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COMPARTIVE ANALYSIS OF CONTENT BASED IMAGE RETRIEVAL AND RELEVANCE FEEDBACK

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***Abstract*— Earlier in microcontroller based approach, every LCD display was associated with a static input. This input was static and cannot be changed by user easily as and when needed. Thus restricting the flexibility to user can have in updating the data. In this paper, we propose to design a prototype where we interface LCD display through FPGA board so as to provide flexibility of data which is being displayed directly to LCD.Thus, this design based Device can prove beneficial for future Consumer Electronics Market. In this design, for serial communication, multi UART with configurable baud rate is implemented. The multi UART and LCD driver are implemented with Verilog language and can be integrated into the FPGA to achieve compact, stable and reliable data transmission..** *(Abstract)*

***Index Terms*— Content-based image retrieval, relevance feedback, precision, accuracy.**

I. INTRODUCTION

The multimedia including digital images, video, audio, graphics and text data. In order to make use of this vast amount if data, efficient and effective techniques to retrieve multimedia information based on its content need to be developed. The keyword annotation is the traditional image retrieval paradigm. In this approach, the images are first annotated manually by keywords. They can then be retrieved by their corresponding annotations. To overcome the difficulties of the annotation based approach alternative mechanism, Content- Based Image Retrieval (CBIR) has been proposed in the early 1990's. Besides using human-assigned keywords, CBIR systems use the visual content of the images, such as color, texture and shape features, as the image index. There is a growing interest in CBIR because of the limitations inherent in metadata-based systems, as well as the large range of possible uses for efficient image retrieval. Textual information about images can be easily searched using existing technology, but requires humans to personally describe every image in the database. This is impractical for very large databases, or for images that are generated automatically possible to miss images that use different synonyms in their descriptions. Systems based on categorizing images in semantic classes like "cat" as a subclass of "animal" avoid this problem but still face the same scaling issues.

II. CONTENT BASED IMAGE RETRIEVEL RELATED WORK

A. Color Feature

Color is the most popularly used feature in image retrieval system. The different color quantization or the human perception, it is important to capture color features. The Color histogram is commonly used feature. Once the image is segmented, from each region the color histogram is extracted.

B. Text feature

Texture is another important property of images. Various representations have been investigated in pattern recognition and computer vision. Texture measures look for visual patterns in images and how they are spatially defined.
Shape is used as another feature in image retrieval. Retrieval by shape is useful and also very restricted environment's which provide good basis fir segmentation.

C. Technical progress of content based image retrieval system

Potential uses for CBIR include:

- Architectural and engineering design
- Art collections
- Crime prevention
- Geographical information and remote sensing systems
- Intellectual property
- Medical diagnosis
- Military
- Photograph archives
- Retail catalogs

3.1 Art collection
The museum is computerized database. Museum collections are widely varied. There are collections of art, of scientific specimens, of historic objects, of living zoological specimens, of

cheese and much more. Because there are so many things to collect, most museums have a specific area of specialization.
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III. TECHNICAL PROGRESS OF CONTENT BASED IMAGE RETRIEVAL SYSTEM

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B. Crime prevention

The crime prevention mainly used reduces the crime. The governments must go beyond law enforcement and criminal justice to tackle the risk factors that cause crime because it is more cost effective and leads to greater social benefits than the standard ways of responding to crime.

C. Military

Military history has a number of purposes. One main purpose is to learn from past accomplishments and mistakes so as to more effectively wage war in the future.

IV. CONTENT BASED IMAGE RETRIEVAL AND RELEVANCE FEEDBACK

The concept of relevance feedback was introduced into CBIR from the concept of text-based information retrieval in the 1998's and then has become a popular technique in CBIR. Relevance feedback is a feature of some information retrieval systems. The idea behind relevance feedback is to take the results that are initially returned from a given query and to use information about whether or not those results are relevant to perform a new query. The retrieval results user provide the feedback as to whether the results are relevant or non-relevant. Relevance Feedback (RF) is the process of automatically adjusting an existing query using the information feed back by the user about the relevance of previously retrieved objects such that the adjusted query. The key issue in relevance feedback is how to effectively utilize the feedback information to improve the retrieval performance.

