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An Improved Approach for Bridging the Semantic Gap by using User's Relevance Feedback in CBIR

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ABSTRACT :

Image processing is the huge design model which works with images. In today's era every area like scientific, educational, medical, industrial, and many more are producing large amount of image as a result of advances in the Internet and new digital image sensor technologies. For image retrieval mainly we are using two approaches. First One is text based approach and second one is content based approach. Text-based retrieval faces difficulties. The efficient management of the speedily expanding visual information became a burning problem. This need formed the emergence of content-based image retrieval(CBIR) techniques. Content-based image retrieval uses the visual contents such as shape of an image, texture and color of an image, and spatial layout to represent and index the image. Although they cannot be utilized to describe user's perception of an image. Semantic Feature is a high level concept, which uses user's perception. The direct relationship among lower-level features and higher-level concept is called the semantic gap. To Reduce "Semantic Gap" problem different techniques are used.

KEY WORDS:

Content based image retrieval; high level semantics; Semantic gap.

INTRODUCTION:

The Proposed algorithm retrieves the most relevant images for given input image. The Proposed algorithm modifies the relevance feedback algorithm based on FSRM (Fuzzy Semantic Relevance Matrix). The Proposed algorithm improves the performance of image retrieval system not only extracting the low level features but also uses the high level semantics of images.

DETAILED DESCRIPPTION OF METHOD:

First extract the low level features of all the images from dataset and create matrix of low level features. Then select the sample image from image database (training/learning), the weights in the FSRM are adjusted according to user's feedback, and the feedback results include relevance, normal and irrelevance. After the limited feedback adjust the weight of FSRM. On the basis of the previous steps, we can retrieve similar images with input image which are in image database, at the same time repeat the previous step operation according to user's feedback. This gives us more relevant images with input image.

ALGORITHM:

Input: Image Dataset, Matrix of low level features

Output: Relevant images

Step1: Initialization of FSRM

Step2: The image retrieval based on the traditional retrieval methods, return most similar images.

Step3: The user mark the result images, the result set is relevance image set, normal image set and irrelevant image set.

Step4: Adjust the weight of the FSRM.

Step5: Go to step 2 to start the next cycle according to the user's sample image, after the limited feedback, go to step 4 to adjusting the weight of each image class.

Step6: Return the alike images according to weight values (the larger the weight the more similar).

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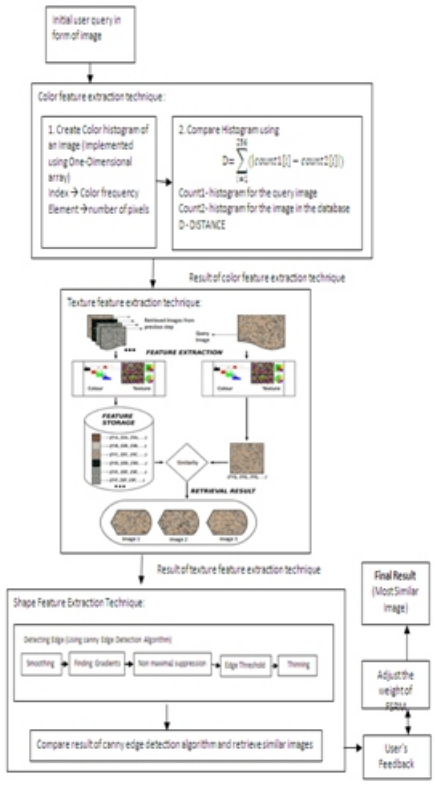


In order to study the performance, the algorithm has been tested on an Intel based machine with a 2.0 GHz processor and 3.00 GB of main memory. The algorithm is also tested to check the Precision. The performance of the algorithm is affected by several factors such as the query image selected for proposed system, user's perception of an image. In this chapter we will take a closer look at the performance of the system for different query image.

Experimental Results:

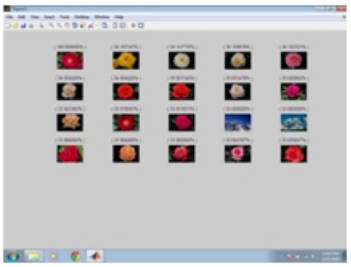
Experiments have been conducted with 400 images of type JPG of 384*256 or 256*384.In first part the system extract color, texture and shape features of images and in second part weight of the FSRM was changed according to user's relevance feedback. When process was finished, most relevant images were returned.

