Color Based Image Retrieval by Combining Various Features

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Abstract: ***Content based image retrieval system retrieve the images according to the strong feature related to desire as color, texture and shape of an image. Although visual features cannot be completely determined by semantic features, but still semantic features can be integrate easily into mathematical formulas. This paper is focused on retrieval of images within a large image collection, based on color projection by applying segmentation and quantification on different color models and compared for good result. This method is applied on different categories of image set and evaluated its retrieval rate in different models.***

Keywords: segmentation, image retrieval, color feature

I. INTRODUCTION

In today's scenario, due to utilization of internet and web technologies there is wide spread range of collection of databases with enormous categories of images. Different type of information are going to be gathered from online in terms of categorized books, learning content, newspaper, advertisement etc. which are digitized and also available as per user requirement. With respect to access these in terms of images from databases, different methods have been implemented to retrieve image as per usefulness. The content based image retrieval system is the application of computer vision with reference to the viewpoint of image problem. This paper is based on the automatic retrieval of most similar images to the given Query image on the basis of local feature extraction like colors, shapes, texture etc. In image retrieval system for searching, browsing, and retrieving images from a large database of images. Most usual and general method of image retrieval, make use of some method of adding up metadata such as descriptions, keywords , tokens, captioning, to the images so that retrieval can be performed well. Few systems are functioning with lower level features; manually image annotation is time-consuming, difficult and costly. To address this, many researchers proposed an automatic user friendly image retrieval system using different methods. Searching any query image which is Content-based (which might be referred to colors, shapes, textures, or any other information) analyzed for actual image to be present in database. In this paper, we try to provide best solution in large number of data.

II. COLOR IMAGE

Any colored image is a blend of few basic colors. In this each individual pixel of a color image down into Red, Green and Blue values. For different color band R, G & B different matrix is generated. The three matrices are arranged in sequential order, next to each other creating a 3 dimensional m by n of 3 matrixes. A RGB image converted to an indexed image which reduces the number of colors in the process.

III. COLOR IMAGE FEATURE EXTRACTION

There are different features related to the colored images:-

3.1 Color histogram:

An image histogram refers to the probability mass function of the image intensities. This is extensive for color images to confine the joint probability of the intensities of the three different color channels. More formally, the color histogram is defined as:

$$H_{c1,c2,c3}(x, y, z)$$

$$= P.Prob(c1 = x, c2 = y, c3 = z)$$

Where c1, c2 and c3 are the three channels of color model image (RGB, HSV, L*a*b and YCbCr) and the P is the no of pixels in given image

3.1.1 Color Histogram Euclidean distance:

There are three distance formulas that can be used for image retrieval: histogram Euclidean Distance, histogram intersection and histogram quadratic (cross) distance. In this paper, histogram Euclidean Distance has been chosen to work. By considering the H' and H" as two color histogram of Query image and searched image respectively. The Euclidean Distance between the H' and H" can be computed as:

$$D(H', H'') = \sqrt{\sum_{x1} \sum_{x2} \sum_{x3} (H'(x,y,z) - H''(x,y,z))}$$

Where E is the Euclidean distance to be calculated between two color histogram H' and H''. In the above formula maximum of histogram value of individual channel of an image has been taken.

3.2 Color Moments

The second feature has been taken as color moments. The Mean and standard deviation of each channel have been calculated as:

$$\text{Mean}(M) = \frac{1}{n}\sum_{j=1}^{n} Ii,j$$

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$$\text{Standard Deviation}(\delta) = \sqrt{\sum_{k=0}^{n} (Ii,j - Er,i)^k}$$

3.2.1Color Moments Euclidean distance:

