Image Retrieval: History, Current Approaches, and Promising Framework

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Abstract
Today, by dominant use of the world computer networks, the volume of image database is increased and retrieving the required image similar with the image is a serious need. Here having a dynamic and flexible framework can help considerably in the design of an image retrieval system with high accuracy. In this study, by the investigation and analysis of three systems of current famous systems of retrieving and emphasis on weaknesses and strengths of the systems, presented a general framework for image retrieval systems. The important issue is that an ideal image retrieval system should be able to automatically extract semantic content and make the images indexing.

Key words:
Image retrieval, GIFT, Schema, MUVIS

1. Introduction

By the increasing growth of multi-media software, serious need is felt about indexing, voice and image retrieving. The composition of voice, image, video and text in applied programs, make this issue serious. To do this, from the early 90s, image retrieving is considered an active background for the studies. The commercial retrieving systems and various researches are introduced such as QBIC, Photobook, Virage ,VisualSEEK ,WebSEEK , NETRA and MARS.

Query by Image Content (QBIC) is the first commercial system in image retrieving based on content. This system accepts image query via presenting example, plan, selecting color and texture models and use the average color in RGB, YIQ, Lab environments and a histogram as color features. The feature of the texture applied in this system is the improved version of texture features using the composition of contrast, greatness and direction. The characteristic of the figure applied in QBIC is its circle form and main direction. This system is one of the systems applying indexing with high dimensions [22]. Online display of this system existing in the following electronic site: http://wwwqbic.almaden.ibm.com/

virage is image search engine based on content that is designed in Virage company. This system do the image retrieving based on color, texture, figure and spatial relations features. The advantage of this system compare with other systems is using all the features, and the user should define the weight of each of the features. Online display of this system existing in the following electronic site: http://www.virage.com/

Photobook is a system searching the image by interactive method. This system is consisting of three parts storing the extracted features, form, texture, and face. The user can search his query based on one of the features in the related part. The new version of this system is named Four Eyes and in comparison with previous version in image retrieval gets more help to improve the retrieving results [24].

VisualSEEK is a search engine based on visual features being designed in Colombia. The main characteristic of this survey system is the query image based on zoned image, spatial relations and characteristic extraction in the cod space. The color and texture characteristic is used based on transforming wavelet in this system [27].

WebSEEK is an image searching engine of image/text for web page and is designed as VisualSEEK in Colombia University. This system uses communication feedback mechanism and is consisting of three main sections:

- Image/video data collection,
- Classification and indexing section,
- Search and retrieving section.

This system accepts image query by receiving key words of visual features [28]. Online display of this system existing in the following electronic site:
http://www.ce.columbia.edu/~sfchang/demos.html

New England Trail Riders Association (NETRA) uses the information of color, texture, form and location in zoning image environment for searching and regions retrieving. The main features of this system is the texture features based on Gabor filter, image set based on neural network and image zoning [15]. Online display of this system existing in the following electronic site: http:// www.netra.org/

MARS is a system that is designed in Illinois University. This system is different with other systems in terms of the techniques and researches. In this system, it is attempted that in the researches, various aspects as machine vision, database management system and information retrieving are considered. The research features of MARS are including database management system, information retrieving, indexing, retrieving and communication between human and machine. The main focus of MARS is responding this question that for efficient image retrieving

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in various applications and many various visions, how the various features should be combined to achieve a suitable architecture? [23].
MUVIS, Schema and GIFT are the systems that are used in recent years due to their abilities with high percent. Therefore, this paper is structured as follows: in section 2 we introduced these systems as three important systems in the world and its performance method. Section 3 deals with the weaknesses and strengths of their systems, key achievements and new ideas are used in the proposed framework architecture. Section 4 introduced an efficient retrieval framework and final section draws conclusion, weaknesses and strengths of our framework.

2. Current Important Systems

2.1 MUVIS i

Figure 1 shows the architecture of this system [7].

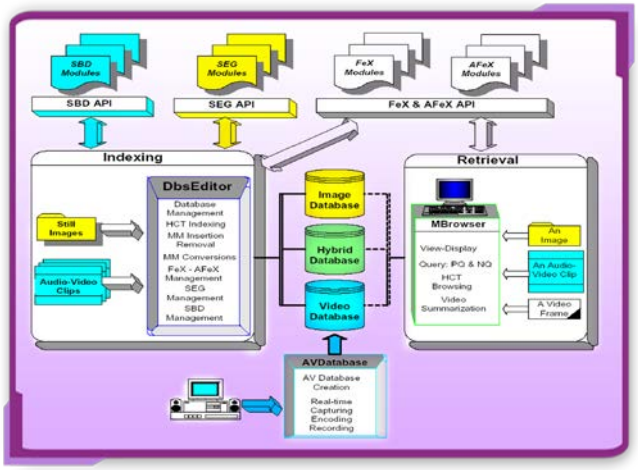

Fig. 1. MUVIS Framework

As we see, there are three databases in this system. There is a database including images, other databases as some data with audio, video, audio/video formats. The final database is the basis that can have some information with combination format of the data of two other bases. There are three kinds of database as image, video, the combination of video/image can store the information. The coding of information is on AVDatabase and the abilities are as follow [10]:

- Real-time indexing,
- Creating database of image and voice,
- Creating and attaching the modes,
- Browse, storing and real-time coding of image and voice.

