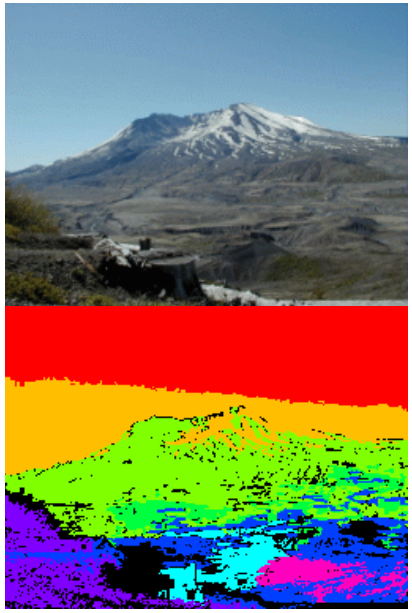
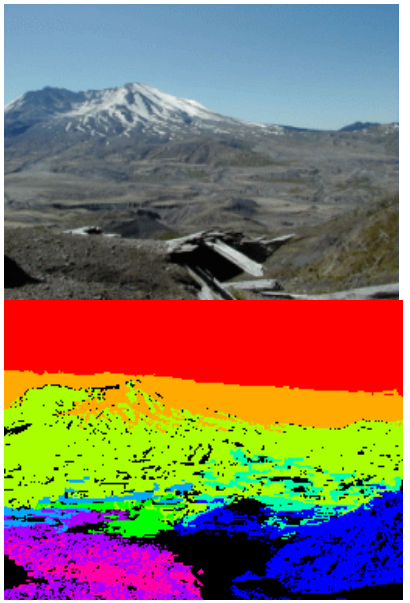




Assignment 3

Content-Based Image Retrieval

Steps

- Represent each image in the database we give you by a feature vector. (Preprocess)
- Design an image distance measure that can compare pairs of image.
- Retrieve, for each test image, the database images in ascending order of distance to the query. The query itself should have distance 0 and be first. Use the interface provided for retrieval.

Initial Processing

- First apply color clustering to the image to get a labeled image of multiple different cluster labels: 1, 2, 3, ...K.
- Then apply connected components (provided) to the labeled image to produce a second labeled image that labels each connected component of cluster labels: 1, 2, ... N. A single color cluster may break into more than one component.
- Possibly perform some noise cleaning to remove small regions. Don't vary parameters between images. You can get noise cleaning ideas or code from anywhere.

Features

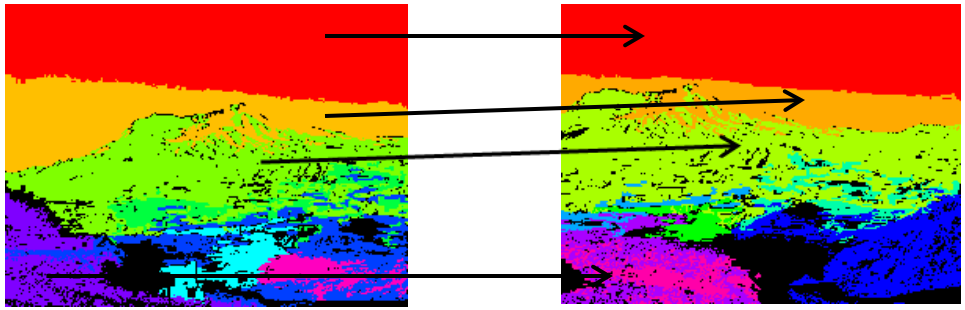
- For each major region (use a size threshold), compute *at least* the following features:
  - size (number of pixels) given
  - mean color, in RGB, or whatever space you like given
  - at least the following co-occurrence texture features using spatial relationship d=(1,1): energy, entropy, contrast.
  - centroid (row, column)
  - bounding box (or if you prefer, could be an ellipse)
- Store the features in the feature vector defined in the code.

Extra Credit Features

- Other region features you want to add
- RAG (region adjacency graph) including for each pair of adjacent regions:
  - above adjacency
  - below adjacency
  - left adjacency
  - right adjacency
  - other
- A fancier distance function to handle RAGs.

Distance Measure

- Dist(I_1,I_2) determines the distance from image I_1 to image I_2.
- Compute Dist from a correspondence you find from the regions of I_1 to those of I_2.
- Start with a greedy method: for each region of I_1, find the most similar region of I_2



- Do **not** ask me HOW to do this. That's for you.

