

Feature Extraction and Clustering Techniques On Remote Sensing Images-A Survey

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Abstract--- Remote detecting picture databases are the quickest developing files of spatial data. Nonetheless, we have a constrained limit with respect to extricating data from huge remote detecting picture databases. There are as of now not very many methods for picture information mining and data extraction in expansive picture informational indexes, and hence we are neglecting to abuse our huge remote detecting information documents. Presently in nowadays there are different applications professed to extricate the precise data from the shaded picture database. This information base having different types of pictures and their very own semantics, amid data extraction dependent on the substance of pictures there are different distinctive sort of feature extraction procedures that are accessible and they can form a cluster. This proposed work centers around the different feature extraction strategies and clustering methods. What's more of that, what sort of data they reflect and where they can without much of a stretch adoptable is likewise given. In this paper, we exhibits a study on the different methodologies utilized for image clustering which is fundamentally founded on the given picture. In image characterization, order of pictures is a mind boggling process which is the need to cluster, arrange and get to them utilizing a simple, quicker and proficient approach to accomplish higher picture precision with less execution time. The characterization of pictures into semantic classes is a fascinating and huge issue. Various methodologies have been proposed identifying with image arrangement over the most recent couple of years.

Keywords: feature extraction, clustering methods, image dataset, remote sensing images, ordering images.

1. INTRODUCTION

Pictures are the great devices for powerful communication in which a picture is a visual portrayal of something. The maximum a picture talks a thousand words' appropriately calls attention to that the pictures are intense devices for communication. It is less demanding to pass on messages through pictures than content. In wording, pictures are the impression of this present reality objects. Essentially the term 'picture' alludes to simple or crude picture information, where the term 'image' alludes to advanced information that is reasonable for preparing utilizing PCs. Computerized picture is a picture made out of discrete pixels of carefully quantized brilliance esteems. The structure of picture digitization is appeared in the figure 1. Advanced Images are electronic depictions taken of a scene or examined from records, for example, photos, compositions, printed writings, and fine arts. A rich part of advanced imaging is the assorted variety of picture types that emerge, and that can get from almost every kind of radiation. For the

most part, the Digital picture is spoken to in Pixel which implies Picture Element. The blend of the clustering of the Pixels takes after a picture to the Human vision. Frequently a picture is a two-dimensional (2D) flag $f(x, y)$, where the estimations of the capacity $f(x, y)$ speak to the adequacy or power of the picture. In fact, an advanced picture is a portrayal of a two dimensional picture as a limited arrangement of computerized esteems, called picture components or pixels. A most sums up way; a computerized picture is a variety of numbers portraying spatial dispersion of certain field parameters.



Fig-1: Picture digitization

In machine learning process information is perceived utilizing their important examples and extricated utilizing the similitude between these examples. To locate the conspicuous examples among the data required to lessen the measure of information and concentrate the genuine relationship or contrast between two information occasions. These connections are registered utilizing the substance of the information. Subsequently that is an intricate space; where vulnerability and irregularity nature of the information can be misinform the genuine choice or acknowledgment design.

The exhibited work in this paper is an assessment of procedures by which the ideal properties between the information can be assessed to discover and shape the ideal properties by which the idea of information and example of the information can be perceived. The exhibited work is a assessment of the picture information and finding the most suitable element extraction strategy, with the end goal to use them in different applications. The below figure-2 illustrate the pixel features.

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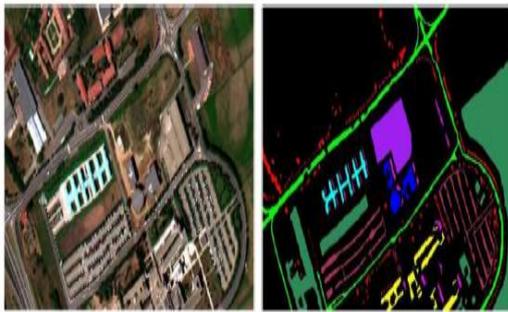


