CONTENT BASED IMAGE RETRIEVAL – CSE 3018
LAB 2- Color Space Based CBIR System

Name – Ayush Sharma
Reg no – 15BCE1335

1. Study any one of the following CBIR Engines work:
   a. Akiwi
   b. Chic Engine
   c. Image Hunter
   d. Baidu Image Search
   e. Yandex Image Search
   f. Google Image Search

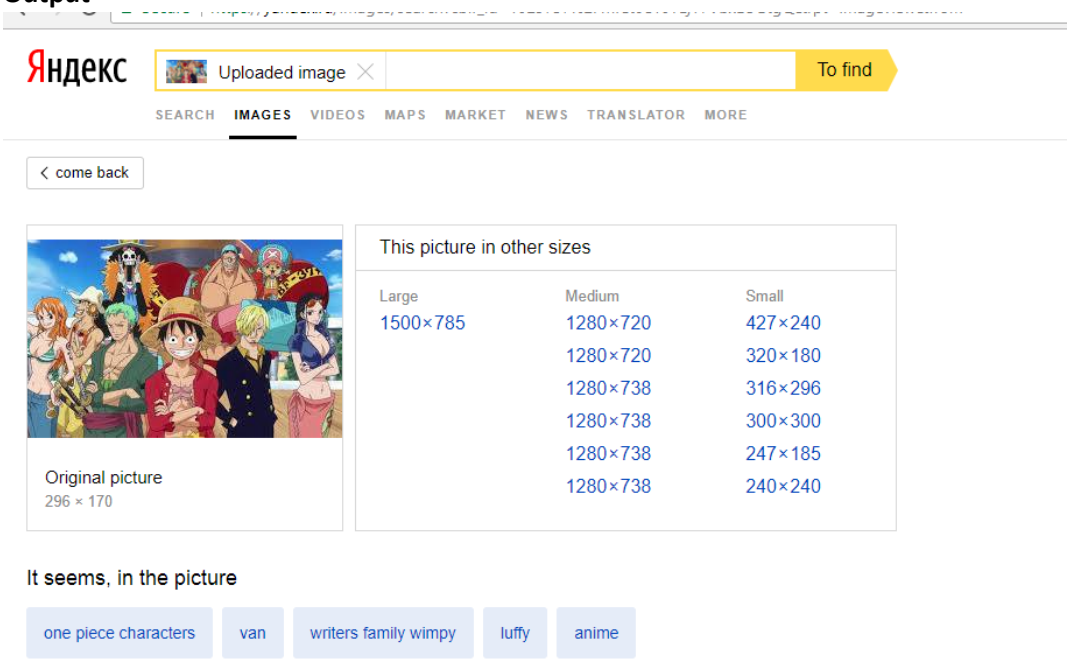
Describe your experience, the way in which CBIR is used in each of these tools and which one is the best.

Answer. These CBIR Engines use the concept of Reverse Image Search is a content-based image retrieval (CBIR) query technique that involves providing the CBIR system with a sample image that it will then base its search upon; in terms of information retrieval, the sample image is what formulates a search query. In particular, reverse image search is characterized by a lack of search terms. This effectively removes the need for a user to guess at keywords or terms that may or may not return a correct result. Yandex Image search is developed by Yandex company of russia. Yandex uses CBIR system to find the related images to a query based on an image based query. The process starts when a Yandex user submits photos in the form of search queries. It then transforms the photo into numerical representations of the photo's key features, a process that is referred to as a set of "visual phrases." Then the search engine sifts through the billions of photos on the Internet to select only images that contain the same visual phrases as the photo that was submitted originally by the user. In shifting through all the images using the visual phrases, Yandex speeds up the search process by narrowing the scope of the search. Finally, the most similar photo will be found due to the computer comparing the submitted photo with the search image's key features.