DbsEditor is a unit for browsing and indexing. Some of these duties are organizing and integration of extracted features, new characteristic extraction, the movement of the existing information between FeX, AFeX models, adding or transferring the information between three databases, facilitating conversion process and feeding databases by entrance raw data.
MBrowser is a tool that is used to browse and retrieve information. This tool compares by using a search engine based on the similarity between the vector of entrance data features and database. These tools provide the following facilities for the user [10]:

- Briefing the image via detecting some parts of image,
- Key availability to image,
- Random availability to image,
- Data display to achieve effective features,
- Features vectors display,
- Searching based on existing features in databases and based on weighting of the features by user,
- Searching based on two types of databases,
- Supporting two query models: Progressive Query (PQ) and Normal Query (NQ),

Progressive query is a method to increase the efficiency of query operation at vast database. This method creates a middle retrieving window during query and the sequence of the middle windows provides a path for searching and rapid retrieving without using other system. The main objective of this design is separation of database to some sub sections and each sub-query is applied on them. In other words, each sub-query is a fraction of the main query that is applied to sub sections. Whenever the result of each of the queries is prepared, the result of query is updated and the result of query is achieved of the composition of the sub-queries [12]. The important issue in this part is determining the value and the size of sub-systems and determining the time durations of update. This model compared to normal model has some advantages such as reduction of retrieving time and consumed memory, browse and stopping query, real-time retrieving and finally better result. Different kinds of formats supporting such as voice, image and video are introduced in [1]. The common kind of this system has some capabilities such as [10]:

- Storing and real-time coding of voice and image,
- Error curve display,
- Using efficient architecture for indexing and retrieving,
- Retrieving operation based on visual and audio query of voice and image data of database,
- Converting various data formats to supporting format by the system.

Feature extraction operation cycle is determined in [8]. It is done as following:

- Extraction of visual features of video frames and the images,
- The storage of selected related frames to YUV format,
- Relating the frames to consecutive series of bits,

- Features measurement,
- Creating feature vector,
- Feature vector storing in the file,
- Normalization of feature vector,
- The management of extracted features of various bases by DbsEditor,
- Using DbsEditor to extract some features of simple features,
- Extraction of image features as 24-bit frames red, green and blue.

For retrieving operation, in [29] at first for the extraction of different features, the main image is involved with some reforms including blaring, Gaussian filter, noise removal and edges extraction of the image and YUV feature consisting of light characteristic and two color features and progressive query technique is used in MBrowser to find the similar image. In [5] by modeling the movement method and ant round a barrier, the forms are extracted of the image for retrieving. MUVIS system is used to evaluate efficiency of the presented method. The main idea in [6] is based on surrounding curve and retrieving based on the boundary form. This method attempts to extract the close boundary of the existing forms in the image and view the forms as close curve, the results of retrieving this algorithm is used to integrating MUVIS models. In [11] a method is presented for automatic extraction of the image, the main focus of this article is on canny edge field, the author attempts that by removing noise and details, simplifies the image. In each stage of simplification, the edges are extracted and are stored in scale-map and the forms boundary is defined and MUVIS structure provides the evaluation of the efficiency of this method. The author defined the superiority of retrieval algorithm in not using the texture and color features.

2.2 Schema ii

Generally, the aim of schema is collecting various modules of image analyst by various sections of schema network (including analysis modules and high level describers and low level describers) and their combination is used to achieve an evaluation efficient system, retrieving and indexing based on CBIR content. Indexing and retrieving in color images via query is done by Query by Example. Schema system is a system providing good methods for retrieving and indexing the images as using segmentation algorithms to analyze the image to meaningful sections. Using segmentation algorithms in retrieving systems is used for zoning besides minimizing search space reduces the process error [16]. Schema system architecture is based on module and can be extended and the difference between different kinds of modules provides various searches or specifically [17]. In the architecture of the first version of this system, segmentation technique is used. Visual features are extracted for each region of the image. For query operation start, a few images are provided for the user classified in various classes. The image is selected by the user and is sent to segmentation parts. This system uses four various methods to achieve an efficient segmentation:

- Pseudo Flat Zone Loop (PFZL),
- Modified Recursive Shortest Spanning Tree (RSST),
- K-Means-with-Connectivity-Constraint (KMCC) [3],
- Expectation Maximization (EM) in a 6D colour/texture space.

