CBIR Systems Based Approaches for Improving Computational Efficiency

Narahari Dudiki[1], Dr. Santanu Sikdar[2]

[1]Research Scholar of Sri Satya Sai University
[2]Research Supervisor of Sri Satya University

Abstract

The current work additionally centers on the chance of integrating tone and edge information with the interest-point based invariant descriptors in the production of visual bags for improving the retrieval performance in natural image databases. For this, a multi-combination approach is embraced, in which, the edge-shading features of the images are joined through early combination for making the vocabulary of visual words. The image histogram worked with the resultant vocabulary is then joined with histogram developed with vocabulary of invariant features through late combination to portray the image. The joining of extra information helps in giving a superior portrayal of the images and helps in improving the retrieval performance. Also, for multi-query CBIR frameworks, another feature swap algorithm is proposed for similarity computation that can offer better retrieval results without query refinement or feature reweighting. The algorithm decides the similarity among query and target images in the database by processing the total amount of the removals of the query-set images' centroid brought about by supplanting every component in the query image set with the up-and-comer images in the database; subsequently successfully amassing the dissimilarity between the images in query-set and the target dataset images. Content-based image retrieval is against customary idea based methodologies. "Content-based" implies that the hunt examines the contents of the image as opposed to the metadata, for example, keywords, labels, or portrayals related with the image.

Keywords: *CBIR Systems, Improving Computational Efficiency, multi-combination approach, natural image databases, Content-based image retrieval*

1. INTRODUCTION

The image database size is getting expanded step by step. This occur because of the advancement in innovation and by increment in different rapid online worlds, increment in limit and different stockpiling gadgets makes the need of improvement in image retrieval systems. In prior cases images were physically commented on and writings, watchwords and labels then they were utilized to portray it that is known as metadata. The manual explanation gets troublesome in the event of huge datasets that outcomes in increment of cost, time and furthermore there is need of huge measure of difficult work. Two distinct clients can pick various words to portray the image qualities that outcomes in unessential retrieval results. To dispose of every one of these issues of existing systems content based image retrieval (CBIR) has been created. In content based strategy images are looked through utilizing visual contents like tone, surface, shape and spatial data in the image. At that point CBIR systems are utilized to look through the images in enormous database of images based on present visual data. For perusing utilization of CBIR systems are more financially savvy, quick and productive. IBM's Query by Image Content (QBIC) was the principal business CBIR. Other created systems are VisualSEEk, Vhoto, Excalibur, WebSEEk, Virage, Photobook and Berkeley's Blobworld. Followed by highlight extraction strategies other different division methods joined with content based retrieval. After those most ideal matches are discover between the images utilizing the most ideal matches from removed highlights. To get the greatest effectiveness different analysts have begun actualized a neural network.Animal animal types large number is enriched by earth in which measurements, spaces and shadings are utilized to interestingly distinguish every species. It is moving errand to remove the previously mentioned highlights. Creatures have various credits, for example, number of horns, stripes, spots. These are the properties that separate them from one another. Thus, a solitary strategy doesn't attempt to achieve this work. Different techniques focal points are consolidated to assort this plan that gives most ideal outcomes.

2. CONTENT-BASED MEDICAL IMAGE RETRIEVAL (CBMIR)

The medical services are getting more compelling and patient benevolent by development in significant of medical image in medical care. The sicknesses can be distinguished in began stages with more accuracy by utilization of creative imaging innovation. At that point the illnesses can be dealt with more explicit, less intrusive and give gainful outcomes. In X-beams, dermatology, radiology, cardiology, HRCT, endoscopy, MRI and dermatology like different offices utilization of carefully created images are getting more grounded. By this these advanced medical images stores access and the board has gotten more intricate. For the most part methodology, depiction like examination attributes or patient recognizable proof premise is utilized to get to these advanced medical images. The advanced medical images can be recovered as content based and text based strategies. Till now number of medical image retrieval systems has been proposed by different scientists based on content or text based techniques or based on both. The principle intention of CBIR is to recover important information from sound, video and images like media things, database, and so on Based on media things content its pertinence is judged and there are a few stages that is performed for it. The essential square chart of CBIR is given underneath:

