image Retrieval with relevance ranking on classified images", 2019 International Conference on Computer Communication and Informatics (ICCCI -2019), Jan. 23 – 25, 2019, Coimbatore, INDIA

[16] Sudeep D. Thepade, Madhura M. Kalbhor." Ensemble of Machine Learning Classifiers for improved Image Category Prediction using Fractional Coefficients of Hartley and Sine Transforms" 2018 Fourth International Conference on Computing Communication Control and Automation (ICCUBEA), 978-1-5386-5257-2/18/$31.00 ©2018 IEEE

[17] Effat Naaz," Enhanced Content Based Image Retrieval Using Machine Learning Techniques", 2017 International Conference on Innovations in Information, Embedded and Communication Systems (ICIIECS) [18] Mayank R. Kapadia, Dr. Chirag N. Paunwala," Improved CBIR system using Multilayer CNN" Proceedings of the International Conference on Inventive Research in Computing Applications (ICIRCA 2018) IEEE Xplore Compliant Part Number:CFP18N67-ART; ISBN:978-1-5386-2456-2

[19] Sachin R. Jadhav," Applications of Hybrid Machine Learning or Improved Content Based Image Classification" 2018 Fourth International Conference on Computing Communication Control and Automation (ICCUBEA)

[20] Charulata Leuva ," Content based Image Retrieval using Machine Learning Technique" IJSTE - International Journal of Science Technology & Engineering | Volume 1 | Issue 12 | June 2015 ISSN (online): 2349-784X

[21] Dao Thi Thuy Quynh," Image retrieval uses SVM-based relevant feedback for imbalance and small training set" 978-15386-9313-1/19/$31.00 ©2019 IEEE

[22] Dhanraj R. Dhotre, Dr. G.R. Bamnote," Multilevel Haar Wavelet Transform and Histogram usage in Content based Image Retrieval System" 2017 International Conference on Vision, Image and Signal Processing, 978-1-5386-0612-4/17 $31.00 © 2017 IEEE DOI 10.1109/ICVISP.2017.34

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING