International Journal of Current Trends in Engineering & Technology
ISSN: 2395-3152
Volume: 03, Issue: 06 (NOVEMBER - DECEMBER, 2017)

A Hybrid Approach for Encrypted Image Retrieval by Utilizing Content and Annotation Features

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***Abstract*—**CBIR will possess a new dimension in the field of digital image processing. In this paper a system is proposed and implemented which accepts any color image from the user end and corresponding relevant output images are displayed. Both queries are encrypted first than go to the servers for examination with dataset explanation and substance features. Encrypted user text query makes filtering of the dataset images than SURF feature of the visual query makes final retrieval of the image. Experiment was done on real and artificial set of images. Result shows that proposed work is better on different evaluation parameters as compare to previous existing methods.

***Keywords*—** *Annotation, Image retrieval, Feature extraction, Re-ranking, SURF, Visual contents.*

I. INTRODUCTION

Image mining is the way toward looking and finding profitable data and information in vast volumes of information. A portion of the techniques used to assemble information are, Image Retrieval, Data Mining, Image Processing and Artificial Intelligence. These strategies permit Image Mining to have two diverse methodologies. One is to separate from databases or accumulations of Images and the other is to mine a mix of related alphanumeric information and accumulations of Images. In design acknowledgment and in Image handling, feature extraction is a unique type of dimensionality lessening. At the point when the information is too expensive to be in any way handled and it is suspected to be famously excess, at that point the information will be changed into a decreased portrayal set of features. Feature extraction includes disentangling the measure of assets required to portray a huge arrangement of information precisely. A few features are utilized as a part of the Image Retrieval framework. The well known among they are Color features, Texture features and Shape features.

Content-based Image recovery (CBIR) is a framework, in which recovers visual-comparative Images from vast Image database in light of consequently inferred Image features, which has been an extremely dynamic research zone as of late. In the vast majority of the current CBIR systems[1], the Image content is spoken to by their low-level features, for example, shading, surface and shape[2][3]. The downside of low-level features is losing much detail data of the Images, if there should arise an occurrence of searching for Images that contain a similar protest or same scene with various perspectives. Lately, the intrigue point locators and descriptors [4] are utilized in numerous CBIR frameworks to beat the above disadvantage. SURF (Speed up Robust Feature) is a standout amongst the most and famous intrigue point indicator and descriptor which has been distributed by Bay et al. [5].

It is generally utilized as a part of the vast majority of the PC vision applications. The SURF has been demonstrated to accomplish high repeatability and uniqueness. It utilizes a Hessian grid based measure for the location of intrigue focuses and a dispersion of Haar wavelet reactions inside the intrigue point neighborhood as descriptor. An Image is dissected at a few scales, so intrigue focuses can be extricated from both worldwide and neighborhood Image subtle elements. Notwithstanding that, the predominant introduction of each of the intrigue indicates is resolved help pivot invariant coordinating. SURF is a standout amongst other intrigue point indicators and descriptors at present accessible.

II. RELATED WORK

The proposed approach is portrayed by two principle steps: 1) demonstrating each Image by a chart, which gives area based Image portrayal joining both neighborhood data and related spatial association, and 2) recovering the Images in the document that are most like the inquiry Image by assessing diagram based likenesses. In the initial step, each Image is at first sectioned into unmistakable locales and afterward demonstrated by an ascribed social diagram, where hubs and edges speak to area attributes and their spatial connections, separately. In the second step, a novel inaccurate diagram coordinating system, which mutually misuses a sub graph isomorphism calculation and an otherworldly chart installing procedure, is connected to coordinate comparing diagrams and to recover Images in the request of diagram comparability.

Kommineni Jenni et.al [2015] clarified Content-based Image recovery (CBIR) as a procedure that empowers clients to separate Images from queries in light of a database that contains countless. . The Image database utilized as a part of the analysis containing 1,800 shading Images from Corel photograph exhibitions. This CBIR technique essentially enhances the precision of the recovery comes about.

Apurva Sharma et.al [2014] cleared up a competent figuring depend on upon SURF, shading histogram, SVM and NN. Creator has proposed a methodology for figure Matching depended on SURF Algorithm using SVM Classifier, NN support forward and shading histogram. CBIR alone with Surf and SVM Method couldn't give better outcomes. Thus, using CBIR with Surf, SVM, NN and shading histogram has given enhanced outcomes.

A. N. Ganar. et.al [2014] proposed Image Retrieval framework by Using Color, Texture and Shape Features. This exploration demonstrates the combination of the shading, shape, and surface information in CBIR to achieve powerful enhanced outcomes.

Prof. C. S. Gode et.al [2014] proposed Image recovery in view of shading, surface and shape as a broad research territory. In this paper, the creators has proposed a system for joining every one of the three, shading, surface, and shape data, and accomplish higher recovery productivity. The Image and its supplement are partitioned into non-covering tiles of equivalent size.

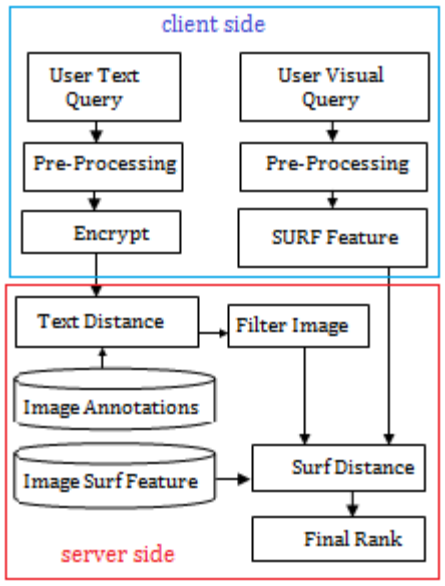

Fig. 1 Block diagram of proposed work.

III. PROPOSED WORK

Text Pre-Processing: Text preprocessing comprises of words which are in charge of bringing down the execution of learning models. Information preprocessing lessens the span of the info content inquiry altogether. Stop-words are useful words which happen much of the time in the dialect of the content (for instance a, the, an, of and so on in English dialect), with the goal that they are not helpful for arrangement.

Feature Extraction

Here words which are not stop word are considered as feature of the query. Now assign number to each text of the query, So that a dictionary of words with their number is created where each text is identified by separate number. Such as D [] = [1, 2, 3, 4, 6, 7, 8, 9] so for n document has its own vector sequence D[n].

AES Encryption

Now common step for all kind of data is that each data need to be converting into 16 element set of input. Here each input need to be in integer data type. In case of numeric this is ok, but in case of image gray scale will convert pixel values in integer form. While for text unique number is assign for all extracted words.

In this encryption calculation four phases are perform in each round. While last round comprise of three phases as it were. These means are basic in both encryption and also decoding calculation where unscrambling calculation is converse of the encryption one. So round comprise of following four phases.

1. Substitute bytes
2. Shift rows
3. Mix Columns
4. Add Round Key

In final round simply all stages remain in same sequence except Mix Columns stage.

Text Distance

Here info query after encryption is change in other numeric esteem. So transformations of same content have same incentive for examination. This can be comprehend as given "School" a chance to word have numeric esteem 28 after encryption its change esteem is 2456. So if "school" show at server for image catchphrase then its change esteem is likewise 2456 just for same arrangement of encryption key.

In this progression check of comparative query words found in image watchwords is use for positioning. This can be comprehend as given inquiry a chance to be {2456, 1324, 2783} and I1 content is {2456, 1324, 2711}, while I2 content is {1256, 1114, 2783} at that point separation of query from I1 and I2 is [2, 1]. Base on separate vector I1 image has high rank as contrast with I2.

Visual Pre-Processing

In this progression image is resize in settle measurement. As various images have distinctive measurement. So transformation of each is done in this progression. One more work is to change over all images in dim arrangement. AS various images have RGB, HSV, and so forth arrange so chipping away at single organization is required.

SURF Feature

SURF expands on the ideas of SIFT yet presents more radical approximations so as to accelerate the recognition procedure. Because of the utilization of indispensable images the many-sided quality of SURF is

extraordinarily decreased, yet, SURF regularly accomplishes unrivaled execution than its ancestor.

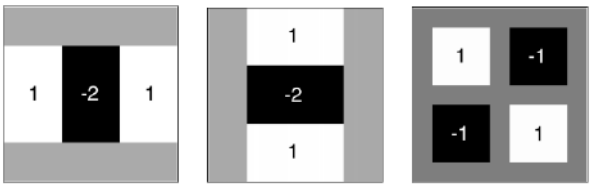

Figure 3: Box filters used by SURF to approximate second order Gaussian derivatives.

$$D_{\text{SURF}}(x, y, \sigma) = \det \begin{bmatrix} H_{11}(x, y) & H_{12}(x, y) \\ H_{21}(x, y) & H_{22}(x, y) \end{bmatrix}$$

where

$$H_{11} = \tilde{G}^{\sigma}_{xx} \star I, \quad H_{22} = \tilde{G}^{\sigma}_{yy} \star I,$$
$$H_{12} = H_{21} = \tilde{G}^{\sigma}_{xy} \star I$$