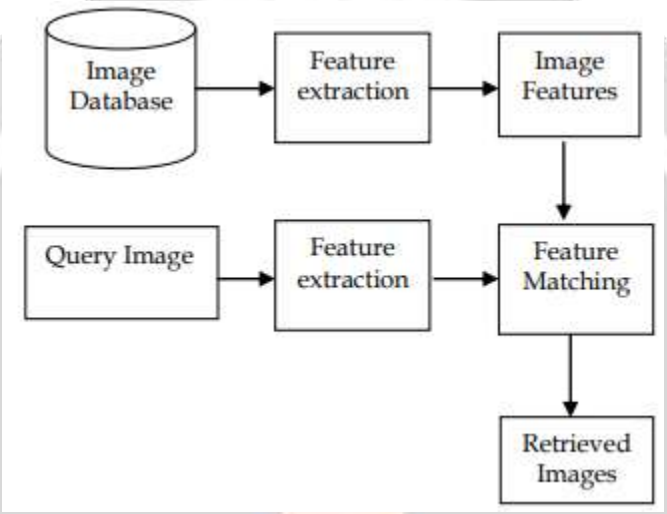

Fig. 1Block diagram of CBIR system

There are number of images present in image database and initial step is to extricate the highlights from images present in database. In this shape, surface and shading data low level highlights of images are removed. Also, in component database these highlights are put away as highlight vector then an inquiry image is goes into the system. After extraction of question image includes an element vector is created which is additionally contrasted and all vector put away in database. Different methodologies can be utilized to do this examination.

3. CBIR APPROACHES

1. Global Feature Based Image Retrieval

Early CBIR systems utilized global element extraction strategies to get the image descriptors. Here, highlights are removed from the whole image instead of from restricted areas in the image. For instance, the QBIC system removes highlights, for example, color surface and shape highlights, which are acquired globally by separating data on the methods for color histograms for color highlights; global surface data on coarseness, differentiation, and bearing; and shape highlights about the bend, minutes invariants, circularity, and flightiness. Other retrieval systems like the Photobook, Virage and so on, likewise utilize global highlights to speak to image semantics. As these highlights (i.e., highlights that are separated from the whole image), regularly neglect to portray the semantic content of the image, the CBIR systems utilizing global highlights generally have low retrieval exactness. To keep away from these issues and to add 'semantic information' to the retrieval systems, area based methodologies, different element combination strategies, probabilistically inducing the unique situation and the procedures of giving applicable input to the system are regularly utilized.

2. Region Based Image Retrieval (RBIR)

Region based retrieval systems have been acquainted with conquered the weaknesses of global element based systems. They work on the way that significant level semantic comprehension of the image can be better reflected by highlights removed from neighborhood districts in the image as opposed to global highlights. When all is said in done, the RBIR systems parcel/section an image into various districts and concentrate nearby highlights from every area Later image coordinating calculations are utilized to decide the comparability between the areas of the question and the applicant images in the database. The nearby area extraction in RBIR approaches can be comprehensively ordered into two, in particular, fixed square division and pixel-wise division. Pixel-wise division plots typically assess the highlights of the local pixels (color, surface and so on) encompassing every pixel in the image to remove perceptually important homogeneous districts in the image (Figure 2). Despite the fact that these techniques are pointed toward acquiring the specific limit of the areas, programmed image division is as yet a difficult assignment and henceforth the danger of breaking critical articles present in the image to various parts. Besides, the computational burden is likewise heavier.

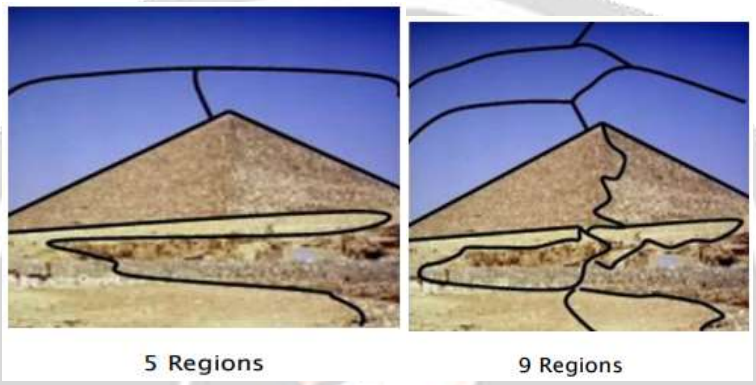

Figure 2 Example of pixel-wise image segmentation

Different systems utilize fixed square division draws near, where the image is isolated into predefined number of squares (Figure 3). Despite the fact that article isn't a worry for this technique, computational expense is low.

