Lee Carrier-Coupal
Tyler Gilbert
Corey Dubois

CS463 Project --- K-means

Problem definition

We were asked to implement a segmentation method called K-means. The segmentation algorithm of K-means is applicable to many different types of situations. In our case, the program must be done for grayscale images (PGM), color images (PPM). It must also take into account the locations and texture of the data set of pixels.

UI directions

The UI will ask the user for an image pathname. Then, when the file is loaded, the use will have the choice between 4 different types of k-means to apply on the image. The k value is entered by the user.

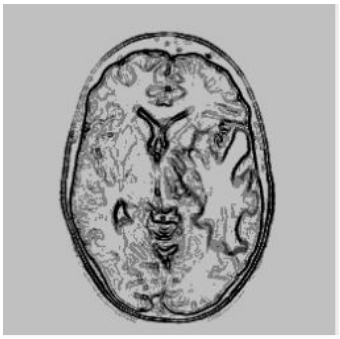
Choices made for solutions

First and foremost, the first challenge was to update the UI and allow it to process RGB color images, take in a k value and add multiples buttons. Now that the structure of the UI was done, we chose to tackle the K-means algorithm based on the location first in order to get familiar with the concept of segmentation. Also, we had to convert the 2D array input image into a list of vectors. Each vector would have multiple components that store information about the pixel, its location, color intensities and its assigned cluster. At that point, the main idea of K-means segmentation was clear, so figuring out grayscale and color k-means was a reasonable task. For texture, we had to be creative and do a combination of two algorithms to get k-means based on texture to work.

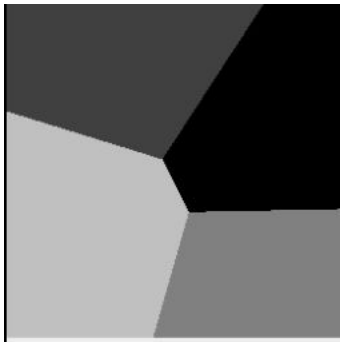
Essentially, applying an edge detector to the image (Sobel) and then applying the intensity k-means did the trick.

Segmentation results

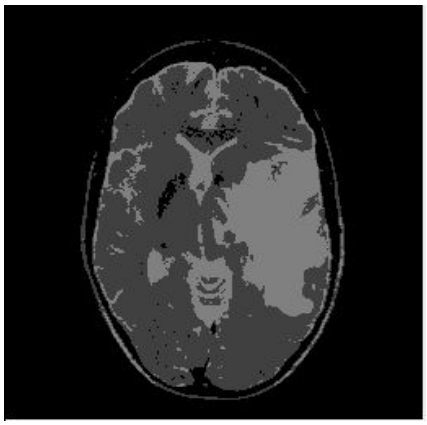
Color K-means, k = 4



Texture K-means, k = 4



Location K-means, k = 4



Grayscale k-means, k = 4

Discussion

We believe the results are an accurate depiction of a proper k-means segmentation. The most noteworthy sign of this belief is that we can clearly see that the image is properly divided in 4 segments as K equals 4. As for segmentation based on location, we aren't too sure what purpose it serves, nevertheless we do see that the image is now separated into 4 parts with different which proves it works.