For example-

Input Query

Output-

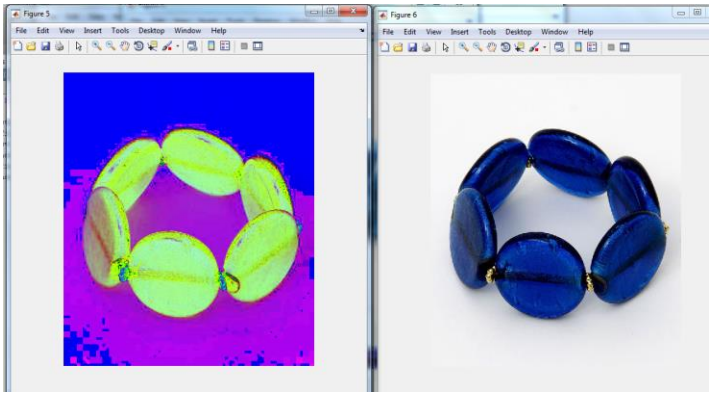


2. Convert an image from RGB to HSV and back to RGB.
   a. Write the equations for conversion
   b. Are they perceptually same?
   c. Show the RGB and HSV values of (100,100) pixel

Code-

```
srcFiles = dir('D:\cbir\green\*.jpg');  % the folder in which  images exists

for i = 1 : length(srcFiles)

    filename = strcat('D:\cbir\green\',srcFiles(i).name);

    I = imread(filename);

    HSV = rgb2hsv(I);

    figure, imshow(HSV);

    again = hsv2rgb(HSV);

    figure, imshow(again);

end
```

Input and Output-



3. Implement a CBIR system that uses features derived from Color Space
   Database – Minimum 60 images and 3 categories – Red Dominant, Green Dominant, Blue Dominant (20 images from each category)
   Query Image – 1
   Search Result – 10
   i. Dimension of the images as features
   ii. Mean of the Color Channels as features
   iii. Moment of the Color Channels as features

Answer

i)Dimension of the images as features

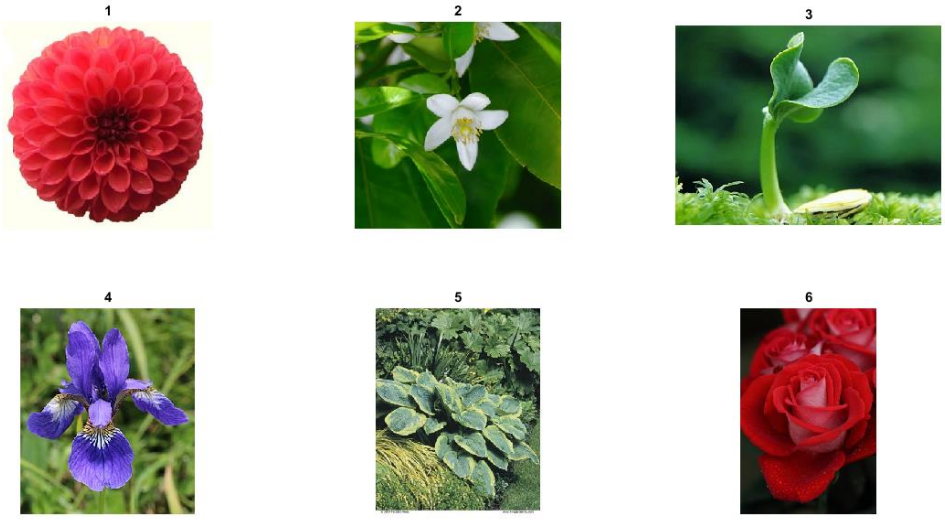
Code-

Using Euclidean Distance

```
queryimg = imread('C:\Documents and Settings\eg22\Desktop\query.jpg');
dim_queryimg = size(queryimg);
dim_diff_vector = [];
source = dir('C:\Documents and Settings\eg22\Desktop\images\*.jpg');
for i=1:44
img_v = [];
data = imread(strcat('C:\Documents and
Settings\eg22\Desktop\images\',source(i).name));
img_v = size(data);
dim_diff_vector(i) = sqrt(((dim_queryimg(1)-
img_v(1))^2)+((dim_queryimg(2)-img_v(2))^2));
end
sorted_vector = sort(dim_diff_vector);
figure (1);
for i=1:10
x = sorted_vector(i);
```

```
for j = 1:44
if(x==dim_diff_vector(j))
img = imread(strcat('C:\Documents and
Settings\eg22\Desktop\images\',source(j).name));
subplot(2,5,i); imshow(img), title(i);
break
end
end
end
```