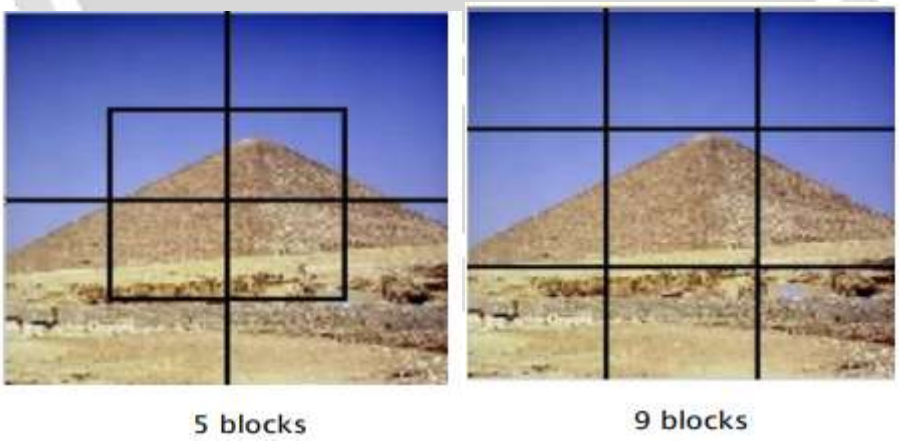

Figure 3 Example of fixed- block image segmentation

Pixel-wise Segmentation Approaches

The early RBIR systems like Blobworld utilize pixel-wise division approach thinking about the color, surface and position highlights to decay the image into homogeneous areas called masses. In this system, as question, the client needs to choose a classification of images for search, indicate a mass and its significance; in light of which the

system recovers various images having comparative masses. In SIMPLIcity, the wavelet highlights are separated from an image and districts are distinguished by k-implies grouping. The closeness between images is processed by coordinating their individual locales utilizing Integrated Region Matching (IRM) calculation thinking about all districts in the image for likeness calculation. The districts in the images are appointed distinctive centrality esteems as per a picked measure based on which a solitary locale is coordinated with more than one areas of the applicant image. The benefit of utilizing such delicate coordinating is the improved vigor against helpless division.

A retrieval system that upholds both inquiry by watchword and question by area of interest Here, the image is divided into various areas and color, surface highlights are separated from them. The predominant color of a district, registered from the quantized HSV color histogram of the area, is taken as the color highlight and surface highlights are removed utilizing Gabor highlights. From these highlights, significant level image semantics are gotten utilizing a choice tree-based learning calculation named DT-ST. During retrieval, a bunch of images whose semantic idea coordinates the question is returned.

Fixed Block Segmentation Approaches

Numerous works utilize fixed square division technique to speak to the image districts. In, two square based surface strategies are proposed utilizing Local Binary Pattern (LBP) as surface descriptor. The principal strategy separates the question and database images into similarly estimated blocks, from which LBP histograms are removed. At that point the square histograms are thought about utilizing an overall L1 difference measure based on the Minkowski distances. The subsequent methodology utilizes the image division on database images and ascertains a solitary element histogram for the inquiry. It summarizes the database histograms as per the size of the inquiry image and finds the best match by abusing a sliding hunt window. The primary strategy is thought about in contrast to color correlogram and edge histogram based calculations. In the second, client cooperation subordinate methodology is utilized to give model inquiries.

