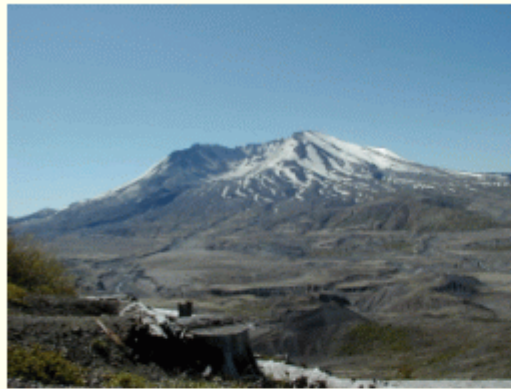


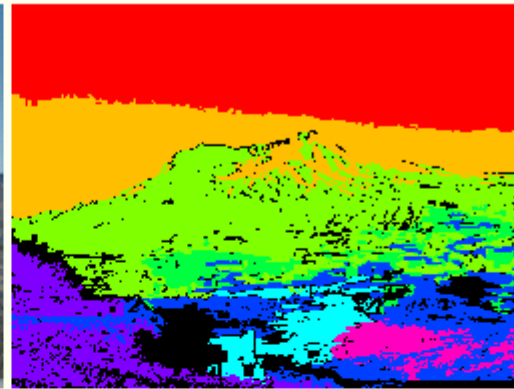
# HW6 Content-Based Image Retrieval

Due Dec 8, 25 points

1- or 2-person teams



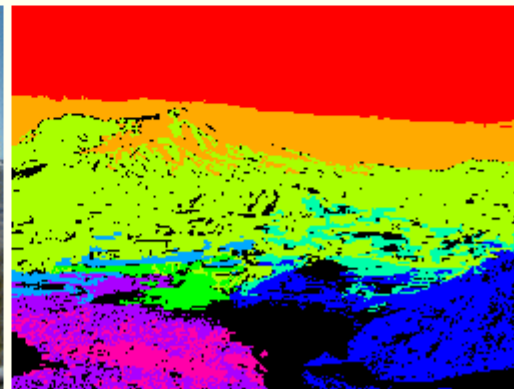
mountain image



segmented by color



another mountain image



segmented by color

- Image database of 40 color images
- 8 sets of 5 images each
  - beach
  - boat
  - cherry
  - crater
  - pond
  - stHelens
  - sunset1
  - sunset2
- submit a query image and retrieve results by CBIR
- 8 images denoted as query images for your tests
- compare the features of each query image to the whole database, compute distance from query to image, report on the distance from each query to each of the for images (showing thumbnails in your report)

1. Color clustering, connected components, noise cleaning  
**You may use your code from HW 3 as your starter code.**

1. For each major region calculate

1. size

2. mean color (in your preferred color space)

3. texture features including energy, entropy, contrast from co-occurrence

**You'll convert to gray-tone to do this.**

4. centroid

5. bounding box

2. region adjacency graph (2-person teams)

3. spatial relationships among regions (2-person teams)

4. Store region attributes and relationships in a data structure

- Design an image distance measure  $RELDIS(I1, I2)$ 
  - Experiment with 2 (4 for 2 person groups) different distance measures, and report about them. State which one worked the best and used in your final results.
- First find correspondences between regions of  $I1$  and  $I2$ 
  - one-person teams using a greedy method
  - two-person teams using a search procedure
- Compute the distance as a function of
  - difference in attributes of corresponding regions
  - difference in number of regions
  - difference in region relationships (2-person teams)
- Create a query system in which you can compare each query image  $Q$  to all the database images  $I$  and compute  $RELDIS(Q, I)$ . Return the image in ascending  $RELDIS$  order.