Output-

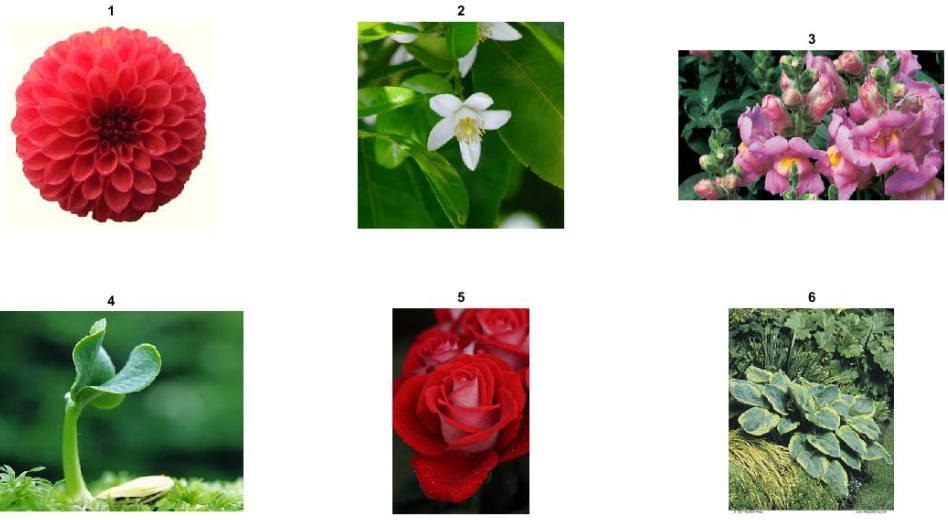


Using Chi-Square Distance

```
queryimg = imread('C:\Documents and Settings\eg22\Desktop\query.jpg');
dim_queryimg = size(queryimg);
chi_sqr = [];
source = dir('C:\Documents and Settings\eg22\Desktop\images\*.jpg');

for i=1:44
data = imread(strcat('C:\Documents and
Settings\eg22\Desktop\images\',source(i).name));
img_v = size(data);
m = size(dim_queryimg,1);  n = size(img_v,1);
mOnes = ones(1,m); D = zeros(m,n);
for j=1:n
```

```
  yi = img_v(j,:);  yiRep = yi( mOnes, : );
  s = yiRep + dim_queryimg;    d = yiRep - dim_queryimg;
  D(:,j) = sum( d.^2 ./ (s+eps), 2 );
end
chi_sqr(i) = D/2;
end

sorted_vector = sort(chi_sqr);
figure (1);
for i=1:10
x = sorted_vector(i);
for j = 1:44
if(x==chi_sqr(j))
img = imread(strcat('C:\Documents and
Settings\eg22\Desktop\images\',source(j).name));
subplot(2,5,i); imshow(img), title(i);
break
end
end
end
```