Figure 2 picture features

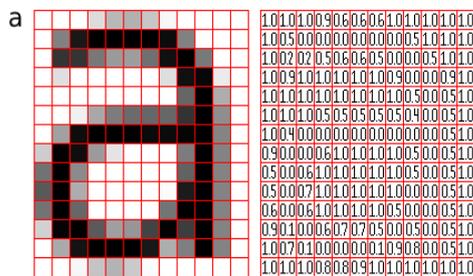


Figure 3 Color Image Pixel Representations

A picture can be characterized as a 2D flag that fluctuates over the spatial directions x and y , that can be composed scientifically as $f(x, y)$. Figure-3 explains the color image pixel representations. As the equivalent, 3D signs of a picture can be inferred or spoken to over the spatial directions x , y and z , that can be composed numerically, for example, $f(x, y, z)$. So also, the directions might be different as indicated by the measurements of the picture with the end goal to speak to them numerically. A straightforward picture arrangement model can be as capacity of picture determined as $f(x, y)$ where $f(x, y)$ gives power at position (x, y) . The esteem or plentifulness of ‘f’ at spatial directions (x, y) is a positive scalar amount whose physical significance is controlled by the wellspring of the picture.

Picture mining is still at the test stage and developing field of research. Absence of comprehension in the examination issues of picture mining is the snag to quick advancement. Picture information assumes crucial job in each part of the frameworks like business, healing centers, building etc. Picture mining regularly manages the investigation and improvement of new advances that permit simple examination and understanding of the pictures. Picture mining isn't just the basic reality of recouping significant pictures however is the development of picture designs that are vital in a given accumulation of pictures. The foundation of picture mining framework is every now and again and entangled process since it infers joining assorted methods extending from picture recovery and ordering plans up to information mining and example acknowledgment [12].

Picture clustering is a critical and testing undertaking in different application spaces, including biomedical imaging, biometry, video observation, vehicle route, modern visual review, robot route, and remote detecting. Characterization is a data preparing errand in which pictures are sorted into a few gatherings. Order of scene enables us to productively and quickly break down environment. A scene is described

as a place in which we can move. Characterizing scenes into semantic classes, (for example, open air, indoor, and sports) isn't a simple undertaking. The scene clustering issue has two basic parts speaking to scenes and learning models for semantic classes utilizing these portrayals. At the point when pictures incorporate impediment, low quality, commotion or foundation mess it is extremely hard to perceiving a question in a picture and this undertaking turns out to be much additionally difficult when a picture contain numerous articles.

Ordering is one of the few essential classifications of machine learning issues [6]. The indoor - outside scene recovery issue, how abnormal state scene properties can be surmised from arrangement of low-level picture features [1]. A mechanized strategy has proposed dependent on the boosting calculation to appraise picture introductions [8]. The clustering of indoor and open air pictures dependent anxious investigation [4]. Investigation of surface requires the distinguishing proof of legitimate properties or features that separate the surfaces of the picture [2][6]. For arrangement of scene pictures into conflict scene and nature scene pictures, the real assignments are ID feature extraction strategy and appropriate classifier. In this paper, displays a literature overview on the different methodologies utilized for characterizing pictures dependent on Per-pixel Classification

II. LITERATURE SURVEY

Madugunki, Meenakshi et.al. [1], analyzed there inquiry issues in picture mining, advancement in picture mining. They proposed a data driven system for picture mining. In that they made out four levels of data: Pixel level, Object level, semantic idea level, and example and information level. This methodology does not tend to clamor excess. B. Usman et.al. [2], proposed a structure for mining pictures by shading content. Their structure gives the likelihood of utilization five separation work for assessment of likeness among pictures and two kinds of quantization. The strategy here introduced thinks about just recovery angles. Contemplations like multifaceted nature or time execution are not treated here.

The thoughts introduced are just a little advance in an extremely rich research bearing. Others visual features, for example, surface, shape, and utilization of compacted pictures can be recognized for further expansion of this issue. Murthy, V. S. V. S et.al. [3], utilizing picture mining in picture recovery, depicted another technique for picture recovery utilizing abnormal state semantic features. It depends on extraction of low level shading, shape and surface attributes and their change into abnormal state semantic features utilizing fluffy generation rules, inferred with the assistance of a picture mining procedure. Dempster-Shafer hypothesis of proof is connected to acquire a rundown of structures containing data for the picture abnormal state semantic features. Johannes Itten hypothesis is embraced for gaining abnormal state shading features. The fundamental preferred standpoint of this strategy is the



likelihood of recovery utilizing abnormal state picture semantic features. After the full framework acknowledgment it will have the capacity to acquire measurement attributes about the convenience of the proposed strategy.