After this stage, the searching is determined in collected images based on the priorities by the user as color, location and shape. The search results are presented in various rankings based on image similarity percent (based on Euclidean distance) by query image in the pages that are considered as mediator with good graphic Graphical User Interface (GUI) to interact with the user. Generally, Schema system provides the following facilities for the user:

- The user can select display classes,
- The user can select the image to start query operation,
- The user can select one of four segmentation algorithms,
  - Automatic segmentation of example image,
  - Searching based on weight (priority) of the features by the user.

The important point in this system is combining progressive descriptors and matching tools of similarity criterion. To achieve this aim, MPEG-7 is used. The common vesion of this system, MPEG-7 XM is used (eXperimentation Model) in feature extraction section. This system provides the user to do the research operation and retrieving based on interest region of the image or total image regions. This version of the system is called Schema XM. MPEG-7 uses the following describers:

- Colour Layout,
- Colour Structure,
- Dominant Colour,
- Scalable Colour,
- Edge Histogram,
- Homogeneous Texture,
- Contour Shape,
- Region Shape.

The matching system architecture MPEG-7 by the above describers is drawn in figure 2 [18]:

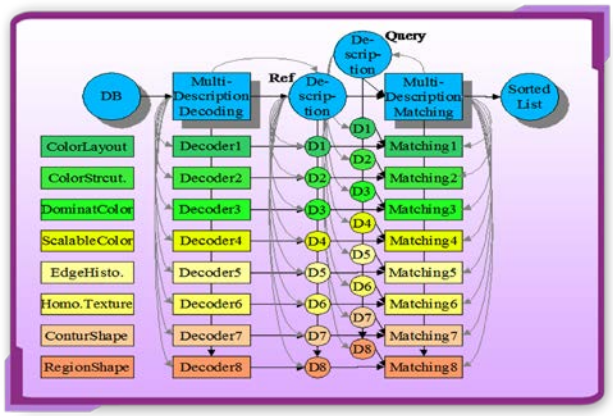

Fig. 2. Schema Matching Architecture

As the output of various describers is not normalized, their normalization before composition is important process of the matching part [19]. Optimization of search trend has considerable effect on optimization of total system. To do this, for each query, the descriptor doesn't need re-extraction of the image. This method by emphasizing this issue describing the query is a part of system descriptors. This method is called "intra search" and can link to Visual XM Library (the location all the processing trends, decode and XM matching is located) and can be used easily.

In [17], Schema is used as extended system for retrieving data based on the content and evaluation criterion of retrieving algorithms. And its high level features are used to retrieval and indexing. The general architecture of schema system is drawn in figure 3 [18].

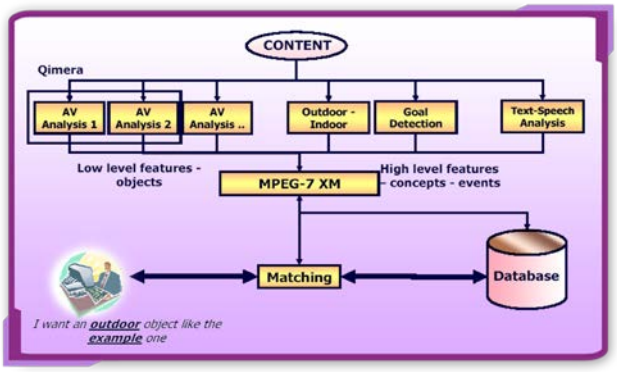

Fig. 3. Schema Architecture

As it was observed, the system is consisting of the combination of various analyses. Segmentation is used for the combination of the output of descriptors of low level features. This system is able to support high level concepts for retrieving and indexing operation with other sections (annotation, producing text via automatic diagnosis of speech). In specific case, high level concepts are used to classify the images to non-face/face (to be conformed to the human similarity criterion). One section is used to determine the rotation and one section to use annotation. Standard MPEG-7 can browse multi-media descriptors extracted by some parts as standard. MPEG-7 is used to describe the extracted items, searching and retrieving functions.