The Euclidean distance of mean and standard deviation respectively can be computed as:

$$D_M = \sqrt{(M' - M'')^2}$$

$$D_{std} = \sqrt{(\delta' - \delta'')^2}$$

3.3 Colormap:

The Coplormap which gives three column matrix of RGB triplets. Each one of the row of matrix define single RGB triplet that specifies one color of the colormap. The values are in the range. There will be any length of the colormaps, but there should be widely three columns. Each one of the row in the matrix shows one color by use of an RGB triplet. There are number of elements which specify the intensities of the red, green, and blue components of the color of RGB triplets which is three-element row vector. The intensities must be in between the range. A 0 value shows no color and 1 value shows full intensity

3.3.1 Colormap Euclidean distance: The colormap Euclidian distance can be compute as :

$$D_{map} = \sqrt{\sum_{n=1}^{z} (c'_n - c''_n)^2}$$

Where D_{map} Euclidian distance for Colormap, c_n is the number of channels i.e, where n=1,2,3 for three channels respectively.

IV. CBIR SYSTEM ON THE BASIS OF COLOR FEATURES

Proposed algorithm uses combinations of color feature to overcome the problem description. The Framework of CBIR system is displayed in figure 5. Query image having similar characteristic from database has to retrieve. Proposed system is implemented and concentrated on visual contents of an image specially color applying on the roses dataset. Proposed system retrieve image from image databases with common, feature values as color histogram. In this paper, the proposed work will try to provide a platform to extract images from the database using query method. Input image before and after segmentation is shown in figure 3.

Figure3: input image (a) before segmentation (b) after segmentation

Segmented image is shown in figure 4 using different color model.

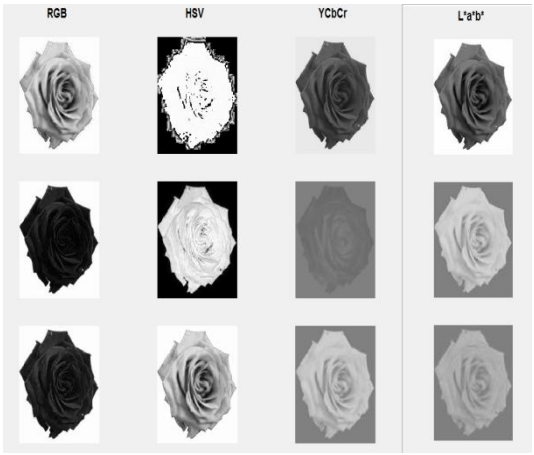

Figure4: different Color Models for input image Database of the image set are display in figure 6.