4.1 **Principles of Relevance Feedback**

In relevance feedback-based approaches, a CBIR system learns from feedback provided by the user. Learning in CBIR systems is categorized into short-term learning, and long-term learning. An image retrieval system implementing relevance feedback to learn the high –level concepts people use the low-level features from the images.Implemetning relevance feedback in CBIR system. Three minimum requirements need to be fulfilled. First, the system must show the user a series of images, what images are already seen not to display again. Second, the user must indicate the images are to some extent relevant to the present query or not. Third, the system must change its behavior depending on which images are included in the positive and negative set. The retrievals process in this two image sets and the system has increasing amount of data to use in retrieving the succeeding image sets. The relevance feedback is fining which use this information most efficiently.

V. CONTENT BASED IMAGE RETRIEVAL ALGORITHMS USING RELEVANCE FEEDBACK

Vasconcelos and Lippmann (2000) used a Bayesian learning algorithm that integrates relevance Feedback provided by the user over a retrieval session.

Jorma Laaksonen et al. (2001) implemented relevance feedback by using self-organizing maps. The Self- Organizing Map (SOM) is an unsupervised, self-organizing neural algorithm widely used to visualize and interpret large high-dimensional data sets.

Xiang Sean Zhou Thomas S. Huang (2001) proposed the on-line learning algorithms for content based multimedia information retrieval which focused on the similarity metric issue named as Kernel based biased discriminate analysis (KBDA).

Sean D. MacArthur et al. (2002) proposed a relevance feedback technique that has used decision trees to learn a common thread among instances marked relevant. The technique was applied in preexisting content-based image retrieval (CBIR) system that was used to access high resolution computed to monographic images of the human lung.

Su, Zhang, Li, and Ma (2003) have given an approach to relevance feedback based CBIR using a Bayesian classifier. Positive examples in the feedback were used to estimate a Gaussian distribution that represents the desired images for a given query.

Deok-Hwan Kim, Chin-Wan Chung, Kobus Barnard (2005) have designed a method which constructs clusters and changes them without performing complete re-clustering. It's computing time was short since the same statistical measures were used at both the classification stage and the cluster-merging stage.
Steven C. H. Hoi, Michael R. Lyu and Rong Jin (2005) have proposed a novel technique to integrate the log information of user feedback into relevance feedback for image retrieval. The algorithm's construction was based on a coupled support vector machine which learns consistently with the two types of information: the low-level image content and the user feedback log.

Wei Jiang, Guihua Er, Qinghai Dai, Jinwei Gu (2005) have incorporated long-term relevance feedback (LRF) with HA to increase both efficiency and retrieval accuracy of CBIR systems. The work contains two parts. (1) Through LRF, a multi-layer semantic representation was built to automatically extract hidden semantic concepts underlying images. HA with these concepts alleviates the burden of manual annotation and avoids the ambiguity problem of keyword-based annotation. (2) For each learned concept, semi-supervised learning was incorporated to automatically select a small number of candidate images for annotators to annotate, which improves efficiency of HA.

Mohammed Lamine Kherfi and Djemel Ziou (2006) presented a new RF framework based on a feature selection algorithm that combined the advantages of a probabilistic formulation with those of using both the positive example (PE) and the negative example (NE). Through interaction with the user, the algorithm learns the importance of image features, and had applied the results obtained to define similarity measures that correspond better to the judgments. The use of the NE allows images undesired by the user to be discarded, thereby improving retrieval accuracy.

Angelia Grigorova et al. (2007) have suggested a new concept semantically based feature space modification called feature adaptive relevance feedback (FA-RF). FA-RF is RF-based approaches that have used two iterative techniques to exploit the relevance information: query refinement and feature re-weighting

Chueh-Yu Li and Chiou-Ting Hsu (2008) have used graphs to represent images, transform the region correspondence estimation problem into an inexact graph matching problem, and proposed an optimization technique to derive the solution.