2.3 GIFT iii

GIFT is a tool that is used in computer vision Lab of Geneva University, based on client-server method, and is consisting of one server with a set of available images. The connection with this server is the basis of Multimedia Retrieval Markup Language (MRML) [4]. The aim of MRML language is equality of access to retrieving media and is used to achieve a standard access to the components of retrieval software. In other words, the aim of this language is equal access to retrieving servers, and to achieve a standard access to the components of retrieval software is used. In other words, the aim of this language is creating a standard method to link with different kinds of retrieval servers and is used to separate client section of server section of retrieving systems and it can be one of the bases of evaluating retrieval systems based on content. Using this language results into achieving a set of retrieval techniques in various applications. MRML is based on eXtensible Markup Language (XML) [26]. XML is a standard that is produced by World Web to describe the data in a structure and this allows us to show the data descriptor [14]. [20] shows the architecture of retrieval systems based on MRML as communication layers between evaluation system and benchmark server. Performance measure and image database is recognized for all the system. The decision of Relevance judgments are taken when the answers are optimized by the knowledge and as these answers are a part of database groups, the decision making is taken easily.

Benchmark is used as Practical extraction and report language (Perl). The parameters that are required for the execution are used as the name of host machine and port of query engine for evaluation. For each image, query location Relevance judgments, relevant images, Relevance groups are weighted. At first the server is configured for evaluation operation based on the clients. For each image query, query is executed and the evaluation results are the basis of decisions. The positive and negative relevance feedback cycles are simulated. This simulation is done for all the queries and all the results are evaluated. This operation is replicated to achieve a high accuracy evaluation system. For evaluation, three kinds of data are stored in the basis:

- A list of images for initial query,
- A list of taken decisions,
- Decision making cycle for each image leading into the collection of a list for all the images.

Finally, this file is used by XML. In relevance feedback cycle this link is given to the user to distinguish between the positive and negative images [20]. The details of this operation are observed in [21].

GIFT outcome viper Project (Visual Information Processing for Enhanced Retrieval), and uses a good technique for text retrieval. The vast space of characteristic is used with the distributed feature, similar words in the text, and relevance feedback method of weighting of the features based on frequency are the good facilities of Viper system. This system is used in retrieval issues of video, classification and semantic annotation. The following general architecture is shown for GIFT system in figure 4:

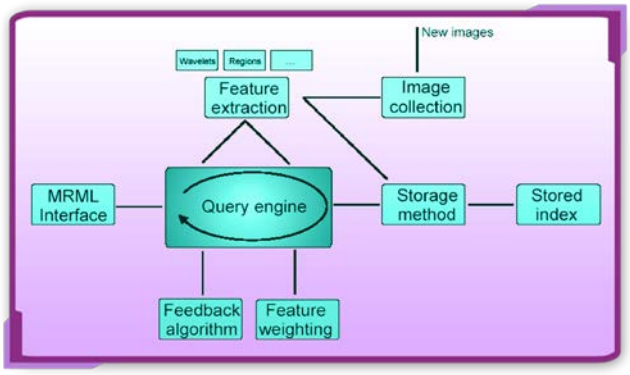

Fig. 4. GIFT Architecture

This system is used as two previous systems for query; example query method is used and is based on the image content. From each image more than thousands features (local, global, color and texture) are extracted and are stored in one list. And a technique called Inverted-file is used for indexing the new images. In inverted-file database, all the existing features are as a list. For each feature, a list of all the images including this feature considered as occurrence frequency. This technique is used to increase the efficiency and GIFT system speed. GIFT uses Classical Inverse Document Frequency (CIDF) based on two parameters, feature relevance, image score for weighting the features [26].

In a journal is published in Geneva university, the applied features in the GIFT is divided into four groups. Two groups are based on the characteristic of color, and two groups based on texture characteristic. Color features as global histogram and dividing the image to the blocks and texture features consisting of two global and local histogram of Gabor. All these features are 87446 features, and multi-weight model is used for priority of the features and the groups of the features are used. As features weighting, idea, value and weight features as pair images. If this feature is appeared in pair images of a group in comparison with that group in other groups, the weight should be increased. In this section, pruning strategy is used as pair images that are not used classified in a class, and only image pair with the best positive and worst negative answer for score parameter is used. Regarding the weighting of feature, idea and education of weights groups, the distance of groups to education data is used for evaluation. This distance receives zero or one based on the fact that the image is related to other classes or not. And a matrix of the weights is used for each image. This system presents as a feedback of good results by interaction with the user. GIFT is used in various applications as medicine, one of the applications being used in recent years is Image Cross-Language Evaluation Forum (ImageCLEF) following the aims [2]:

- Retrieving based on visual and text features,
- Development of above idea to other features,
- Providing a reference for evaluation of image retrieval.

Library organizing of the data is observed in figure 5.