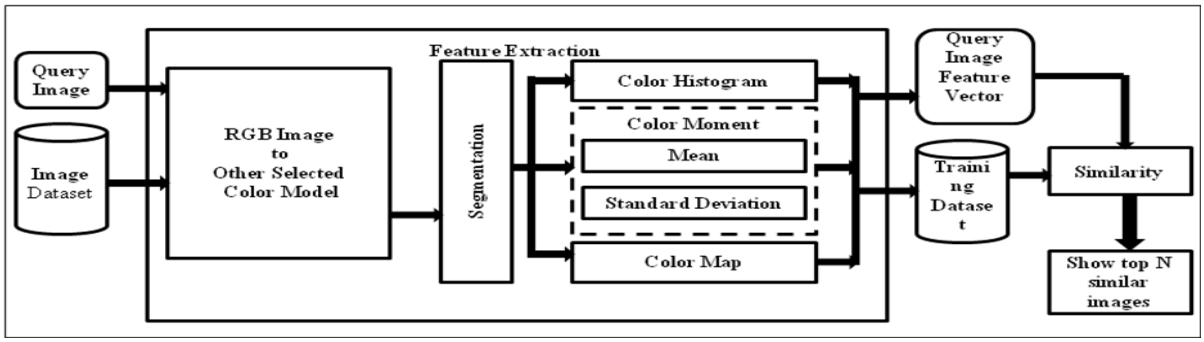

Figure 5: Framework of CBIR System

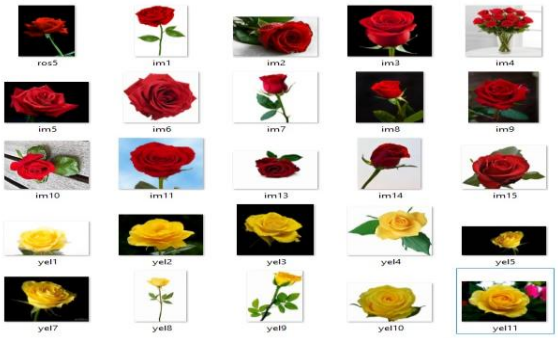

Figure 6: Set of Images in database

Following algorithm are used to retrieve the images:

1. Input a query image.
2. Convert RGB image to specified color model space.
3. Do Color Segmentation.
   [Collect four features]
4. Create histogram of segmented image.
5. Take maximum of histogram value of each channel of color image separately for first feature
6. Next to take color moment: mean and standard deviation as second and third feature respectively.
7. Take color map value of each channel of segmented color image separately as fourth feature
8. Repeat from step 2 to step 7. For each image from dataset of images and store feature vector of each image.
9. Calculate feature vector of query image. Used Euclidean distance to find the score of each feature present in dataset related to query image.
10. Sort the score to retrieve top N similar images.

V. EXPERIMENTAL ANALYSIS

In this research paper different color model as RGB, YCbCr and HSV have been taken for feature collections which are as mention below:

Feature1 for RGB model: maximum value of R, G, and B in RGB Histogram

Feature2: Mean of image intensity

Feature3: Standard Deviation of RGB image

Feature4: Color Map value of RGB

Same has been carried out for the next YCbCr, HSV and L*a*b models respectively, Table1 shows the feature of query image in different models.

To retrieve the image according to the query image, score is calculated as given formula:

$$Distance\ Vector = \sum_{1}^{n} (Fn - Fq_n)^2$$

Where n denotes the number of F features of dataset image I, q_n denotes the number of features for an query image.

After taking four features as mentioned above the Euclidian distance (D) has been calculated, Feature1 is taken as F1 for D(H',H"), Feature2 as F2 for D_M, Feature3 as F3 for D_{std}, Feature4 as F4 for D_{map} In this research paper, Number of features ($F_{1..n}$ for four features of dataset images and $Fq_{1..n}$ for four features of query image) are taken, the distance vector for these four image can be calculated as:

$$Distance\ Vector(D) = \sqrt{(F1 - Fq_1)^2 + (F2 - Fq_2)^2 + (F3 - Fq_3)^2 + (F4 - Fq_4)^2}$$

Here D is considering as a score card for each images in the dataset.

Where

F1=R^{max}, G^{max}, B^{max} of Histogram of Image

F2= Color Map value of RGB color

F3= mean of image

F4=Standard Deviation of image

Same has been taken for Query image as Fq_1 , Fq_2 ,Fq_3 , Fq_4 respectively.

The maximum value of color histogram of each channel in different color model for each image in database is shown in Table 2. The score of the dataset images are arranged in ascending order by using the RGB color model in Table 3 with respect to query image. Table 4 display the score of the image in YCbCr model with respect to query image. Table 5 display the score of the image in L*a*b model with respect to query image. Table 6 display the score of the image in HSV model with respect to query image. From the given tables we analyzed that YCbCr and RGB not retrieve a related image from top 1 to 14 images. L*a*b retrieve top 14 image of same color and HSV retrieve top 14 of same color.