Wei Bian and Dacheng Tao (2010) have represented images by low-level visual features. They have designed a mapping to select the effective subspace from for separating positive samples from negative samples based on a number of observations. They have proposed the Biased Discriminative Euclidean Embedding (BDEE) which parameterizes samples in the original high-dimensional ambient space to discover the intrinsic coordinate of image low-level visual features.

Peter Auer et al. (2010) have described Pin view, a content-based image retrieval system that exploits implicit relevance feedback during a search session.

Dorota G lowacka, John Shawe-Taylor (2010) have presented a new approach to content-based image retrieval based on multinomial relevance feedback. They have modeled the knowledge of the system using a Dirichlet process.

Yu Sun, Bir Bhanu (2010) suggested a new content based image retrieval (CBIR) system combined with relevance feedback and the online feature selection procedures. A measure of inconsistency from relevance feedback was explicitly used as a new semantic criterion to guide the feature selection. By integrating the user feedback information, the feature selection was able to bridge the gap between low-level visual features and high-level semantic information, leading to the improved image retrieval accuracy.

Ja-Hwung Su et al. (2011) have proposed a novel method, Navigation-Pattern-Based Relevance Feedback (NPRF), to achieve the high efficiency and effectiveness of CBIR. In terms of effectiveness, the proposed search algorithm NPRF Search makes use of the discovered navigation patterns and three kinds of query refinement strategies, Query Point Movement (QPM), Query Reweighting (QR), and Query Expansion (QEX).

Manish Chowdhury , Sudeb Das, and Malay Kumar Kundu (2012) [15] have presented content based image retrieval (CBIR) system based on a new Multiscale Analysis (MGA)-tool, called Ripplet Transform Type-I (RT).To improve the retrieval result, a fuzzy relevance feedback mechanism (F-RFM) was implemented. Fuzzy entropy based feature evaluation mechanism was used for automatic computation of revised feature's importance and similarity distance at the end of each iteration.

VI. CHALLENGES IN RF BASED CBIR SYSTEMS

Research can be done in the area of CBIR to improve the values of evaluation parameters like precision, convergence, execution time using Relevance Feedback. Researchers can design a CBIR algorithm for different applications like crime prevention, the military ,intellectual property, architectural and engineering design ,fashion and interior design, journalism and advertising, medical diagnosis ,geographical information and remote sensing systems ,cultural heritage, education and training, home entertainment, web searching etc. The retrieval performance of CBIR algorithm using Relevance Feedback technique can be improved for the images having same semantic category. Researchers working in the area of CBIR dealing with very large data sets the relevance feedback techniques can be improved by incorporating with parallel and distributed computing techniques.

The standard parameters which are used for the experimental evaluation of the results by the above stated algorithms are precision, recall and accuracy. Precision is defined as number of retrieved relevant images divided by total number of retrieved images and the recall is number of retrieved relevant images divided by total number of relevant images in the database. The Standard Deviation serves as an error-bar, while the precision is the major evaluation method. The criterion precision delivers the ability for hunting the desired images in user's mind and the coverage represents the ability for finding the accumulated positive images in a query session. Accuracy can be calculated as relevant images retrieved in top T returns divided by T. The formulas for calculation of these evaluation parameters can be given as following:

$$\text{Precision} = \frac{\text{Number of retrieved relevant images}}{\text{Total number of retrieved images}}$$

$$\text{Recall} = \frac{\text{Number of retrieved relevant image}}{\text{Total number of relevant images in the database.}}$$

$$\text{Accuracy} = \frac{\text{Relevant images retrieved in top T returns}}{T}$$