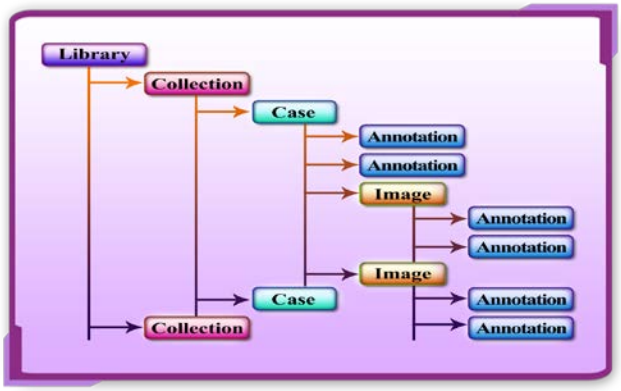

Fig. 5. Library organizing of the GIFT

Online display of this system existing in the following electronic site: http://ir.shef.ac.uk/imageclef/

All the methods that are used in Image CLEF, two search engines are used to achieve the aims, one engine for text retrieval and one engine for image retrieval. The following figure depicted the relationship between these two engines [13]:

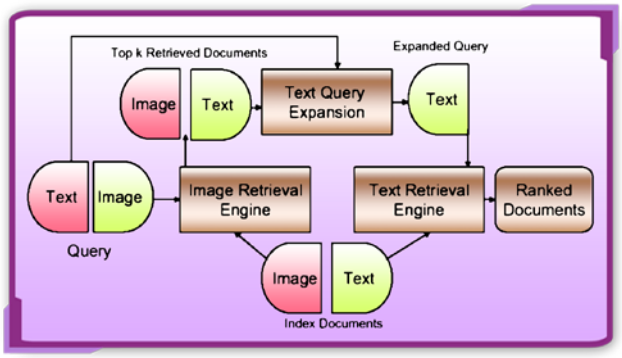

Fig. 6. Relationship between Text and Image Retrieval Engine in GIFT

In text retrieval at first the words are translated in the language (English) and text retrieval is done by various systems as EasyIR **,**TREC **,**Okapi-model [9], topX NEXI [30] and SMART [25]. The common point of all these methods is using GIFT in image retrieval engine due to the provided abilities and facilities**.**

3. Key Points Achievement

In the design of the proposed framework, it is attempted that the advantages of three systems are considered and weaknesses of the system are ignored. At first, the weaknesses and strengths of the systems are mentioned from the author view:

3.1 Strengths of MUVIS

- The separation of database to some databases based on the type of data format,
- Dividing the duties to three general groups,
- Converting various data formats to supporting formats,
- Supporting PQ (Progressive Query),
- Picture summarization via to detection of some parts of the image.

3.2 The shortages felt in MUVIS

- The lack of supporting the distributed systems via client-server method,
- The lack of using MPEG-7 XM standard.

3.3 Strengths of Schema

- Module-based architecture,
- Using four efficient algorithms of segmentation to analyze the image to meaningful sections,
- Using MPEG-7 XM (eXperimentation Model) in feature extraction,
- Selecting images class by the user,
- Optimization of search trend by Intra search method.

3.4 The shortages felt in Schema

- The lack of support of distributed systems via client-server method,
- The lack of support Progressive Query.

3.5 Strengths of GIFT

- Using client-server method,
- Using MRML language for linking with the server,
- Keeping the list of decision making cycles and taken decisions,
- Using inverted-file technique,
- Using multi-weight automatic weighting model and pruning strategy.

3.6 Common Strengths

- Query by example,
- Normalization of features vector,
- Search based on all existing features in database and based on weighting of the features by user,
- Classification of images in various classes.

3.7 New ideas applied in the proposed framework

- Using query method via presenting a simple plan of sketch,
- Using two types of relevance feedback cycle: global and local,
- Using query method via keywords that can be replaced by the applied class selection in Schema system.

4. Architecture and evaluation of proposed framework

If we want that the propose framework like GIFT system can be supported by web world, client server method is used to design it. Based on facilities and advantages for MRML language, this language is used for creating standard relation between the users (clients) and retrieving system (server). The general view is imagined for this relation in figure 7.

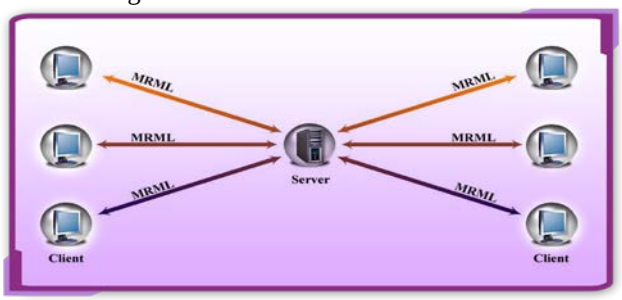

Fig. 7. Relationship between Clients and Server in Proposed Framework

By modeling of MUVIS system in which the duties are separated into three main groups, in the following proposed system, the duties are separated into 5 main groups.