Table 1: features extracted for Query Image

Sn.	Query Image	Color Models	F1			F2			F3	F4
			max value of Histogram			Color Map			Mean	Standard Deviation
			Channel1	Channel2	Channel3	Channel1	Channel2	Channel3		
1.	Red2	L*a*b	44005	48590	48800	0.1529	0.0117	0.0117	0.0614	0.1609
2.	Red 2	RGB	40620	46276	47635	0.1568	0.0039	0.0039	14.5222	40.0809
3.	Red 2	HSV	46211	50367	50427	0.1568	0.0078	0.0078	15.0010	42.9606
4.	Red 2	YCbCr	39666	45014	45549	0.1921	0.0156	0.0156	19.4967	46.7806

Table 2: Maximum value of color histogram of each channel separately

Sn.	Image	Color Models Histogram Values											
		L*a*b			HSV			YCbCr			rgb		
		max(L)	max(a)	max(b)	max(H)	max(S)	max(V)	max(Y)	max(Cb)	max(Cr)	max(R)	max(G)	max(B)
1	Red1	57423	60483	60839	51721	57722	57702	51550	57215	57591	51721	57722	57702

2	Red 10	57217	58462	57576	53124	54637	53421	55057	56500	55456	53124	54637	53421
3	Red 11	43901	51170	45199	41417	50370	42600	40447	49478	41929	41417	50370	42600
4	Red 12	57032	60270	59046	54544	57739	56541	54594	58530	57041	54544	57739	56541
5	Red 13	54305	57435	54933	54815	57456	55227	53351	56794	54192	54815	57456	55227
6	Red 14	52279	55319	53130	53528	56176	54326	51313	54547	52343	53528	56176	54326
7	Red 15	42105	42907	42702	44221	44928	44655	40400	41226	41055	44221	44928	44655
8	Red 2	44005	48590	48800	46211	50367	50427	39666	45014	45549	46211	50367	50427
9	Red 3	47467	52808	47499	42741	49851	42766	43996	50656	44044	42741	49851	42766
10	Red 4	55896	56663	56204	54460	55644	54692	54154	55157	54510	54460	55644	54692
11	Red 5	40515	50975	42149	41452	51349	42755	39925	50764	41780	41452	51349	42755
12	Red 7	59620	60828	59754	59125	60314	59229	59092	60344	59262	59125	60314	59229
13	Red8	61481	62681	62045	58074	60470	59423	59227	61105	60298	58074	60470	59423
14	Red 9	47347	53170	50212	44398	50864	47734	44258	51153	47990	44398	50864	47734
15	Yel1	65536	65536	65536	65536	65536	65536	49891	49891	53604	65536	65536	65536
16	Yel10	65342	65344	65500	65534	65536	65536	40085	40087	46795	65534	65536	65536
17	Yel11	61988	62917	62087	60884	61806	60885	37277	38259	38773	60884	61806	60885
18	Yel2	65503	65503	65513	65536	65536	65536	38848	38848	43132	65536	65536	65536
19	Yel3	65536	65536	65536	65536	65536	65536	46244	46244	49625	65536	65536	65536
20	Yel4	65527	65527	65535	62592	62592	62592	49018	49018	49439	62592	62592	62592
21	Yel5	65390	65390	65432	65536	65536	65536	56854	56854	58322	65536	65536	65536
22	Yel7	65194	65194	65200	65536	65536	65536	49653	49653	50735	65536	65536	65536
23	Yel8	65536	65536	65536	65536	65536	65536	62237	62237	62266	65536	65536	65536
24	Yel9	65536	65536	65536	65284	65278	65303	60204	60204	61245	65284	65278	65303