Siorpaes, Katharina et.al. [4], with the headway in the internet, a lot of information on a wide range of fields has turned out to be accessible on the web. Client recovered pictures by a productive and compelling way. Many methods have been created to take care of the picture recovery issue based on picture features, for example, shading, surface and shape. This innovation called as Content Based Image Retrieval. It assumes a vital job in Image Indexing and Retrieval. Su, Ja-Hwung et.al. [5], showed the ideas of a model of a Knowledge-driven substance based data mining framework delivered to oversee and investigate extensive volumes of remote detecting picture information. The framework comprises of a computationally concentrated disconnected part and an online interface. The disconnected part goes for the extraction of crude picture includes, their pressure, and information decrease, the age of a totally unsupervised picture content-list, and the ingestion of the index section in the database administration framework.

A picture recovery framework can be characterized as seeking, perusing, and recovering pictures from gigantic databases comprising of advanced pictures. Albeit Conventional and normal procedures of recovering pictures make utilization of including metadata specifically inscribing watchwords in order to perform explanation of words. Anyway picture hunt can be depicted by devoted strategy of pursuit which is generally used to discover pictures. For looking pictures client gives the inquiry picture and the framework restores the picture like that of question picture [2].

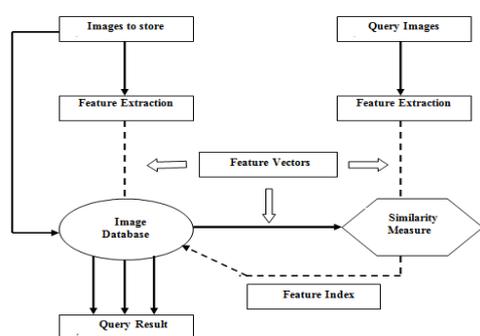


Figure 2 General Image Retrieval System

Lai, Chih-Chin et al [6] have for the most part centered in giving better recovery of data from pictures by upgrading the nature of the pictures utilizing computerized picture handling procedures. To upgrade the picture quality one of the least complex and powerful system is Histogram Equalization (HE). This investigation gives different situations where higher protection of splendor is required however which are not taken care of appropriately by Histogram Equalization (HE), Brightness Preserving Bi-Histogram Equalization (BBHE), Dualistic Sub-Image Histogram Equalization (DSIHE),

Ramesh BabuDurai et.al.[7] have predominantly talked about the picture upgrade systems when it is being

connected to the fingerprints. Diverse clamors in the pictures turn into a boundary in the examining and recovery of the data from the pictures. Without the learning of the source debasement the picture is progressed. The improvement procedures are contrasted and the diverse execution estimates like Root Mean Square Error (RMSE), Peak Signal to Noise Ratio (PSNR), and Correlation Coefficient (CC), SSIM.

Raghuwanshi et.al.[8] in their paper have inspected the different procedures in the picture upgrade. Picture upgrade is one of the imperative and precarious methods in picture preparing. There are diverse kinds of pictures in the remote detecting pictures, therapeutic pictures, and ethereal pictures and so on which truly persevere from the poor complexity and clamor. To enhance the nature of the picture it is basic to expel the commotions from the picture and improve the picture, evacuating the haze in the picture and so on must be prepared. The improvement strategy contrasts for every last field of picture with its target.

Jayaprabha, P et al [9] have introduced a writing audit in the picture upgrade systems for shading picture improvement. The picture clearness in picture is lessened because of lighting, climate and gear issue and so on when the picture is tainted because of clamors the loss of information in the pictures is additionally conceivable. To recuperate data from the debased picture, picture upgrade procedures were created. Different strategies like Contrast Stretching, Histogram Equalization and its enhancement adaptations, Homomorphic Filtering, Retinex, and Wavelet Multiscale Transform are being looked into in this paper.

Moore, S et al [10] proposed systems in picture improvement. Where the principle center is given to the point preparing techniques and histogram handling. The standard motivation behind picture upgrade is to process the information picture in such a way, to the point that the yield is more pertinent to the applications. To enhance the visual prominence of the pictures there are huge number decisions of upgrade systems. Picture negative is principally reasonable for enhancing the white detail installed in obscurity locales.

III. FEATURE EXTRACTION

Feature extraction is most essential advanced technique. Features are arranged into three kinds that is low, center and abnormal state. Low level features are shading, surface and Middle level component is shape and High level element is semantic hole of articles [13]. Shading is by a long shot the most widely recognized visual element utilized, fundamentally in view of the straightforwardness of separating shading data from pictures. Surface and shape are additionally key segments of human visual observation. Like shading, this makes it a fundamental component to think about while questioning picture databases. Shading Feature In picture recovery, the shading is broadly utilized element. Numerous techniques are used to separate shading feature from pictures. Here a portion of the strategy is portrayed.