In, the images are apportioned into nonoverlapping tiles of equivalent size. Surface and color highlights are extricated from these tiles at two unique goals in two-lattice structure. Highlights drawn from contingent co-event histograms registered byusing the image and its supplement in RGB color space, fill in as color and surface descriptors. Inclination vector stream fields are utilized to separate state of items and invariant minutes are utilized to depict the shape highlights. For figuring the likeness between image tiles, a coordinated coordinating plan based on most huge most noteworthy need (MSHP) rule and nearness framework of a bipartite chart built between image tiles is utilized. As shape highlights are globally separated, the distance between the particular element vectors of the two images are processed utilizing Canberra distance. The general distance between two images is the total amount of their color-surface highlights and the shape highlights.

4. IMAGE USERS

1. Image use in the community

It is a cliché to see that images are right now utilized in varying backgrounds. The impact of TV and computer games in the present society is clear for all to see. The commonest single explanation behind putting away, sending and showing images is most likely for sporting use, however this classification incorporates a wide range of perspectives and collaboration styles, from latently viewing the most recent scene of a drama to effectively examining a tennis star's shots in the desire for improving one's own game. Images are progressively used to pass on data, in zones as assorted as guide making, climate guaging and mail-request shopping, and to convince or pass on a disposition, as in publicizing. They can likewise be acknowledged in their own right, as masterpieces. An itemized sociological investigation of image utilize would be strange in this report, especially as there is at present little proof for the presence of various client networks with various requirements. Most people interface with images in various manners at various occasions, maybe going through an hour in a craftsmanship display one day, and watching a games video the following. Attempting to order such conduct by client type doesn't appear to be valuable.

2. Professional groups making use of images

In the domain of expert image use, the circumstance is somewhat extraordinary. While there are surely contrasts in style between singular plan engineers, for instance, the idea of the plan cycle forces various unpreventable requirements inside which all specialists should work. Thus it is conceivable to sum up somewhat about the manner in which images are utilized by various callings. Since this report is principally worried about image stockpiling and retrieval, it bodes well to restrict our conversation by focusing on utilizations which include put away assortments of images here and there. A few gatherings of individuals use images in their work consistently, for example, visual fashioners and artists, while others may never be needed to utilize them, for example, bank chiefs and bookkeepers. There is a wide scope of callings lying between these two boundaries, including medication and law. Different gatherings of laborers, for example, administrators and gallery guardians, might be needed to discover images in the interest of customers as opposed to for themselves. It is difficult to give a full picture here of the utilizations being made of visual data. The accompanying models ought to be deciphered as being simply a preview of the circumstance:

Crime prevention The police utilize visual data to recognize individuals or to record the areas of crime for proof; throughout the course of time, these photographic records become a significant document. In the UK, it is basic practice to photo each and every individual who is captured and to take their fingerprints. The photo will be documented with the fundamental record for the individual concerned, which in a manual system is a paper-based document. In a computer-based system, the photo will be digitized and connected to the comparing printed records. Until indicted, admittance to photographic data is confined and, if the blamed is vindicated, all photos and fingerprints are erased. Whenever indicted, the fingerprints are passed to the National Fingerprint Bureau. As of now, there is a public activity examining an arranged Automated Fingerprint Recognition system including BT and more than thirty provincial police powers. Different employments of images in law authorization incorporate face acknowledgment, DNA coordinating, shoe sole impressions, and observation systems. The Metropolitan Police Force in London is associated with an undertaking which is setting up a global database of the images of taken articles

Medicine The medical and related wellbeing callings use and store visual data as X-rays, ultrasound or other examined images, for conclusion and observing purposes There are severe standards on secrecy of such data. The images are kept with the patients' wellbeing records which are, in the principle, manual documents, put away by exceptional identifier (NI number). Visual data, if it is delivered mysterious, might be utilized for exploration and instructing purposes. A large part of the examination exertion identified with images is attempted in the medical material science territory. Parts of concern incorporate powerful image preparing (for example limit/include location) systems which help the specialist in identifying and diagnosing injuries and tumors and following advancement/development

Fashion and graphic design Imagery is significant for realistic, style and modern fashioners. Representation is by all accounts part of the innovative cycle. While there will be singular contrasts in the manner creators approach their undertaking, many use images of past plans as pictures, photos and illustrations, just as articles and other visual data from this present reality, to give motivation and to envision the finished result. 2-D representations, and, progressively, 3-D mathematical models are utilized to introduce thoughts to customers and different associates. There is likewise a need to speak to the manner in which pieces of clothing hang and stream.