Table3: Score in RGB color model

Sn.	images	RGB Feature Extracted F1	F2	F3	F4	Score
1	Red2	0	0.00	0.00	0.00	0
2	Red 11	6362	0.07	6.26	12.02	6380
3	Red 3	6474	0.03	3.56	9.65	6487
4	Yel5	7136	0.15	13.42	38.52	7188
5	Red 5	8683	0.02	1.26	2.90	8687
6	Red 9	10929	0.02	3.02	3.14	10936
7	Yel3	13377	0.16	13.62	38.40	13429
8	Red 15	13543	0.07	5.56	10.60	13559
9	Yel2	15596	0.16	13.56	37.36	15647
10	Red 14	16202	0.08	6.87	14.14	16223
11	Red 12	16503	0.07	6.17	5.84	16515
12	Red 10	18022	0.04	2.87	3.82	18029
13	Red 1	18278	0.02	2.23	4.43	18285
14	Yel11	18601	0.12	9.68	13.77	18624
15	Red 13	18661	0.09	7.95	15.79	18685
16	Yel7	19633	0.15	13.27	38.26	19684
17	Red4	21893	0.07	5.93	3.81	21903
18	Red7	27834	0.11	9.89	14.99	27859
19	Yel9	35664	0.16	14.48	39.40	35718
20	Yel10	36114	0.16	14.51	39.34	36168
21	Yel4	36223	0.16	14.52	40.05	36278
22	Yel1	36224	0.16	14.52	40.08	36279
23	Yel8	36224	0.16	14.52	40.08	36279
24	Red8	38600	0.07	1.15	8.62	38610

Table4 : Score in YCbCr color model

Sn.	images	YCbCr Feature Extracted F1	F2	F3	F4	Score
1	Red2	0	0.00	0.00	0.00	0
2	Yel10	5099	0.22	24.29	26.66	5151
3	Red11	5800	0.04	2.14	6.02	5808
4	Red15	5923	0.03	4.14	2.58	5930
5	Yel2	6673	0.30	35.20	42.45	6751
6	Red5	6880	0.05	5.37	8.16	6894
7	Red3	7270	0.02	2.52	7.40	7279
8	Yel3	7836	0.17	16.88	26.87	7880
9	Red9	8046	0.03	3.19	2.59	8051
10	Yel11	9862	0.25	31.66	35.27	9929
11	Yel4	10891	0.17	19.83	31.56	10943
12	Yel7	12172	0.13	10.21	20.10	12202
13	Yel1	13900	0.18	19.85	37.53	13958
14	Red14	16513	0.11	10.17	17.38	16541
15	Red4	19826	0.07	6.68	3.72	19837
16	Red13	20019	0.12	11.39	19.31	20050
17	Red1	20859	0.06	7.09	2.66	20869
18	Red10	21609	0.08	6.92	2.02	21618
19	Red12	23186	0.12	12.21	15.54	23214
20	Yel5	24470	0.11	3.40	4.06	24477
21	Red7	28292	0.14	13.05	16.96	28322
22	Red8	29310	0.14	13.86	17.00	29341
23	Yel9	29982	0.12	7.85	1.07	29991
24	Yel8	32948	0.15	10.78	5.09	32964

Table5: Score in L*a*b color model

Sn.	images	L*a*b Features Extracted F1	F2	F3	F4	Score
1	Red2	0	0.00	0.00	0.00	0
2	Red11	4431	0.04	0.01	0.03	4431
3	Red3	5610	0.02	0.01	0.03	5610
4	Red9	5843	0.02	0.01	0.01	5843
5	Red5	7881	0.09	0.04	0.05	7881
6	Red15	8549	0.05	0.03	0.03	8549
7	Red14	11510	0.07	0.03	0.05	11510
8	Red13	14898	0.08	0.03	0.06	14898
9	Red4	16168	0.06	0.02	0.01	16168
10	Red10	18682	0.06	0.02	0.01	18682
11	Red12	20276	0.10	0.04	0.07	20276
12	Red1	21597	0.09	0.04	0.05	21597
13	Red7	22662	0.10	0.04	0.05	22663
14	Red8	26065	0.12	0.05	0.08	26065
15	Yel11	26556	0.12	0.05	0.07	26556
16	Yel7	31522	0.15	0.06	0.13	31522
17	Yel10	31857	0.15	0.06	0.14	31857
18	Yel5	31878	0.15	0.06	0.14	31878
19	Yel2	32055	0.15	0.06	0.15	32056
20	Yel4	32095	0.15	0.06	0.16	32096
21	Yel1	32107	0.15	0.06	0.16	32107
22	Yel3	32107	0.15	0.06	0.16	32107
23	Yel8	32107	0.15	0.06	0.16	32107
24	Yel9	32107	0.15	0.06	0.16	32107

