

CSE 3018 - Content Based Image Retrieval

Lab 5 - Implementation of Similarity / Distance Measure in a CBIR Framework

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Color Moments:

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clc;
imagefiles = dir('*.jpg');
nfiles = length(imagefiles);
qimage = imread('1.jpg');
qsize = size(qimage);
R = qimage(:,:,1);
G = qimage(:,:,2);
B = qimage(:,:,3);
qrmean = mean2(R);
qgmean = mean2(G);
qbmean = mean2(B);
qrmoment = std2(R);
qgmoment = std2(G);
qbmoment = std2(B);
qrskew = skewness(imhist(R));
qbskew = skewness(imhist(B));
qgskew = skewness(imhist(G));
qfeature =
[qrmean,qgmean,qbmean,qrmoment,qgmoment,qbmoment,qrskew,qgskew,qbskew];
dis_vector = zeros(1,nfiles);
ed_vec = zeros(1,nfiles);
cblock_vec = zeros(1,nfiles);
cos_vec = zeros(1,nfiles);
corr_vec = zeros(1,nfiles);
chi_vec = zeros(1,nfiles);
kld_vec = zeros(1,nfiles);
mink_vec = zeros(1,nfiles);
jac_vec = zeros(1,nfiles);
jd_vec = zeros(1,nfiles);
emd_vec = zeros(1,nfiles);
ks_vec = zeros(1,nfiles);
for ii=1:nfiles
currentfilename = imagefiles(ii).name;
cimage = imread(currentfilename);
cR = cimage(:,:,1);
cG = cimage(:,:,2);
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cB = cimage(:,:,3);
crmean = mean2(cR);
cgmean = mean2(cG);
cbmean = mean2(cB);
crmoment = std2(cR);
cgmoment = std2(cG);
cbmoment = std2(cB);
crskew = skewness(imhist(cR));
cb skew = skewness(imhist(cB));
cgskew = skewness(imhist(cG));
cfeature =
[crmean,cgmean,cbmean,crmoment,cgmoment,cbmoment,crskew,cgskew,cbskew];
%ed_vec(ii) = sqrt(sum((qfeature - cfeature) .^ 2));
ed_vec(ii) = pdist2(qfeature,cfeature,'euclidean');
cblock_vec(ii) = pdist2(qfeature,cfeature,'cityblock');
mink_vec(ii) = pdist2(qfeature,cfeature,'minkowski');
jac_vec(ii) = pdist2(qfeature,cfeature,'jaccard');
cos_vec(ii) = dot(qfeature,cfeature)/(norm(qfeature)*norm(cfeature));
C=cov(cfeature,qfeature);
p=C(2)/(std(cfeature)*std(qfeature));
corr_vec(ii) = p;
m = size(cfeature,1); n = size(qfeature,1);
mOnes = ones(1,m); D = zeros(m,n);
for i=1:n
yi = qfeature(i,:); yiRep = yi( mOnes, : );
s1 = yiRep + cfeature; d = yiRep - qfeature;
D(:,i) = sum( d.^2 ./ (s1+eps), 2 );
end
D = D/2;
chi_vec(ii) = D;
kld_vec(ii) = KLDiv(cfeature,qfeature);
jd_vec(ii) = jeffrey_divergence(cfeature,qfeature);
ks_vec(ii) = kolmogorov_smirnov_distance(cfeature,qfeature);
%emd_vec(ii) = emd(cfeature,qfeature,1,1,@gdf);
end
header = {'','Euclidean','City Block','Minkowski','Jaccard','Cosine
Similarity','Pearson Correlation','Jeffrey Divergence','Kullback-Leibler
Divergence','Kolmogorov Distance',''};
res =
real([ed_vec;cblock_vec;mink_vec;jac_vec;cos_vec;corr_vec;jd_vec;kld_vec;ks
_vec]).';
xlswrite('color moments',header,'color');
xlswrite('color moments',res,'color','B2');