Distributing and promoting. Photos and pictures are utilized widely in the distributing business, to delineate books and articles in papers and magazines. Numerous public and territorial paper distributers keep up their own libraries of photos, or will utilize those accessible from the Press Association, Reuters and different offices. The photographic assortments will be filed constantly under, generally, wide subject headings (for example nearby scenes, structures or characters just as pictures covering public and global subjects). Progressively, electronic techniques for capacity and access are showing up, close by advancements in mechanized strategies for paper creation, significantly improving the speed and precision of the retrieval cycle. Ads and publicizing efforts depend vigorously on still and moving imagery to advance the items or administrations. The development of business stock photo libraries, for example, Getty Images and Corbis, mirrors the rewarding idea of the business.

Architectural and engineering design Photos are utilized in engineering to record completed ventures, including inside and outside shots of structures too specific highlights of the plan. Generally these photos will be put away as

printed copy or in slide design, open by, state, project number and maybe name, and utilized for reference by the engineers in making introductions to customers and for instructing purposes. Bigger modelers' practices with more sufficient assets, have presented computerized cameras and the electronic stockpiling of photos. The images utilized in many parts of designing incorporate drawings, plans, machine parts, etc. Computer Aided Design (CAD) is utilized widely in the plan cycle. An excellent need in numerous applications is the need to utilize standard parts, to keep up serious evaluating. Consequently many designing firms keep up broad plan chronicles. Computer aided design and 2-D displaying are additionally widely utilized in structural plan, with 3-D demonstrating and other representation procedures progressively being utilized for speaking with customers. A new study of IT in structural firms stressed the predominance of CAD (particularly 2-D) in the plan cycle, however it presumed that object-based, astute 3-D displaying systems will turn out to be more significant later on.

Historical research Historians from an assortment of controls – craftsmanship, humanism, medication, and so forth – utilize visual data sources to help their examination exercises. Archeologists additionally depend vigorously on images. In certain occurrences (especially, however not only, workmanship), the visual record might be the solitary proof accessible. Where admittance to the first masterpieces is confined or outlandish, maybe because of their geographic distance, possession limitations or components to do with their state of being, scientists need to utilize substitutes as photos, slides or different photos of the articles, which might be gathered inside a specific library, exhibition hall or workmanship display. Photographic and slide assortments are kept up by a wide scope of associations, including scholarly and public libraries.

3. Current techniques for image and video retrieval

❖ Organizing an image collection

While this survey is essentially centered on procedures for the capacity and retrieval of electronic images, it is helpful to think about the customary acts of picture and other manual assortments of images and recordings. Image assortments of different kinds are kept up by a wide scope of associations, all things considered, and in an assortment of areas.

Customarily, images will be put away in their unique simple structure, in wallets, documents or envelopes, which thusly will be organized on racks, in drawers or in cupboards. The degree of ordering related with manual image assortments will be firmly identified with the significance of the assortment, the manner in which it is utilized, and the time and assets designated to the assignment. Retrieval of specific images from such assortments is characteristically work escalated and regularly fortunate. Information on the assortment ordinarily rests with the administrators, documenters, caretakers or others liable for its upkeep and, less frequently, the genuine clients. At the point when manual assortments are digitized, choices must be made about the related metadata and regularly it may not be achievable, because of absence of assets, to redesign the content of the index or literary record related with each image.

❖ Classification and indexing schemes

Many picture libraries use watchwords as their principle type of retrieval – regularly utilizing ordering plans created in-house, which mirror the uncommon idea of their assortments. A genuine illustration of this is the system created by Getty Images to record their assortment of contemporary stock photos. Their thesaurus contains a little more than 10 000 catchphrases, separated into nine semantic gatherings, including topography, individuals, exercises and ideas. File terms are doled out to the entire image, the fundamental items portrayed, and their setting. Retrieval programming has been created to permit clients to submit and refine questions at a scope of levels, from the expansive (for example "opportunity") to the particular (for example "a youngster pushing a swing").