Table6: Score in HSV color model

Sn.	images	HSV Feature Extracted F1	F2	F3	F4	Score
1	Red2	0	0.00	0.00	0.00	0
2	Red9	3284	0.01	1.92	1.42	3288
3	Red15	8177	0.04	5.66	4.61	8187
4	Red3	8426	0.08	9.23	14.94	8450
5	Red10	8659	0.01	0.35	7.84	8668
6	Red5	9081	0.08	9.15	11.59	9102
7	Red11	9178	0.07	5.96	9.48	9194
8	Red14	10123	0.08	7.22	16.20	10147
9	Red4	10681	0.04	2.46	0.95	10684
10	Red1	11721	0.02	2.63	1.90	11726
11	Red13	12138	0.09	7.53	16.48	12162
12	Red12	12695	0.06	6.03	5.99	12707
13	Red8	17992	0.08	7.81	7.10	18007
14	Red7	18525	0.10	8.86	14.10	18548
15	Yel11	21343	0.11	8.56	11.04	21363
16	Yel4	23786	0.15	12.19	27.96	23826
17	Yel9	28415	0.16	14.85	39.82	28470
18	Yel10	28840	0.16	15.00	42.71	28898
19	Yel1	28842	0.16	15.00	42.96	28900
20	Yel2	28842	0.16	15.00	42.96	28900
21	Yel3	28842	0.16	15.00	42.96	28900
22	Yel5	28842	0.16	15.00	42.96	28900
23	Yel7	28842	0.16	15.00	42.96	28900
24	Yel8	28842	0.16	15.00	42.96	28900

Table 7 and Table 8 use to compare the retrieval rate of HSV and L*a*b for best result. Three categories of databases of specific color images have been taken like apple dataset, bus dataset, flower dataset to compare with the proposed method as well as famous precision and recall measures have been calculated for given pre-categorized databases. Both precision and recall are strong evaluation measure. Most of each experiment, image retrieval performed for given every query image. In this regard all the red images in different dataset are renamed as 'r', green as 'g' and yellow as 'y' in table 7 and table 8. In table7 using HSV model, it retrieved all top similar red images from apple dataset, and same retrieve all top in bus dataset with reference to query image and retrieved all top red images from flower dataset. L*a*b color model it also gives the same result for apple dataset and bus dataset and lower dataset.

Table7: HSV color image score for three different categorized dataset

HSV color image score for three different dataset					
apple	**score**	**bus**	**score**	**flower**	**score**
red1	0	r2	0	r2	0
r13	1293	r12	1267	r9	3288
r15	2564	r5	1992	r15	8187
r12	4132	r7	3483	r3	8450
r9	4233	r17	3773	r10	8668
r8	5707	r3	5053	r5	9102
r7	6416	r6	5582	r11	9194
r14	9033	r4	5755	r14	10147
r11	9054	r14	6124	r4	10684
r6	15667	r8	8052	r1	11726
r2	16902	r15	8083	r13	12162
r3	16902	r16	8087	r12	12707
r4	17839	r10	13043	r8	18007
r10	18558	r11	14442	r7	18548
r5	19621	r9	14816	y11	21363
g16	24171	r1	21162	y4	23826
g17	28078	y4	24172	y9	28470
g18	28078	y3	24889	y10	28898
g19	28078	y6	25090	y1	28900
g20	28078	y7	25190	y2	28900
g21	28078	y9	25199	y3	28900
g22	28078	y2	25220	y5	28900
y23	28078	y5	25221	y7	28900
y24	28078	y1	25223	y8	28900
y25	28078	y8	25223	r6	31884