- Graphical User Interface (GUI),
- Feature Extraction,
- Matching,
- Indexing,
- Database.

The architecture of the proposed framework is

observed in figure 8.

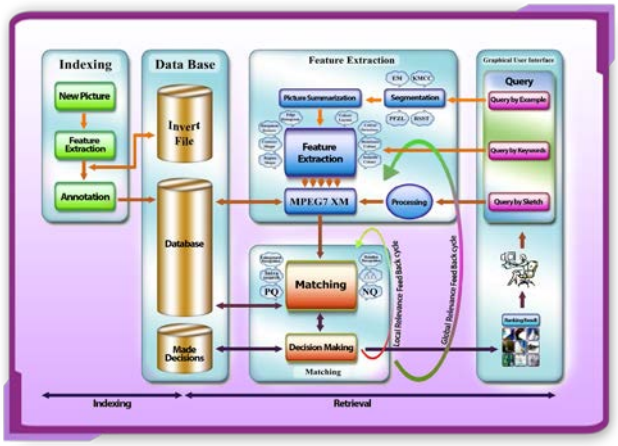

Fig. 8. Proposed Framework

Graphical User Interface (GUI) is considered to create a good environment for interaction with the user. In this part, query was received of the user and the retrieving results were shown in various rankings. In query section, three kinds of queries are considered:

- Query by example,
- Query by sketch,
- Query by keywords.

The combination of these three queries inclines the system to an organized search. The search with keywords requires applying annotation during images storing. This can be applied based on organizing the library of GIFT data easily.

Using segmentation algorithms in retrieving systems for zoning besides reducing the search space reduce the retrieving process error. This operation is done in Feature extraction. In this stage, four algorithms being applied in schema systems are used to reach an efficient segmentation. After this stage, searching in collected images is started based on the priority that the user gives for features. Like schema using MPEG-7 XM (eXperimentation Model) in feature extraction provide the user to search and retrieve the operation based on the favorite zone of the image or total image zones.

In matching section, various modules were used to define the rotation and zooming. The difference between various models modules provide various searches as at the same time or privately. MPEG-7 standard can display multi-media descriptions by modules as standard. MPEG-7 is used to describe the extracted items, searching possibility in retrieving functions. In this system like MUVIS, besides, NQ, PQ is used. PQ provides searching and rapid retrieval without using any other system, and provides some advantages such as reduction of retrieving time and applied memory, display and stopping query and instantaneous retrieving. Optimization of search procedure has considerable effect on total system optimization. To do this, we can think about a method that for each query, the descriptor of query doesn't need re-extraction of the image. This method can be done by relying on this issue that descriptor of a query is a part of system describers. This method is called intra search and can links easily to Visual XM Library (the location in which all the processing processes, decode, XM matching) is linked and can be applied easily. This system is modeled of schema and like GIFT, a list of taken decisions are stored. This decision making cycle for each image leads into the collection of a list for all the images. In relevance feedback cycle, this possibility is given to the user to distinguish between positive images from negative images.

By affecting this GIFT, this system uses a technique called inverted-file for indexing of new pictures. In inverted-file database, all the existing features are as a list. For each feature a list of all the images with this feature is stored with occurrence frequency. This technique is proposed to increase the efficiency and speed of the system.

In Database of this system, for each image, besides the information of the image, there is some information based on decision making cycle and inverted file. As it increases the load of memory, the stored information volume is the weakness of this framework.

To make machine similarity criterion with human being similarity, leading into the reduction of semantic distance, as is shown in the figure 8, in this system, two kinds of relation relevance feedback cycle with user are included: global relevance feedback cycle and local relevance feedback cycle. As applying feedback cycle of global relation requires much time, to avoid time loss, if possible, local relation feedback cycle of local relation is used and this item can be the strengths of this system.

Finally, search results are presented in various rankings based on images similarity percent (based on Euclidean distance) with query image in the pages that are considered as mediator and good graphic as Graphical User Interface (GUI) to interact with the user.

5. Discussion and conclusion

In this paper, at first we express the history of retrieving systems and indexing and briefly we investigate some of different methods and retrieving systems. MUVIS, Schema, GIFT systems were investigated. These systems are the systems that are used mostly in some applications as voice and image retrieval. The following features are the reasons of the focus on these three systems.

MUVIS is a strong tool to display, indexing and survey in various kinds of audio, video, audio/video formats. These tools are comprehensive solutions related to content extraction and image retrieval. MUVIS used three parts of

AVDatabase, DbsEditor and MBrowser each doing various duties.

Schema systems is the one providing good methods for retrieval and image indexing as using segmentation algorithms to analyze the image to meaningful sections. Using segmentation algorithms in retrieval systems for zoning besides reducing the search space reduces process error of retrieval. Using MPEG-7 standard in feature extraction are the important points in this system.