Presumably the most popular ordering plan in the public space is the Art and Architecture Thesaurus (AAT), starting at Rensselaer Polytechnic Institute in the mid 1980s, and now utilized in workmanship libraries across the world. AAT is kept up by the Getty Information Institute and comprises of almost 120,000 terms for portraying objects, textural materials, images, engineering and other social legacy material. There are seven features or classifications which are additionally partitioned into 33 subfacets or orders. The aspects, which progress from the theoretical to the solid, are: related ideas, actual credits, styles and periods, specialists, exercises, materials, and articles

❖ **Current indexing practice**

While talking about the ordering of images and recordings, one requirement to recognize systems which are outfitted to the proper portrayal of the image and those worried about subject ordering and retrieval. The previous is practically identical to the bibliographical depiction of a book. Notwithstanding, there is still nobody standard being used for image depiction, albeit much exertion is being exhausted here by a scope of associations, for example, the Museum Documentation Association, the Getty Information Institute the Visual Resources Association the International Federation of Library Association/Art Libraries and the International Committee for Documentation (CIDOC) of the International Council of Museums (ICOM)

The unmistakable indexing of photos presents various unique difficulties. Photos, for instance, are not self-recognizing. Not at all like literary works that give such fundamental classifying helps as cover sheets, edited compositions and chapter by chapter list, photos frequently contain no sign of creator or picture taker, names of people or places portrayed dates, or any printed data whatever. Classifying of images is more perplexing than that for text reports, since records ought to contain data about the principles utilized for image catch and how the information is put away just as illustrative data, for example, title, picture taker (or painter, craftsman, and so on) Moreover, duplicates of particular sorts of images may include numerous layers of licensed innovation rights, relating to the first work, its duplicate (for example a photo), a computerized image checked from the photo, and any ensuing advanced image got from that image.

5. COMPUTATIONAL FEATURES OF CONTENT BASED IMAGE RETRIEVAL SYSTEM

Highlight extraction is the way toward portraying the image by considering boundaries known as highlights (shading, edge, surface and so on) from a given image. An element is characterized as a “unmistakable boundary that is separated from an image". The adequacy of image retrieval relies upon the viability of highlights/credits utilized for the portrayal of the content. A significant issue is the decision of appropriate highlights for a given undertaking. Viable image retrieval can be accomplished by cooperatively utilizing shading, edge thickness, boolean edge thickness and histogram canisters. These highlights are examined in this part.

1. Color

Color has been the best component and practically all systems use colors. Albeit a large portion of the images are in the RGB (Red, Green, Blue) color space, this space is seldom utilized for ordering and questioning as it doesn't related well to the human color discernment. It simply like sensible to be utilized for images taken under the very same conditions each time, for example, brand name images. Different spaces, for example, HSV (Hue, Saturation, and Value) or the CIE Lab and Luv spaces are vastly improved regarding human discernment and are all the more every now and again utilized. This implies that distinctions in the color space are like the contrasts between colors that people see. There are various kinds of color spaces accessible which are fitting for various purposes. A portion of the color spaces that we frequently run over are RGB, HSV, CIE Lab and Luv. Color highlight can be included histogram canisters or normal, standard devation or difference in a picked color space.

2. Texture

Texture, is another significant property of images. Surface highlights of images allude to the visual examples that have properties of homogeneity that don't result from the presence of just a solitary color or power. Image surface content gives data of image properties, for example, perfection, coarseness, and consistency which is valuable in a CBIR system. Essentially, surface portrayal strategies can be ordered into two classifications: underlying and factual. Underlying strategies including morphological administrator and nearness chart, portray surface by recognizing primary natives and their arrangement rules. Underlying strategies will in general be best when applied to surfaces that are standard. Measurable strategies, including Fourier force spectra, cooccurrence networks, Shift-invariant Principal Component Analysis (SPCA), Tamura highlight, World decay, Markov arbitrary field, fractal model and multi-goal sifting methods, for example, Gabor and wavelet change, portray surface by the factual dissemination of the image power.