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imgName =
{'1.jpg';'2.jpg';'3.jpg';'4.jpg';'5.jpg';'6.jpg';'7.jpg';'8.jpg';'9.jpg';
'10.jpg'};
xlswrite('color moments',imgName,'color');

```

Screenshot:

	Euclidian	City Block	Minkowski	Jaccard	Cosine Similarity	Pearson Correlation	Jeffery Diverion	Kullback-Leibler Divergence	Kolmogorov Distance
1.jpg	0	0	0	0	1	1	0	0	0
2.jpg	0.868744955	222.1400488	176.5944434	1	0.300316597	0.692384447	111.2422606	60.87998688	111.2422606
3.jpg	0.985724591	168.8183461	144.6939861	1	0.027739519	0.970222139	81.78876969	17.71009044	81.78876969
4.jpg	0.968910287	131.0016801	125.970902	1	0.046790583	0.930201423	74.56484725	18.32367897	74.56484725
5.jpg	0.932670583	165.577569	96.88992045	1	0.317751089	0.85213242	72.09621739	41.6663747	72.09621739
6.jpg	0.93693019	166.9090114	121.5609587	1	0.08741423	0.854210263	81.23060492	22.0999433	81.23060492
7.jpg	0.940898015	145.2587053	81.17398461	1	0.076605233	0.864181312	73.37730429	18.20344631	73.37730429
8.jpg	0.945017758	381.6342082	343.9137057	1	0.0839247	0.883773232	188.3003032	73.74561737	188.3003032
9.jpg	0.964131098	116.6497413	46.75972721	1	0.153239667	0.918774019	55.35475812	21.07480954	55.35475812
10.jpg	0.728547413	350.4828742	287.551446	1	1.035025312	0.36995454	147.9886056	130.7437328	147.9886056

Histogram:

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clc;
imagefiles = dir('*.jpg');
nfiles = length(imagefiles); % Number of files found
qimage = imread('1.jpg');
qimage = rgb2gray(qimage);
qsize = size(qimage);
[pixelCounts, im] = imhist(qimage);
qmean = mean(im);
qvar = var(im);
qskew = skewness(im);
qkurt = kurtosis(im);
qent = entropy(im);
NM = sum(pixelCounts);
qenergy = sum((pixelCounts / NM) .^ 2);
qfeature = [qmean,qvar,qskew,qkurt,qent,qenergy];
ed_vec = zeros(1,nfiles);
cblock_vec = zeros(1,nfiles);
cos_vec = zeros(1,nfiles);
corr_vec = zeros(1,nfiles);
chi_vec = zeros(1,nfiles);
kld_vec = zeros(1,nfiles);
mink_vec = zeros(1,nfiles);
jac_vec = zeros(1,nfiles);
jd_vec = zeros(1,nfiles);
emd_vec = zeros(1,nfiles);
ks_vec = zeros(1,nfiles);
for ii=1:nfiles

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currentfilename = imagefiles(ii).name;
cimage = imread(currentfilename);
cimage = rgb2gray(cimage);
[cpixelCounts, cim] = imhist(cimage);
cmean = mean(cim);
cvar = var(cim);
cskew = skewness(cim);
ckurt = kurtosis(cim);
cent = entropy(cim);
cNM = sum(cpixelCounts);
cenergy = sum((cpixelCounts / cNM) .^ 2);
cfeature = [cmean,cvar,cskew,ckurt,cent,cenergy];
ed_vec(ii) = pdist2(qfeature,cfeature,'euclidean');
cblock_vec(ii) = pdist2(qfeature,cfeature,'cityblock');
mink_vec(ii) = pdist2(qfeature,cfeature,'minkowski');
jac_vec(ii) = pdist2(qfeature,cfeature,'jaccard');
cos_vec(ii) = dot(qfeature,cfeature)/(norm(qfeature)*norm(cfeature));
C=cov(cfeature,qfeature);
p=C(2)/(std(cfeature)*std(qfeature));
corr_vec(ii) = p;
m = size(cfeature,1); n = size(qfeature,1);
mOnes = ones(1,m); D = zeros(m,n);
for i=1:n
    yi = qfeature(i,:); yiRep = yi( mOnes, : );
    s1 = yiRep + cfeature; d = yiRep - qfeature;
    D(:,i) = sum( d.^2 ./ (s1+eps), 2 );
end
D = D/2;
chi_vec(ii) = D;
kld_vec(ii) = KLDiv(cfeature,qfeature);
jd_vec(ii) = jeffrey_divergence(cfeature,qfeature);
ks_vec(ii) = kolmogorov_smirnov_distance(cfeature,qfeature);
%emd_vec(ii) = emd(cfeature,qfeature,1,1,@gdf);
end
header = {'','Euclidean','City Block','Minkowski','Jaccard','Cosine
Similarity','Pearson Correlation','Jeffery Diversion','Kullback-Leibler
Divergence','Kolmogorov Distance','';
res =
real([ed_vec;cblock_vec;mink_vec;jac_vec;cos_vec;corr_vec;jd_vec;kld_vec;ks
_vec]).';
xlswrite('color moments',header,'hist');
xlswrite('color moments',res,'hist','B2');
imgName =

```

```
{'1.jpg';'2.jpg';'3.jpg';'4.jpg';'5.jpg';'6.jpg';'7.jpg';'8.jpg';'9.jpg'
;'10.jpg'};
xlswrite('color moments',imgName,'hist');
```

Screenshot:

A	B	C	D	E	F	G	H	I	J
	Euclidian	City Block	Minkowski	Jaccard	Cosine Similarity	Pearson Correlation	Jeffery Diverion	Kullback-Leibler Divergence	Kolmogorov Distance
1.jpg	0	0	0	0	1	1	0	0	0
2.jpg	2.763E-07	0.000707519	0.005636855	0.2	1	1	0.005636855	0.005636855	0.005636855
3.jpg	8.2295E-08	0.00024473	0.002647916	0.2	1	1	0.002647916	0.002647916	0.002647916
4.jpg	3.0137E-07	0.000768863	0.005908957	0.2	1	1	0.005908957	0.005908957	0.005908957
5.jpg	9.8235E-10	2.77314E-06	0.000304785	0.2	1	1	0.000304785	0.000304785	0.000304785
6.jpg	5.7373E-10	1.60257E-06	0.000235404	0.2	1	1	0.000235404	0.000235404	0.000235404
7.jpg	1.2647E-09	3.57322E-06	0.000345546	0.2	1	1	0.000345546	0.000345546	0.000345546
8.jpg	6.5516E-07	0.001606921	0.009067273	0.2	1	1	0.009067273	0.009067273	0.009067273
9.jpg	8.3124E-08	0.000247272	0.002660396	0.2	1	1	0.002660396	0.002660396	0.002660396
10.jpg	0.00031523	0.346119807	0.546048322	0.2	0.999999995	0.999999995	0.546048322	0.546048322	0.546048322