Results

(1) Query Image1:

Color Based Retrieval:

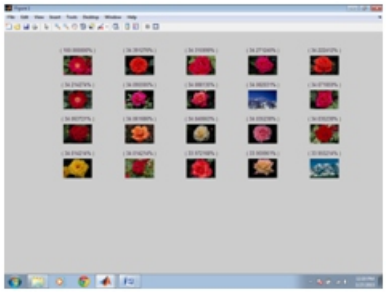
After using Color Histogram technique for color feature extraction system retrieved total 355 images out of these 46 images are relevant to query image.



Color based Image Retrieval Result

Texture Based Retrieval:

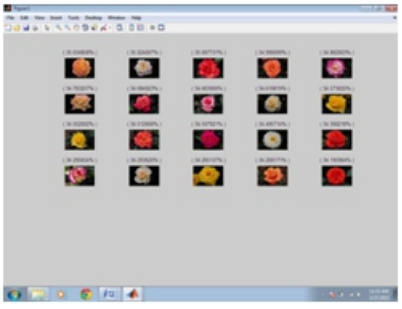
After using Pixel based approach for texture feature extraction system retrieved total 355 images out of these 48 images are relevant to query image.



Texture based Image Retrieval Result

Shape Based Retrieval:

After using Canny Edge Detector algorithm for shape feature extraction system retrieved total 298 images out of these 50 images are relevant to query image.



Shape based Image Retrieval Result

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FSRM using User's Feedback:

After retrieving images using color, texture and shape features FSRM weight modified according to user's feedback. If user mark relevant then weight modified according to formula (1), If user mark partially relevant then weight modified according to formula (2), If user mark not relevant then weight modified according to formula (3).

W new= Wold+0.6(1-Wold) ..... (1)
W new= Wold+0.1(1-Wold) ..... (2)
W new= Wold-0.6(1-Wold) ..... (3)

Where, W new=weight after user's feedback. [6]
Wold=weight before user's feedback.

After calculating W new system retrieved images which have weight>=0.7.These images are Most Relevant images of user's query image which satisfied the user's perception of an image.After extracted color, texture and shape features we got 344 images out of these based on formula (1),(2) and (3) system retrieved 52 images with weight value more than 0.3.From these 52 images system retrieved 32 images with weight value greater then 0.7.So as a result system retrieved 32 most relevant images.

Result of Proposed Approach for Query1

Approach	Retrieved images	Relevant images	Total no. of relevant images in database	Precision	Recall
Color based	210	20	30	09.52%	66.67%
Texture based	210	20	30	09.52%	66.67%
Shape based	228	20	32	08.77%	57.14%
FSRM using User's Feedback	25	10	30	40.00%	33.1%

Precision and Recall value for query1 using different approaches of Image Retrieval.

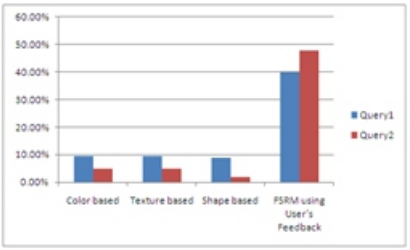
Query Image2:

FSRM using User's Feedback:

Result of Proposed Approach for Query2

Approach	Retrieved images	Relevant images	Total no. of relevant images in database	Precision	Recall
Color based	356	17	30	4.77%	56.66%
Texture based	356	17	30	4.77%	56.66%
Shape based	282	5	30	1.77%	16.66%
FSRM using User's Feedback	23	11	30	47.82%	36.66%

Precision and Recall value for query2 using different approaches of Image Retrieval.



Precision values for different approaches of image retrieval

Conclusion:

Proposed method for improving image retrieval using relevance feedback and FSRM is likely to be an efficient method for improving the performance of image retrieval. The hope from projected algorithm is to retrieve the most relevant images and improve the precision and recall values. The proposed system is expected to give effective result in less feedback times.

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Future Work:

There still exist some changes and improvements that can be achieved in the future of proposed system. In the first part of the model, we will present how a Relevance Feedback could be gives relevant images using FSRM. In the second part of the model, we will implement how high level features of images could be gives most relevant images while at the same time improving the retrieval accuracy.

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