More on Distance Measure

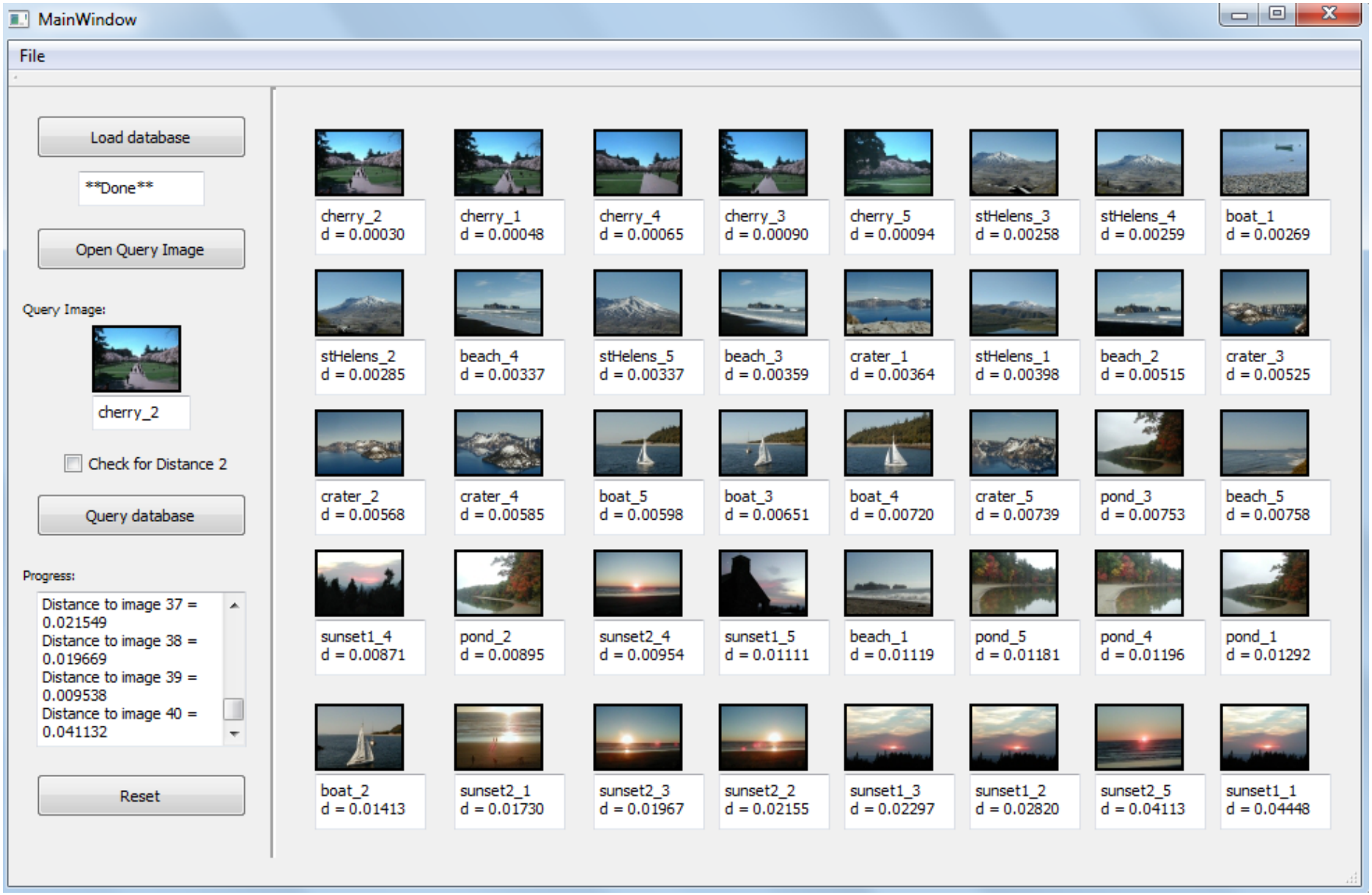
- You should try at least two difference distance measures. They can differ in:
  - attributes used, weights on attributes
  - the actual distance, ie. Euclidean vs. others

- If you do the graph structure, you need some kind of graph distance. See S&S Section 11.6 or make up your own.

Report

- Turn in a brief report in Word or PDF that describes:

1. the attributes you implemented
2. the distance measures you tried
3. the results of your tests including both the 16 screenshots (1 for each of the 2 distance measures for each of the 8 query images) and your comments.


MainWindow
File
Load database
Done
Open Query Image
Query Image:
cherry_2
Check for Distance 2
Query database
Progress:
Distance to image 37 = 0.021549
Distance to image 38 = 0.019669
Distance to image 39 = 0.009538
Distance to image 40 = 0.041132
Reset
cherry_2 d = 0.00030
cherry_1 d = 0.00048
cherry_4 d = 0.00065
cherry_3 d = 0.00090
cherry_5 d = 0.00094
stHelens_3 d = 0.00258
stHelens_4 d = 0.00259
boat_1 d = 0.00269
stHelens_2 d = 0.00285
beach_4 d = 0.00337
stHelens_5 d = 0.00337
beach_3 d = 0.00359
crater_1 d = 0.00364
stHelens_1 d = 0.00398
beach_2 d = 0.00515
crater_3 d = 0.00525
crater_2 d = 0.00568
crater_4 d = 0.00585
boat_5 d = 0.00598
boat_3 d = 0.00651
boat_4 d = 0.00720
crater_5 d = 0.00739
pond_3 d = 0.00753
beach_5 d = 0.00758
sunset1_4 d = 0.00871
pond_2 d = 0.00895
sunset2_4 d = 0.00954
sunset1_5 d = 0.01111
beach_1 d = 0.01119
pond_5 d = 0.01181
pond_4 d = 0.01196
pond_1 d = 0.01292
boat_2 d = 0.01413
sunset2_1 d = 0.01730
sunset2_3 d = 0.01967
sunset2_2 d = 0.02155
sunset1_3 d = 0.02297
sunset1_2 d = 0.02820
sunset2_5 d = 0.04113
sunset1_1 d = 0.04448