GIFT is a tool based on client-server method and is consisting of a server with a set of access images. This system for query uses query method by example based on image content of each image. More than thousands features (local, global, color, texture) are extracted and are stored in a list and inverted-file technique is used for new images indexing. By modeling, the strengths and weaknesses and shortages of three systems of an efficient system are proposed. Using MRML language to link retrieval system with the customers, using MPEG-7 XM standard (eXperimentation Model) in features extraction, using PQ (progressive query) and intra search method in search engine, storing and keeping decisions cycle for each image and using inverted-file is used for new images indexing, of important indices and the superiority of this system to other systems are used. Two types of relevance feedback cycle of local and global relation are other proposed system advantages are used. As the decisions taken storage and inverted-file during the entrance of new images to the systems impose load memory to the system, the advantages are ignored.

References

[1] Ahmad, I., S.Kiranyaz and M.Gabbouj, “Audiovisual Retrieval Framework for Multimedia Archives On Java Enabled Mobile Devices”. EUROCON, Serbia & Montenegro, Belgrade, Nov 2005.

[2] Clough, P., H.Muller, T.Deselaers, M.Grubinger, T.Lehmann, J.Jensen and W.Hersh, “The CLEF 2005 Cross-Language Image Retrieval Track”, In Proceedings of the 6th international conference on Cross-Language Evolution Forum: accessing Multilingual Information Repositories (CLEF), pp. 558-566, 2005.

[3] Connor, N.O. et al, “Region and Object Segmentation Algorithms in the Qimera Segmentation Platform”, In third International Workshop on Content-Based Multimedia Indexing, IRISA, Rennes, France, Sep 2003.

[4] Eidenberger, H., “A New Perspective On Visual Information Retrieval”, SPIE IS&T Electronic Imaging Conference on Storage and Retrieval Methods and Applications for Multimedia, pp. 133-144 San Jose, USA, 2004.

[5] Ferreira, M., S.Kiranyaz and M.gabbouj , “A Novel Shape Descriptor over Multi-Scale Edge Field : 2D Walking Ant Histogram”, In Proceedings of 13th International Conference on Systems, Signals and Image Processing and Semantic Multimodal Analysis of Digital Media, IWSSIP, Budapest, Hungary, Sep 2006.

[6] Ferreira, M., S.Kiranyaz and M.Gabbouj, “Multi-Scale Edge Detection and Object Extraction for Image Retrieval”, In IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), May 2006.

[7] Gabbouj, M. et al, “An Extended Framework Structure in MUVIS for Content-Based Multimedia and Retrieval”, In 4th International Conference: Sciences of Electronic, Technologies of Information and Telecommunications (SETIT), Hammamet, Tunisia, Mar 2007.

[8] Guldogan, O., and M.Gabbouj, “Content-based Image Indexing and Retrieval Framework on Symbian Based Mobile Platform”. In Proceedings of 13th European Signal Processing Conference (EUSIPCO), Antalya, Turkey, Sep 2005.

[9] Jones, G.J.F., and K.McDonald, “Dublin City University at CLEF 2005: Experiment With ImageCLEF St Andrew`s Collection”, In CLEF: Workshop on Cross-Language Information Retrieval and Evaluation Forum, Vienna, Austria. Sep 2005.

[10] Kiranyaz, S., K.Caglar, E.Guldogan, O.Guldogan and M.Gabbouj, “MUVIS: A Content-Based Multimedia Indexing and Retrieval Framework”, In Proceedings of the Seventh International Symposium on Signal Processing and its Applications (ISSPA), 2003.

[11] Kiranyaz, S., M.Ferreira and M.Gabbouj, “Automatic Object Extraction Over Multi-Scale Edge Field for Multimedia Retrieval”, In IEEE Transactions on Image Processing, vol. 15, no. 12, pp, 3759-3772, Dec 2006.

[12] Kiranyaz, S., and M.Gabbouj, “Novel Multimedia Retrieval Technique: Progressive Query (Why Wait?)”, In IEE Proceedings of the Vision, Image & Signal Processing, vol. 152, no. 3, pp. 356-366, Jun 2005.

[13] Lacoste, C., J.H.Lim, J-P.Chevallet, D.Racoceanu and N.Maiilot, “Knowledge-Based Medical Image Indexing and Retrieval”. Image Perception, Access & Language (IPAL) French-Singaporean Joint Lab (CNRS, I2R, NUS, and UJF), Perception, Access & Language (IPAL) French-Singaporean Joint Lab, 2006.

[14] Lskandar, D.N.F.A., J.Pechcevski, J.A.Thom and S.M.M.Tahaghoghi, “Combining Image and Structured Text Retrieval”, Advances in XML Information Retrieval and Evaluation. Lecture Notes in Computer Science, 3977, 525–539. 2005.