Output-



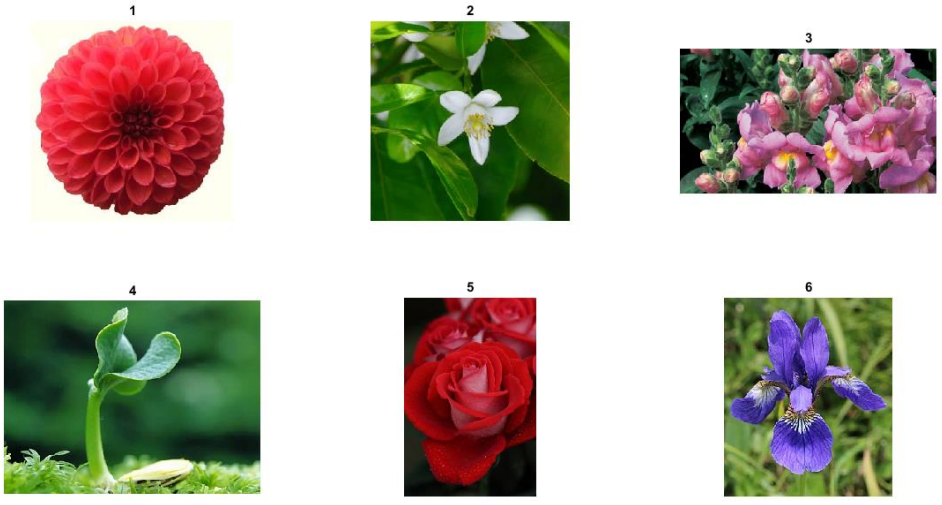
ii) Mean of the color channels as feature

Code-

Using Euclidean Distance

```
queryimg = imread('C:\Documents and Settings\eg22\Desktop\query.jpg');
rhq = imhist(queryimg(:,:,1),32);
ghq = imhist(queryimg(:,:,2),32);
bhq = imhist(queryimg(:,:,3),32);
q= mean([rhq ghq bhq]);
Euclid_dist = [];
source = dir('C:\Documents and Settings\eg22\Desktop\images\*.jpg');
for i=1:44
data = imread(strcat('C:\Documents and
Settings\eg22\Desktop\images\',source(i).name));
rh = mean(imhist(data(:,:,1),32));
gh = mean(imhist(data(:,:,2),32));
bh = mean(imhist(data(:,:,3),32));
src = [rh gh bh];
Euclid_dist(i) = sqrt(((q(1)-src(1))^2)+((q(2)-src(2))^2)+((q(3)-
src(3))^2));
end
sorted_e = sort(Euclid_dist);
figure (1);
for i=1:10
x = sorted_e(i);
for j = 1:44
if(x==Euclid_dist(j))
img = imread(strcat('C:\Documents and
Settings\eg22\Desktop\images\',source(j).name));
subplot(2,5,i); imshow(img), title(i);
break
end
end
end
```

Output-



Using Chi- Square Distance

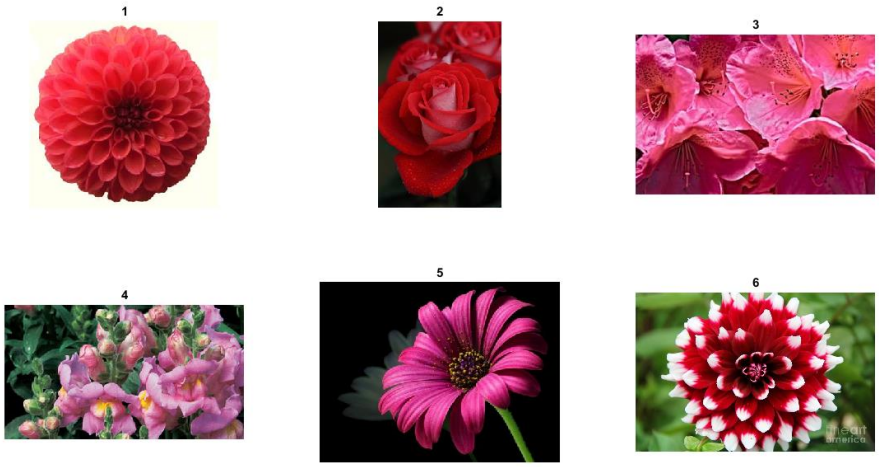
```
queryimg = imread('C:\Documents and Settings\eg22\Desktop\query.jpg');
chi_sqr = [];
rhq = imhist(queryimg(:,:,1),32);
ghq = imhist(queryimg(:,:,2),32);
bhq = imhist(queryimg(:,:,3),32);
q= mean([rhq ghq bhq]);
source = dir('C:\Documents and Settings\eg22\Desktop\images\*.jpg');

for i=1:44
data = imread(strcat('C:\Documents and
Settings\eg22\Desktop\images\',source(i).name));
rh = mean(imhist(data(:,:,1),32));
gh = mean(imhist(data(:,:,2),32));
bh = mean(imhist(data(:,:,3),32));
src = [rh gh bh];
m = size(q,1);  n = size(src,1);
mOnes = ones(1,m); D = zeros(m,n);
for j=1:n
  yi = src(j,:);  yiRep = yi( mOnes, : );
  s = yiRep + q;    d = yiRep - q;
  D(:,j) = sum( d.^2 ./ (s+eps), 2 );
end
chi_sqr(i) = D/2;
end
sorted_vector = sort(chi_sqr);
figure (1);
for i=1:10
x = sorted_vector(i);
for j = 1:44
if(x==chi_sqr(j))
img = imread(strcat('C:\Documents and
Settings\eg22\Desktop\images\',source(j).name));
subplot(2,5,i); imshow(img), title(i);
break
end
end
end
```