To separate the shading features from the substance of a picture, we have to choose a shading space and utilize its properties in the extraction. In like manner, hues are characterized in three-dimensional shading space. In advanced picture purposes, RGB shading space is the most predominant decision. The principle disadvantage of the RGB shading space is that it is perceptually non-uniform and gadget subordinate framework [2]. The HSV shading space is an instinctive framework, which portrays particular shading by its tone, immersion, and brilliance esteems.

For locale based picture recovery prevailing shading strategy is utilized or shading feature extraction. Because of the error of the division, the normal shade of a portioned locale might be not the same as that of the first district. To get the prevailing shade of the picture, first the histogram is gotten and after that the canister with the most extreme size is taken as the predominant shade of the locale [3]. B. Surface Feature Texture is an imperative component of regular pictures. Picture surfaces can be characterized as visual example in pictures of common finished surfaces and falsely made visual examples. It contains essential data about the auxiliary plan of the surface i.e., mists, leaves, blocks, texture, etc. A assortment of procedures have been produced for estimating surface closeness.

Ardakany et.al [11] have proposed technique where Shape include is separated by utilizing Fourier Descriptor and the centroid separation. And Gabor channel is utilized to remove surface features from pictures [8]. By utilizing consolidated Fourier descriptor feature and Gabor channel include alongside morphological shutting task result is enhanced contrast with utilizing just a single element at a time. The histogram of edge course technique catches general shape data of picture. This data is acquired utilizing vigilant, sobel calculation and edge headings are quantized to store in containers. This system give scale and revolution invariance [3]. Among locale based descriptors, minutes are exceptionally prominent.

P. Jayaprabha has introduced an examination in comparative area, in 2013. They displayed an abnormal state semantic recovery process, in which the internet searcher is used for recovering an expansive number of pictures utilizing a given content based inquiry. In a low level picture recovery process, comparative picture look work is given to client to fill in the info inquiry for picture comparability portrayals. The web unrest and advanced advances have committed a need a framework to sort out richly accessible computerized picture for easy order and recovery. The procedures includes wide regions, i.e. picture division, picture include extraction, portrayal, mapping of features to semantics, stockpiling and ordering, picture likeness remove estimation and recovery making CBIR framework advancement a urgent undertaking [12].

Jin, Yohanet.al. [12] proposed a methodology that endeavors to trim unimportant watchwords by the use of Word Net. To order unessential catchphrases, examination on different semantic similitudes of watchwords and to intertwine the results of every one of these measures together to settle on a ultimate choice with the assistance of Dempster-Shafer proof mix. Different models have actualized by them to connect visual tokens with catchphrases dependent on information based, Word Net

and assessed execution utilizing accuracy, and review utilizing benchmark dataset. The outcomes demonstrate that by expanding information based with traditional model they can enhance accuracy of comment by taking out insignificant watchwords [15].

Ahmed J. Afifi et.al.[13] proposed a methodology that endeavors to trim insignificant watchwords by the utilization of Word Net. To classify unessential catchphrases, examination on different semantic similitudes of watchwords and to intertwine the results of every one of these measures together to settle on a ultimate conclusion with the assistance of Dempster-Shafer proof blend. Different models have executed by them to connect visual tokens with catchphrases dependent on information based, Word Net and assessed execution utilizing accuracy, and review utilizing benchmark dataset. The outcomes demonstrate that by enlarging information based with traditional model they can enhance exactness of comment by taking out superfluous catchphrases [15].

| Method | Advantages | Disadvantages |
|------------------------------|--|--|
| 1.Support Vector Machine | <ul style="list-style-type: none"> Deliver unique solution. Very efficient than other methods. Avoid over-fitting | <ul style="list-style-type: none"> High algorithm complexity Run slowly |
| 2. Artificial Neural Network | <ul style="list-style-type: none"> Robust to noisy training dataset Very efficient for large dataset | <ul style="list-style-type: none"> High computational cost Lazy learner |
| 3. Decision Tree | <ul style="list-style-type: none"> Require little efforts from users Easy to interpret and explain | <ul style="list-style-type: none"> Splits are very sensitive to training data set High classification error rate |