VII. ANALYSIS OF CBIR SYSTEMS BASED ON RF TECHNIQUES

S.NO	AUTHOR	YEAR	PROPOSED METHOD	DATASET USED	EVALUATION PARAMETER	PERFORMANCE RESULTS
1	Pengyu Hong, Qi Tian, Thomas S. Huang	2000	Support Vector Machine with Relevance feedback	Corel Image Gallery	Feature Vectors: Color Moments Wavelet Moments	Number of hits in top 20 returned images = 18
2	Vasconcelos and Lippman	2000	Bayesian Learning Algorithm	Brodatz texture database and Columbia object	Precision and Recall	Precision/ Recall curve were plotted
3	Xiang Sean Zhou Thomas S. Huang	2001	Kernel Based Biased Discriminant Analysis	Corel Image Gallery	Mean and Variance	Mean =17.0 Variance = 8.86
4	Jorma Laaksonen, Markus Koskela, Sami Laakso and Erkki Oja	2001	Self Organizing Maps	Corel Gallery 1,000,000 product	Quantitative figure denoted by as the t measure(smaller the t value better the result)	The average ‘ t ’ value = 0.174
5	Sean D. MacArthur, Carla E. Brodley, and Avinash C. Kak	2002	Relevance feedback technique using decision trees	Image database of HRCT scans	Precision	Average Precision=0.504
6	Su, Zhang, Li, and Ma	2003	Bayesian classifier	Corel Image Gallery	Accuracy	Accuracy increase in top 10 results = 13.4 % in top 20 results =7.8% and in top 100 results =2.6 %
7	Steven C. H. Hoi, Michael R. Lyu , Rong Jin	2005	Log Based Relevance Feedback By Coupled Support Vector Machine(LRF-CSVM)	Corel Image Gallery	Precision	Mean Average Precision= 0.47
8	Wei Jiang, Guihua Er, Qionghai Dai, Jinwei Gu	2005	Hidden Annotation(HA) with Long Term Relevance Feedback Learning(LRF)	Corel Image Gallery	Precision	Average Precision= 0.75

9	Mohammed Lamine Kherfi and Djemel Ziou	2006	Probabilistic feature weighting using positive example (PE) and negative example (NE)	Calphotos collection from Pennsylvania State University	Precision	Average Precision= 0.8
10	Anelia Grigorova, et al	2007	Feature Adaptive Relevance Feedback(FA-RF)	UC Berkeley digital library project	Precision and Recall	Precision=0.6406 Recall=0.6833
11	Chueh-Yu Li and Chiou-Ting Hsu	2008				
12	Peter Auer et al.	2010	Pin view	PASCAL Visual Object Classes Challenge 2007 dataset	Precision	Average precision =15.0
13	Dorota G lowacka ,John Shawe-Taylor	2010	Multinomial Relevance Feedback	VOC2007 dataset	number of rounds needed to identify a specific target image	Average no of iterations needed for Target size 1 =71 Target size 5=24 Target size 10=16
14	*Yu Sun, Bir Bhanu*	2010	Relevance Feedback with online Feature selection	1. Butterfly Image Database 2.Google Images	Precision	For Dataset 1 Precision=0.8 For Dataset 2 Precision=0.75
15	Wei Bian and Dacheng Tao	2010	Biased Discriminative Euclidean embedding (BDEE)	Corel image gallery	Precision. And standard deviation	Average Precision = 0.32 for 9 RF iterations
16	Ja-Hwung Su et. al	2011	Navigation-Pattern-Based Relevance Feedback(NPRF)	Corel image database and the web images	Precision	Average precision=0.910
17	Manish Chowdhury, Sudeb Das, and Malay Kumar Kundu	2012	Ripplet Transform (RT) and Fuzzy Relevance Feedback Mechanism (F-RFM)	SIMPLIcity Database	Precision	Average precision=0.80

VIII. CONCLUSION

Relevance Feedback is a powerful Technique in CBIR for Multimedia retrieval. In the existing some dataset and results are not mention detaily . In this paper Content based image retrieval and various relevance feedback techniques for last ten years, their dataset used and their results are discussed in detail. The Relevance Feedback technique can be incorporated in CBIR system. It gives higher values of the standard evaluation parameters used for evaluation of the CBIR system which is lead to better results of retrieval performance.

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