Table 8: **L*a*b** color image score for three different categorized dataset

L*a*b color image score for different category of dataset					
apple	**score**	**bus**	**score**	**flower**	**score**
r1	0	r2	0	r2	0
r2	2844	r5	707	r11	4431
r6	3977	r14	1046	r3	5610
r5	4622	r8	1061	r9	5843
r11	7070	r15	3130	r5	7881
r8	1163	r12	5946	r15	8549
r13	1331	r10	6936	r14	11510
r15	1359	.r4.	7831	r13	14898
r12	1699	r7	9647	r4	16168
r9	1882	r3	10375	r10	18682
r2	2138	r17	10828	r12	20276
r3	2131	r1	12287	r1	21597
r7	2266	r6	13385	r7	22663
r4	2389	r16	15754	r8	26065
r14	4418	r11	19363	y11	26556
y24	4903	r9	21251	r6	30840
g16	4917	y6	34238	y7	31522
g17	4919	y3	34290	y10	31857
g18	4919	y9	34458	y5	31878
g19	4919	y4	34597	y2	32056
g20	4919	y2	34721	y4	32096
g21	4919	y1	34785	y1	32107
g22	4919	y7	34817	y3	32107
y23	4919	y5	34822	y8	32107
y25	4919	y8	34822	y9	32107

5.1 The image retrieval Efficiency:

The precision of the system significantly shows the total number of similar images present in retrieved images and the total number of retrieved images from the database. In the same way recall is the ratio of the number of similar images present in the retrieved images and the total number of relevant images in the database. In this paper, for given Query image Q, if total N numbers of images have been retrieved so for this, The retrieval efficiency named as precision, recall and accuracy can be calculated given below:

$$\text{Precision} = \frac{\text{Number of relevant images retrieved}}{\textit{Total number of images in database}}$$

$$\text{Recall} = \frac{\text{Number of relevant images retrieved}}{\textit{Total no of relevant images in database}}$$

Table9 : image retrieval results with respect to precision and recall

Proposed Techniques using given HSV in different image categories	**Apple database**	**Bus database**	**Flowers database**
Query Image(n1)	R1	R2	R2
Number of images in database(n2)	24	24	24
Recall	1.00	1.00	0.93
Precision	0.60	0.64	0.56

As it can be seen from the above Table 9 the proposed technique is implemented in different category of dataset. First dataset is for collection of images of apple dataset of Red, Green and Yellow colored images, second dataset is the collection of buses of red and yellow color and the third dataset is the collection of roses of red and yellow colors.

5.2 Comparative Study by using different color models in proposed work:

Table10: Comparative Study by using different color models in proposed work

Proposed Techniques using given color model	RGB	YCbCr	L*a*b	HSV
Input Images	Red2	Red2	Red2	Red2
Precision	0.28	0.25	0.40	0.40

Recall	0.47	0.40	0.67	0.67

On the basis of above comparative study of different color models by implementation of the proposed steps of CBIR system, it's clear from the above Table10 that both L*a*b and HSV give the better result as the accuracy of both L*a*b and HSV are same. Both are giving the best top 14 images related to query image out of 15 relevant images. So in this paper it can be say that on the basis of color feature both HSV and L*a*b doing well their job rather than RGB and YCbCr. Since HSV and L*a*b both shows same accuracy on the basis of color features, hence in this research paper , there are mix of all three dataset(shown in figure 7) category and making the one dataset for more accurate result which is shown through the table11.