Table 1: Advantages and Disadvantages of picture order techniques

SVM is a proficient administered double order strategy. SVM characterization strategies have regularly found to give higher exactnesses contrasted with different techniques, for example, MLC, ANN-based clustering. SVM classifiers dependably convey special arrangements, since the optimality issue is curved. A portion of the huge commitments in SVM clustering incorporate bunch suspicion based dynamic learning for characterizing remote detecting pictures proposed by Felci Rajam et al. [14], combination of surface and SIFT-based descriptors for remote detecting picture order proposed by S. Singaravelan et al. [15], picture clustering dependent on direct separation coding proposed by Swapnalini Pattanaik et al. [16]. These calculations are exhibited quickly as pursues: D S Guru et al. [17] builds up a solid dynamic learning based characterization for remote detecting pictures. Gathering marked examples is tedious and exorbitant. Additionally, repetitive examples back off the preparation procedure. Therefore, preparing set should be kept as little as conceivable to keep away from excess, and in the meantime, designs with the biggest measure of data should be incorporated into the preparation set. The proposed dynamic



learning technique is executed in the learning period of the SVM classifier. The SVM classifier is first prepared with few marked examples. Each unlabeled example is given a yield score dependent on how likely or far-fetched it is an individual from a class. These yield scores are plotted into a histogram. In this manner, the most uncertain examples produce yield scores situated in the valley area of the histogram.

Manimala Singha et.al. [18] Depicted the picture digging approaches for order and division of Brain MRI information. Picture division assumes an essential job in a few restorative imaging applications by modernizing or helping the portrayal of anatomical courses of action and extra districts of intrigue. Programmed acknowledgment of tumors in a few medicinal pictures is energized by the necessity of better precision when taking care of with a human life. It has been affirmed that twofold perusing of medicinal pictures potentially will demonstrate the route for upgraded tumor identification. In any case, the expense suggested in twofold perusing is to a great degree enormous that is the reason better programming to help people in restorative foundations is of immense enthusiasm right now. In their methodology they built up a framework which utilizes picture mining ways to deal with classify the pictures either as typical or unusual or after that gap the tissues of the odd Brain MRI to perceive mind related maladies.

M Mary Helta Daisy et.al.[19] talked about an enhanced picture mining procedure. An upgraded picture digging system for mind tumor clustering utilizing pruned affiliation rule with MARI calculation is introduced in their paper. The strategy proposed makes utilization of affiliation rule mining method to characterize the CT filter mind pictures into three classifications to be specific typical, kind and censure. It joins the low-level features removed from pictures and abnormal state learning from experts. The created calculation can assist the doctors for efficient clustering with numerous catchphrases per picture to show signs of improvement the precision. The strategy proposed in this paper arranges the cerebrum CT filter pictures into three classes: typical, generous and dangerous. The test result on pre-analyzed database of cerebrum pictures indicated 96% and 93% affectability and exactness separately.

Padmashree Desai et.al [20] outlined around an Image mining strategies which is subject to the Color Histogram, surface of that Image. The inquiry picture is considered, at that point the Color Histogram and Texture is made and as per this the resultant Image is found. They have inspected a histogram-based hunt methods and shading surface systems in two diverse shading spaces, RGB and HSV. Histogram seek recognize a picture through its shading circulation. It is uncovered that pictures recovered by utilizing the worldwide shading histogram potentially won't be semantically related in spite of the fact that they share similar shading appropriation in a few outcomes.

Guoyong Duana et al.[21] proposes the utilization of a univariate choice tree classifier with blunder based pruning (EBP). They utilize four distinctive ascribe choice measure measurements to confirm that the clustering precision isn't influenced by the decision of characteristic choice measure metric. The precision of the choice tree classifier is

estimated while utilizing diverse pruning strategies, for example, diminished mistake pruning (REP), skeptical blunder pruning (PEP), blunder based pruning (EBP), basic esteem pruning (CVP), and cost multifaceted nature pruning (CCP). It uncovers that the EBP beats the other pruning techniques. They likewise play out a similar assessment between ANN-based order and the proposed choice tree-based characterization. Exactness and preparing time are recorded for both the ANN-based classifier and the choice tree based classifier, utilizing ETM+ and InSAR datasets.

Reshma Chaudhari et.al [22] in her paper has quickly portrayed the different component extraction systems. Specifically the viability of the combination of worldwide and neighborhood includes in programmed picture comment, content-based picture recovery network and some great models are likewise being shown in this paper. Shading feature is a standout amongst the most vital features of pictures. Shading features are characterized subject to a specific shading space or model.