- Extra credit:
  - Create a simple GUI for performing queries
  - Experiment with other features

# Some Results from a 2-Person Team

Query Results

Query Image: boat\_5.jpg

Distance Function: Custom Distance

Attribute Weights:

Size:

Color:

Centroid:

Bounding Box:

Region Adjacency Graph:

Energy:

Entropy:

Contrast:

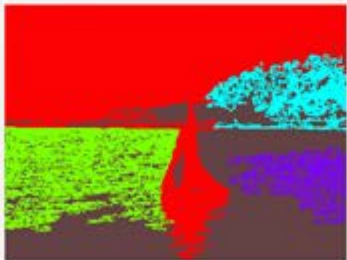

Perimeter:

Circularity:









































Local Binary Pattern:

Gradient Magnitude:

Gradient Direction:



Query Results

<b>boat_5</b>  d=0	<b>sunsett_5</b>  d=1.49889	<b>boat_4</b>  d=3.51064	<b>sunset1_4</b>  d=5.9409	<b>pond_4</b>  d=6.17503	<b>sunsett_3</b>  d=6.20048	<b>sunset1_2</b>  d=6.37745	<b>boat_3</b>  d=7.20207
<b>boat_2</b>  d=7.30617	<b>stlhelens_2</b>  d=7.5748	<b>pond_5</b>  d=10.3448	<b>beach_5</b>  d=10.4327	<b>cherry_3</b>  d=10.4481	<b>stlhelens_3</b>  d=11.1996	<b>pond_3</b>  d=12.0413	<b>pond_2</b>  d=13.3086
<b>cherry_5</b>  d=16.0021	<b>cherry_4</b>  d=16.8594	<b>stlhelens_4</b>  d=17.0678	<b>stlhelens_5</b>  d=17.3381	<b>sunset2_1</b>  d=17.7625	<b>pond_1</b>  d=17.9849	<b>sunset2_5</b>  d=20.0338	<b>sunset1_1</b>  d=20.196
<b>crater_5</b>  d=25.6008	<b>sunset2_3</b>  d=29.1796	<b>sunset2_4</b>  d=29.8909	<b>cherry_1</b>  d=31.4395	<b>crater_3</b>  d=35.4545	<b>beach_4</b>  d=39.9903	<b>stlhelens_1</b>  d=42.0568	<b>beach_1</b>  d=42.1303
<b>sunset2_2</b>  d=47.9388	<b>crater_4</b>  d=58.6763	<b>cherry_2</b>  d=59.2691	<b>crater_2</b>  d=63.5049	<b>beach_3</b>  d=72.4982	<b>boat_1</b>  d=90.8518	<b>crater_1</b>  d=105.441	<b>beach_2</b>  d=149.004

Query Results

Query Image: crater\_3.jpg

Distance Function: Custom Distance

Attribute Weights:

Size:

Color:

Centroid:

Bounding Box:

Region Adjacency Graph:

Energy:

Entropy:

Contrast:


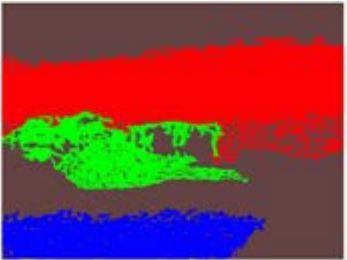
Perimeter:

Circularity:









































Local Binary Pattern:

Gradient Magnitude:

Gradient Direction:

Query Results

crater_3  d=0	crater_2  d=1.61995	crater_5  d=6.59778	stHlelens_3  d=8.75068	crater_4  d=8.84015	cherry_5  d=10.8343	beach_1  d=14.0075	sunsett_2  d=14.4386
sunsett_3  d=14.444	stHlelens_5  d=15.3723	beach_4  d=15.4416	stHlelens_2  d=16.413	sunsett_4  d=17.0318	crater_1  d=17.0969	cherry_4  d=17.9811	pond_3  d=18.067
sunsett_1  d=19.167	stHlelens_4  d=19.2283	boat_3  d=20.9362	sunsett_4  d=21.4792	boat_2  d=21.5257	stHlelens_1  d=21.9774	pond_1  d=26.5519	beach_2  d=28.0115
sunsett_5  d=28.4863	cherry_3  d=28.7244	sunsett_3  d=30.7644	beach_3  d=31.3619	beach_5  d=31.8383	pond_4  d=33.6818	boat_4  d=34.2578	sunsett_5  d=35.1457
boat_5  d=35.4545	boat_1  d=38.0213	sunsett_1  d=38.3608	sunsett_2  d=44.6192	cherry_1  d=45.6415	pond_5  d=49.296	pond_2  d=50.1949	cherry_2  d=58.221