3. Shape Retrieval

Shape features, the articles or areas have been utilized in many content-based image retrieval systems. Contrasted and color and surface highlights, shape highlights are generally portrayed after images have been portioned into locales or articles. Since hearty and exact image division is hard to accomplish, the utilization of shape highlights for image retrieval has been restricted to unique applications. The strategies for shape portrayal can be characterized into limit or locale based techniques. A decent shape portrayal include for an article ought to be invariant to interpretation, pivot and scaling.

4. Semantics

Most current CBIR systems recover images from an assortment, based on the low level highlights of images, for example, color, surface and shape. All things considered, a few systems endeavor to discover images that are semantically like a given question. Semantically comparable is implied in the feeling of human visual comparability insight (or called significant level in CBIR).

5. Edge density and Boolean edge density

Edges are distinguished from each image utilizing sobel administrator. To improve the pixels that has a place with the edges and limits by utilizing a standard edge locator. Sobel administrator finds the slope (change) in force at each point in the image. Based on this power change towards evenly or vertically we can move around the image edge. Sobel administrator exits for x-request and y-request subordinates and furthermore for blended fractional subsidiaries. Pixels a long way from edges will drop to zero and those close to an edge will increment to greatest. Determined the mean pixel estimation of the resultant image From the edge thickness, the image is spoken to as edge pixels are white (1) and non-edge pixels are dark (0). Include white pixel in the image. The mean of these white pixels are considered as boolean edge thickness.

6. Existing methods for content based image retrieval

As the measure of assortment of advanced images increment, the issue of finding an ideal image in a gigantic assortment likewise turns out to be exceptionally troublesome. In this way the need of a productive strategy to recover computerized images is perceived by general society. There are two ways to deal with image retrieval, Text Based methodology and Content Based methodology. The past arrangement is a more conventional methodology which is watchword based image retrieval. The watchword ordering of computerized images is helpful however requires an impressive degree of exertion and regularly restricted for portraying image content. The substitute methodology, the content based image retrieval records images by utilizing the low level highlights of the advanced images and the looking relies upon highlights being consequently separated from the image.

7. Major content based image retrieval systems

A concise review of the significant content based image retrieval systems was introduced in this segment. Techniques like QBIC, Photobook, MARS, IMatch, Blobworld and Netra systems were examined. QBIC: IBM built up the image retrieval system, Query By Image Content (QBIC). It extricates basic highlights from items or images which are color, surface and shape. Color highlights processed are; the 3D normal color vector of an article or the entire image in RGB, YIQ, Lab, Munsell color space and a 256-dimensional RGB color histogram. The surface highlights utilized in QBIC are adjusted adaptations of the coarseness, difference, and directionality highlights. The shape highlights comprise of shape territory, circularity, capriciousness, significant hub direction and a bunch of logarithmic second invariants. A strategy for recovering images based on a harsh client sketch was likewise actualized in QBIC. For this reason, images in the database are spoken to by a decreased paired guide of edge focuses. QBIC permits consolidated sort look through where text-based catchphrases and visual highlights are utilized in a solitary inquiry.

6. CONCLUSION

The resultant fusion histogram is used to represent the image. Experiments carried out in Wang's, Corel5K and COIL 100 datasets showed 8.1%, 6.9% and 11% increments respectively in the average precisions of the top retrieved results using the combined histograms to that of SURF based histograms. Also, it is observed that the proposed method outperforms many of the recent feature fusion methods that integrate SIFT with LBP, Color Difference Histogram (CDH) with Angular Radial Transform, LBP with edge information etc. However, the datasets considered here for carrying out the experiments were static and had well-defined categories with considerable number of images in each category. Because of this, codebooks with limited size only were needed to represent the images for obtaining competent retrieval results with recent similar systems. Nevertheless, in real-life scenario, the retrieval is usually performed in databases with assorted images. In such cases, larger codebooks are needed for effective representation and hence retrieval of images.With the intention of further improving the retrieval efficacy, a feature replacement algorithm has been presented for similarity computation in a multi-query environment. Multiple queries are often used in CBIR systems with the idea of gathering additional information about the user's requirement. In a generic multi-query system, the features gathered from the query image set are used for learning a discriminative classification model (if both positive and negative images are included in the query set) or methods such as query averaging, query point movement, feature reweighting etc. are employed to rank the images in the dataset for retrieving relevant images.

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