Rather than the Laplacian administrator, SURF utilizes the determinant of the Hessian for feature identification in scale space. Figure 3 demonstrates the crate channels Gσxx, Gσyy and Gσxy approximating the second request subordinates of the Gaussian G σ. Scales are again discredited and rely upon the measure of the utilized box channels. By definition a portion size of s x s pixels relates to σ= 1.2. Applying these case channels to an image I yield the sections of the Hessian framework. It is imperative to note here that, instead of the DoG channels, the SURF recognition administrator is nonlinear in the information image.

Visual Distance

This can be understood as Let X is a query image matrix and Y is the dataset image matrix. Then distance between them is calculated by:

$$D = \sqrt{sum((X - Y)^2)}$$

Base on the minimum distance value between query and dataset image rank is assigned to the image. This is considering as final rank of the work.

Final Rank

Here proposed work has reduced the execution time as filtered image from the dataset are compared for content feature comparison. Here image having minimum distance is considered as the most matching image. In similar fashion other set of images are ranked.

IV. EXPERIMENT AND RESULT

In this portion of the paper various comparing parameters are explained with their formula. Later values obtained from the experiment are tabulated in form of comparison between proposed and UBLH method. Finally discussion of different tables and graph are done for the complete understanding of results.

Evaluation Parameter: To test outcomes of the work following are the evaluation parameter such as Precision, Recall and F-score.

Precision = TP / (TP+ FP)
Recall = TP / (TP + TN)
F-measure = 2 * Precision * Recall / (Precision + Recall)

Where TP: True Positive
TN: True Negative
FP: False Positive

Execution Time

This parameter evaluates execution time of the algorithm that is time taken by the method for fetching the images from the dataset as per user query request. It is expected time required for image retrieval should be less.

Results

Table 1. Precision comparison of proposed and previous work.

Images	Precision Value Comparison	
	Proposed Algorithm	Previous work [6]
Insect	0.777778	0.44
Scenery	0.75	0.583333
Object	0.714286	0.428571

As above table 2 proved that proposed work has increase the relevancy precision score as compare to the previous method. This is due to the inclusion of the textual or annotation property in the retrieval system. Here precision was increased by removing the irrelevant images on the basis of user query and annotations, so most of the relevant images remained in the pool for visual features extraction.

Table 2. Recall comparison of proposed and previous work.

Images	Recall Value Comparison	
	Proposed Work	Previous work [6]
Insect	0.7	0.16
Scenery	0.9	0.28
Object	0.5	0.12

As above table 3 proved that proposed work has increase the relevancy recall score as compare to the previous method. This is due to the inclusion of the textual or annotation property in the retrieval system. Here recall was increased by removing the irrelevant images on the basis of user query and annotations. So confusion among

images get reduce a lot as less number of visual features are need to be extract from the remaining images.

Table 3. Execution time comparison of proposed and previous work.

Images	Execution time in second	
	Proposed Work	Previous work [6]
Insect	5.1036	5.6392
Scenery	5.13652	6.18396
Object	6.3283	8.24561

As above table 4 shown that proposed work execution time is less as compare to the previous methodology used in [6]. Here time was reducing by removing the irrelevant images on the basis of user query and annotations. So less number of visual features is needed to be extracting from the proposed work.

Table 4. F-measure time comparison of proposed and previous work.

Images	F-measure Value Comparison	
	Proposed Work	Previous work [6]
Insect	0.736	0.235
Scenery	0.818182	0.378
Object	0.588235	0.187

As above table 5 proved that proposed work has increase the relevancy f-measure score as compare to the previous method. This is due to the inclusion of the textual or annotation property in the retrieval system. Here f-measure was increased by removing the irrelevant images on the basis of user query and annotations. So confusion among images get reduce a lot as less number of visual features are need to be extract from the remaining images.

V. CONCLUSIONS

In the exploration of Image recovery, there is a great deal of accomplishments in picture semantic feature; they can be connected to content-based picture recovery to examine the move between visual elements and semantic elements of the pictures. This paper uses the new blend of textual and also visual components for positioning the picture as both make the re-positioning procedure all the more capable, which is appeared in results. Here it is demonstrated that utilization of single element reduces the accuracy of the work, so multiple feature can increase the accuracy as done in this work. In future one can adopt other feature combination with encryption for data security as well.

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