Figure 7: mixed dataset of dataset for apple, bus and flower

Table11: Comparative analysis of proposed work using HSV and L*a*b color models

	HSV		L*a*b	
sn.	**image**	**score**	**image**	**score**
1	RedRose2	0	RedRose2	0
2	RedRose9	3288	RedBus15	3753
3	RedApple13	3329	RedApple12	3828
4	RedApple1	3478	RedApple9	4116
5	RedBus5	3728	RedBus8	4199
6	RedApple15	3890	RedRose11	4431
7	RedBus12	4068	RedBus2	4749
8	RedBus14	4222	RedBus12	4801
9	RedBus2	4854	RedBus5	5255
10	RedBus15	5726	RedApple2	5302
11	RedApple12	5849	RedApple3	5302
12	RedApple9	5936	RedApple15	5305
13	RedApple8	6093	RedBus14	5404
14	RedApple7	7472	RedApple13	5429
15	RedBus7	7635	RedBus10	5508
16	RedBus17	7799	RedBus4	5560
17	RedRose15	8187	RedRose3	5610
18	RedRose3	8450	RedRose9	5843
19	RedRose10	8668	RedApple7	6160
20	RedApple11	9065	RedApple8	6819
21	RedApple14	9085	RedApple4	7566
22	RedRose5	9102	RedBus7	7610
23	RedBus3	9165	RedRose5	7881
24	RedRose11	9194	RedBus3	8326
25	RedBus4	9481	RedRose15	8549
26	RedBus6	9695	RedBus17	8560
27	RedRose14	10147	RedBus1	10058
28	RedRose4	10684	RedApple11	10892
29	RedRose1	11726	RedBus6	11111
30	RedBus8	12008	RedRose14	11510
31	RedBus16	12054	RedBus16	13368
32	RedRose13	12162	RedRose13	14898
33	RedRose12	12707	RedApple10	14973
34	RedApple6	15377	RedRose4	16168
35	RedBus10	16865	RedBus11	16835
36	RedApple2	17774	RedApple1	17737
37	RedApple3	17774	RedRose10	18682
38	RedRose8	18007	RedBus9	18688
39	RedBus11	18227	RedRose12	20276
40	RedBus9	18546	RedApple6	21566
41	RedRose7	18548	RedRose1	21597
42	RedApple4	18754	RedApple5	22271
43	RedApple5	19308	RedRose7	22663
44	RedApple10	19478	RedRose8	26065
45	YellowRose11	21363	YellowRose11	26556
46	YellowRose4	23826	RedApple14	27142
47	RedBus1	24862	YellowRose7	31522
48	GreenApple16	25016	YellowBus6	31523
49	YellowBus4	27856	YellowBus3	31579
50	YellowRose9	28470	YellowBus9	31743
51	YellowBus3	28568	YellowRose10	31857
52	YellowBus6	28767	YellowRose5	31878
53	YellowBus7	28866	YellowBus4	31884
54	YellowBus9	28875	YellowApple24	31941
55	YellowBus2	28896	YellowBus2	32006
56	YellowBus5	28898	YellowRose2	32056
57	YellowRose10	28898	YellowBus1	32070
58	GreenApple17	28900	GreenApple16	32090
59	GreenApple18	28900	YellowRose4	32096
60	GreenApple19	28900	YellowBus7	32102
61	GreenApple20	28900	GreenApple17	32107
62	GreenApple21	28900	GreenApple18	32107
63	GreenApple22	28900	GreenApple19	32107
64	YellowApple23	28900	GreenApple20	32107
65	YellowApple24	28900	GreenApple21	32107
66	YellowApple25	28900	GreenApple22	32107
67	YellowBus1	28900	YellowApple23	32107
68	YellowBus8	28900	YellowApple25	32107
69	YellowRose1	28900	YellowBus5	32107
70	YellowRose2	28900	YellowBus8	32107
71	YellowRose3	28900	YellowRose1	32107
72	YellowRose5	28900	YellowRose3	32107
73	YellowRose7	28900	YellowRose8	32107
74	YellowRose8	28900	YellowRose9	32107

VI. CONCLUSION

Most Content-Based Image Retrieval (CBIR) systems focus on different stock of photo collections and try to address challenges of large specialized image collections and topics such as efficient image retrieval by image content. The research work concentrated on large set of images with different categories.

This paper analyzed that the retrieval rate of HSV model and L*a*b model for color based image retrieval are approximately same using the proposed approach. While of RGB and YCbCr color model.

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