Pooja Kamavisdar et al. [23] in their work have grouped the panchromatic high goals information from urban territories utilizing morphological and neural methodologies. There are fundamentally three stages that are being pursued. The initial step is to construct the differential morphological profile which records the auxiliary data utilizing the geodesic opening and shutting activities of various sizes. The utilization of structures activities offers ascend to numerous channels which may have redundancies, while the first panchromatic pictures have just a single information channel. In the second step feature determination or feature extraction is being prepared.

T. Dharani et al. [24] in their work utilize a protest situated calculation for high goals remote detecting pictures to remove the data as far as picture division. A point of our exploration is to build up the chain of importance outline and a recognizable proof arrangement of "pixel-crude object", at that point to convey probes extraction of small scale beach front zone features, e.g., salt marsh, water line, ocean divider, and mariculture lake. An epic structure of picture comprehension and figuring dependent on multi-scale and multi-feature is created in this paper. The system comprises of five stages, which are picture unpredictability portrayal, enormous territory unpleasant division, multiscale fine division, feature crude blending and arrangement, and feature crude and target mapping.

T. Dharani et al. [25] in their paper have inspected a few Fuzzy parcels which are bunch of pixels in the unearthly area. A Multiobjective Optimization calculation is primarily utilized in the treatment of the issue in fluffy dividing where all the while various fluffy bunch legitimacy records can be improved. The client can pass judgment and select an answer which fulfills the prerequisites of the issue as various prevailed arrangements are being procured as the resultant arrangement of close Pareto ideal arrangements.

Sultan Aljahdali et.al [26] have utilized the traditional K-Means bunch calculation in the viable division and characterization of advanced pictures where the calculation

is the enhanced type of Fuzzy K-Means. The fundamental impediment of utilizing the Fuzzy K-Means is because of its vast computational expense. So to beat this issue a calculation is being proposed.

This area condenses the previously mentioned systems of the FBIR utilized in different late papers.

IV.RESULTS & FINDINGS

| Features | Techniques | Accuracy | Dimension | Advantage | Disadvantage |
|-----------------|---------------------------------|----------|-----------|---|--|
| Color Feature | Color Moment | Low | Low | Lower computational complexity | Precision is low |
| | HSV histogram | High | Medium | Simple ,Fast computation | No spatial information |
| | Color Correlogram | High | High | Includes the spatial correlation of colors ,Simple to compute | Very slow computation |
| Texture Feature | Gabor Filter | High | High | Achieves highest retrieval results | Computationally intensive |
| | Gabor Moment | Low | Low | Lower Dimensionality | Low retrieval result compare to Gabor filter |
| | Gray level co-occurrence matrix | High | High | Include positions of pixels having similar gray level values | High Dimensionality |
| Shape Feature | Moment Invariant | High | Low | Invariable to translation, rotation and scale | Limited recognition power |
| | Zernike moments | High | Low | Invariable to translation, rotation and scale | Computational Complexity is High |

Table-2: Parameter Evaluation

V.CONCLUSION

In this displayed investigation paper a review is directed for discovering strategies for substance based picture recovery process. In expansion of that the features vector estimation and different as often as possible utilized systems are additionally evaluated. In not so distant future this strategy is used to present another picture include count method, which is utilized for shading picture acknowledgment and clearer and effective edge location. This paper gives the concise learning on some managed order strategies utilized in Image Classification. The most widely recognized methodology for picture characterization is non-parametric. This overview furnishes the some unique order technique with their a few impediments. Feature based picture recovery is exceptionally flexible subject. Also, its outcome changes as indicated by methodology utilized. From above examination we can state that shading feature extraction utilizing HSV space histogram based method is more productive and it requires less memory so resultant database will be little. Gabor channel will be use for surface component extraction which is close to human visual execution. For shape include minute invariant technique will be utilized which is perpetual for interpretation, turn and scale. Here various features will utilize as opposed to singular element extraction technique which will give great outcome. Subsequently in this paper initial an overview on Content based picture recovery (CBIR) is performed what's more of that the diverse methodologies created lately are additionally talked about. Amid examination that is discovered that there are various procedures that have been presented so far however the vast majority of them are very little precise or now and then lake in execution. This paper has depicted some of significant commitments made in this field and talks about the basics. Furthermore another model is additionally proposed for future usage.

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