[15] Ma, W.Y., and B.S.Manjunath, “NeTra a Toolbox For Navigating Large Image databases”, In Proceedings of the IEEE International Conference on Image Processing, vol. 1, pp. 568–571. 1999.

[16] Mezaris, V. et al, “Combining Multiple Segmentation Algorithms and MPEG-7 eXperimentation Model in the Schema Reference System”, In Proceedings of 8th International Conference on Information Visualization (IV), London, UK, pp. 253-258, Jul 2004.

[17] Mezaris, V. et al, “The Schema Reference System: An extensible Modular System for Content-Based Information Retrieval”, In Proceedings of Workshop on Image Analysis for Multimedia Interactive Services (WIAMIS), Monteux, Switzerland, Apr 2005.

[18] Mezaris, V. et al,"An Extensible Modular Common Reference System for Content-based Information Retrieval: the SCHEMA Reference System", In Proceedings of Fourth International Workshop on Content-Based Multimedia Indexing (CBMI), Riga, Latvia, Jun 2005.

[19] Mezaris, V. et al, "A Test-Bed for Region-Based Image Retrieval Using Multiple Segmentation Algorithms and MPEG-7 eXperimentation Model: The Schema Reference System", In Proceedings of 3rd International Conference on Image and Video Retrieval (CIVR), Springer LNCS vol. 3115, pp. 592-600, Dublin, Ireland, Jul 2004.
[20] Muller, H., W.Muller, S.Marchand-Maillet, D.M.Squire and T.Pun, "Automated Benchmarking In Content-based Image Retrieval", In Proceedings of the IEEE International Conference on Multimedia and Expo, ICME, Tokyo, Japan, 2001.
[21] Muller, H., W.Muller, D.M.Squire, S.Marchand-Maillet and T.Pun , "Strategies for Positive and Negative Relevance Feedback in Image Retrieval". In Proceedings of the International Conference on Pattern Recognition (ICPR), Barcelona, Spain, 2000.
[22] Niblack, W., R.Barber, W.Equtz and M.Flickner, "The QBIC Project: Querying Images By Content Using Color, Texture And Shape", In Proceedings of Conference on Storage and Retrieval for Image and Video Databases (SPIE). Vol. 1908, pp.173-187. San Jose, CA, Feb 1993.
[23] Ortega, M., Y.Rui , K.Chakrabarti , S.Mehrotra and T.S.Huang , "Supporting Similarity Queries in MARS", In Proceedings of the fifth ACM international conference on Multimedia, pp. 403-413, 1997.
[24] Pentland, A., R.W.Picard, and S.Sclaroffu, "Phootobook: Content-Based Manipulation of Image Databases", International Journal of Computer Vision, Vol. 18, Nr. 3, pp. 233-254, Springer, 1996.
[25] Ruiz, M.E., and S.B.Southwick, "UB at CLEF 2005: Bilingual CLIR and Medical Image Retrieval Task", In 6th Workshop of the Cross-Language Evaluation Forum (CLEF), Springer Lecture Notes in Computer Science. Vol. 4022/2006, pp. 737-743, Vienna, Austria, 2005.
[26] Rummukainen, M., J.Laaksonen and M.Koskela, "An Efficiency Comparison of Two Content-based Image Retrieval Systems, GIFT and PicSOM". In Proceedings of International Conference on Image and Video Retrieval (CIVR). Urbana, IL, USA. Jul 2003.
[27] Smith, J.R., and S.F.Chang, "VisualSEEk: a fully automated Content-Based image query system", In Proceedings of the 4th ACM International Conference on Multimedia, pp. 87-98, 1997.
[28] Smith, J., "Integrated Spatial and Feature Image Systems: Retrieval, Analysis and Compression", Ph. D. Thesis Graduate School of Arts and Sciences, Columbia University, New
York, USA, Feb 1997.
[29] Tosic, T., and Z.Trpovski , "Evaluating The Influence Of Image Modifications Upon Content-Based Multimedia Retrieval", In Proceedings of the 8th Seminar on Neural Network Applications in Electrical Engineering, Faculty of Electrical Engineering, University of Belgrade, Serbia, Sep 2006.
[30] Westerveld, T., and R.V.Zwol , " Benchmarking Multimedia Search In Structured Collections ", In Proceedings of the ACM SIGMM International Workshop on Multimedia Information Retrieval, pp. 313-320, Santa Barbara, USA, Oct 2006.

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[i] Multimedia Video Indexing and Retrieval System
[ii] Network of Excellence in Content-based semantic Scene Analysis and Information Retrieval
[iii] GNU Image Finding Tool