iii. Moment of the Color Channels as features

Code-

Using Euclidean Distance

```
queryimg = imread('C:\Documents and Settings\eg22\Desktop\query.jpg');
rhq = imhist(queryimg(:,:,1),32);
ghq = imhist(queryimg(:,:,2),32);
bhq = imhist(queryimg(:,:,3),32);
q= var([rhq ghq bhq]);
Euclid_dist = [];
source = dir('C:\Documents and Settings\eg22\Desktop\images\*.jpg');
for i=1:14
data = imread(strcat('C:\Documents and
Settings\eg22\Desktop\images\',source(i).name));
rh = var(imhist(data(:,:,1),32));
gh = var(imhist(data(:,:,2),32));
bh = var(imhist(data(:,:,3),32));
src = [rh gh bh];
Euclid_dist(i) = sqrt(((q(1)-src(1))^2)+((q(2)-src(2))^2)+((q(3)-
src(3))^2));
end
sorted_e = sort(Euclid_dist);
figure (1);
for i=1:10
x = sorted_e(i);
for j = 1:14
if(x==Euclid_dist(j))
img = imread(strcat('C:\Documents and
Settings\eg22\Desktop\images\',source(j).name));
subplot(2,5,i); imshow(img), title(i);
break
end
end
end
```



Using Chi-Square Distance

```
queryimg = imread('C:\Documents and Settings\eg22\Desktop\query.jpg');
chi_sqr = [];
rhq = imhist(queryimg(:,:,1),32);
ghq = imhist(queryimg(:,:,2),32);
bhq = imhist(queryimg(:,:,3),32);
q= var([rhq ghq bhq]);
source = dir('C:\Documents and Settings\eg22\Desktop\images\*.jpg');

for i=1:14
data = imread(strcat('C:\Documents and
Settings\eg22\Desktop\images\',source(i).name));
rh = var(imhist(data(:,:,1),32));
gh = var(imhist(data(:,:,2),32));
bh = var(imhist(data(:,:,3),32));
src = [rh gh bh];
m = size(q,1);  n = size(src,1);
mOnes = ones(1,m); D = zeros(m,n);
for j=1:n
  yi = src(j,:);  yiRep = yi( mOnes, : );
  s = yiRep + q;    d = yiRep - q;
  D(:,j) = sum( d.^2 ./ (s+eps), 2 );
end
chi_sqr(i) = D/2;
end
sorted_vector = sort(chi_sqr);
figure (1);
for i=1:10
x = sorted_vector(i);
for j = 1:14
if(x==chi_sqr(j))
img = imread(strcat('C:\Documents and
Settings\eg22\Desktop\images\',source(j).name));
subplot(2,5,i); imshow(img), title(i);
break
end
end
end
```