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INTERACTIVE ACTIVE CONTOURS

ECE 6310, FINAL PROJECT

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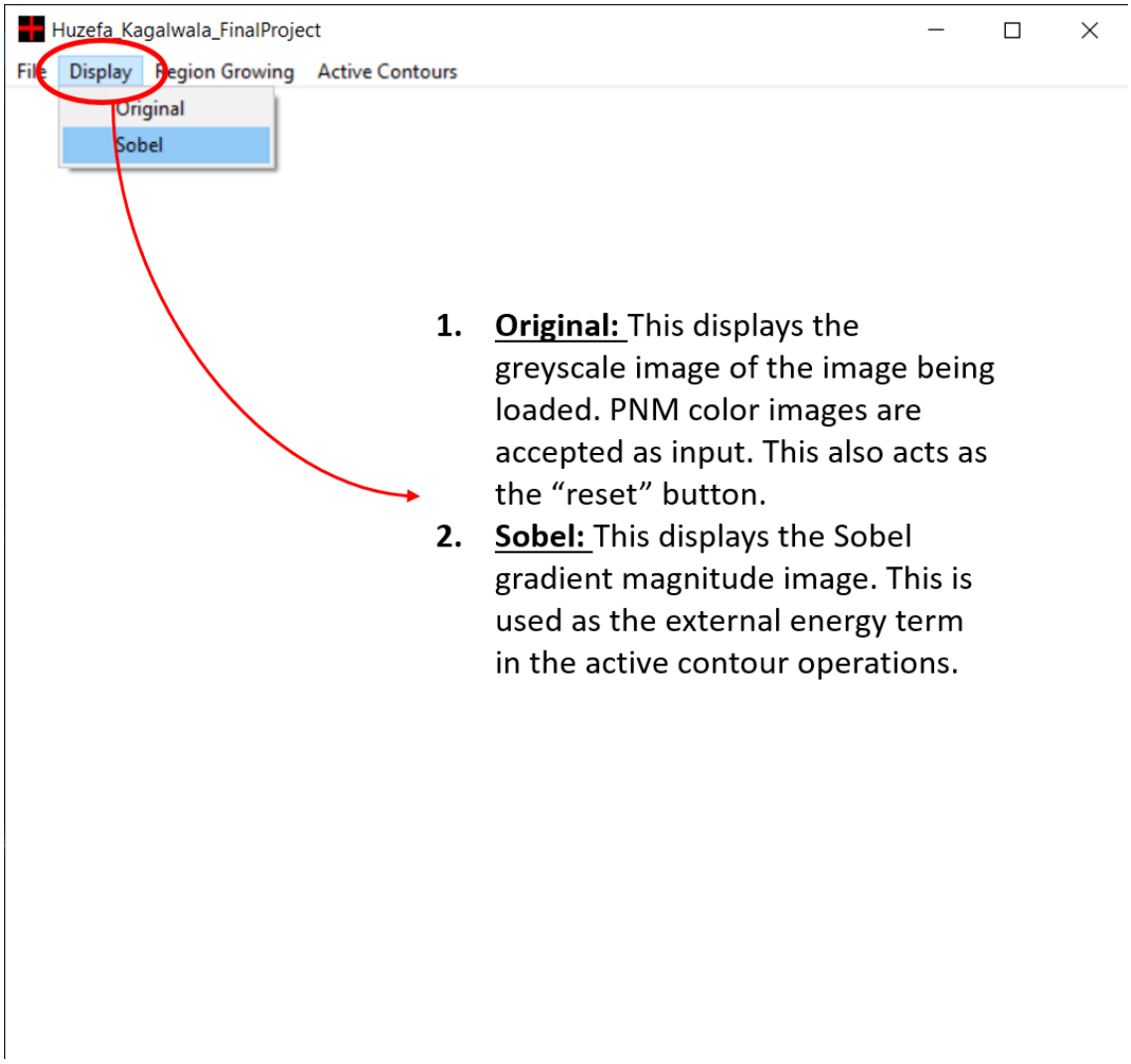
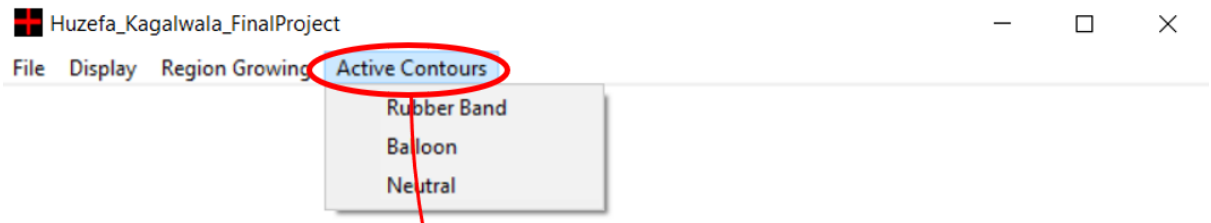
Part1:

Menu Options

Ans:

In this assignment, we were asked to create a GUI to demonstrate interactive active contours. The following screenshots show the basic layout of the application. This application has been built upon the application built for Lab4 and hence, those parts won't be shown again. The new functionality added is as follows:





1. **Rubber Band:** Upon clicking this, the rubber band model of active contours is activated
2. **Balloon:** This option runs the balloon model of active contours.
3. **Neutral:** This option runs the third active contour after a few points have been anchored.

The Rubber Band model has been implemented as shown in previous labs, with one external energy dependent on the Sobel gradients to lock in on image and two internal energy terms responsible for shrinking and keeping the contour points evenly spaced.

The Balloon model has one external energy term which are the Sobel gradients. The first internal energy term is the distance of the pixels in the window around the contour points to the centroid of the contour and the second one is the same as the rubber band model, to keep the points evenly spaced.

The “Neutral” option runs a differently tuned version of the balloon model or rubber band model, depending on what was run earlier. It emphasizes on reshaping the contour based on equal spacing and finding a gradient and not much on expanding or contracting the shape of the contour, as it is assumed that the contour must have latched onto a favorable position on the first pass itself.

Part2:

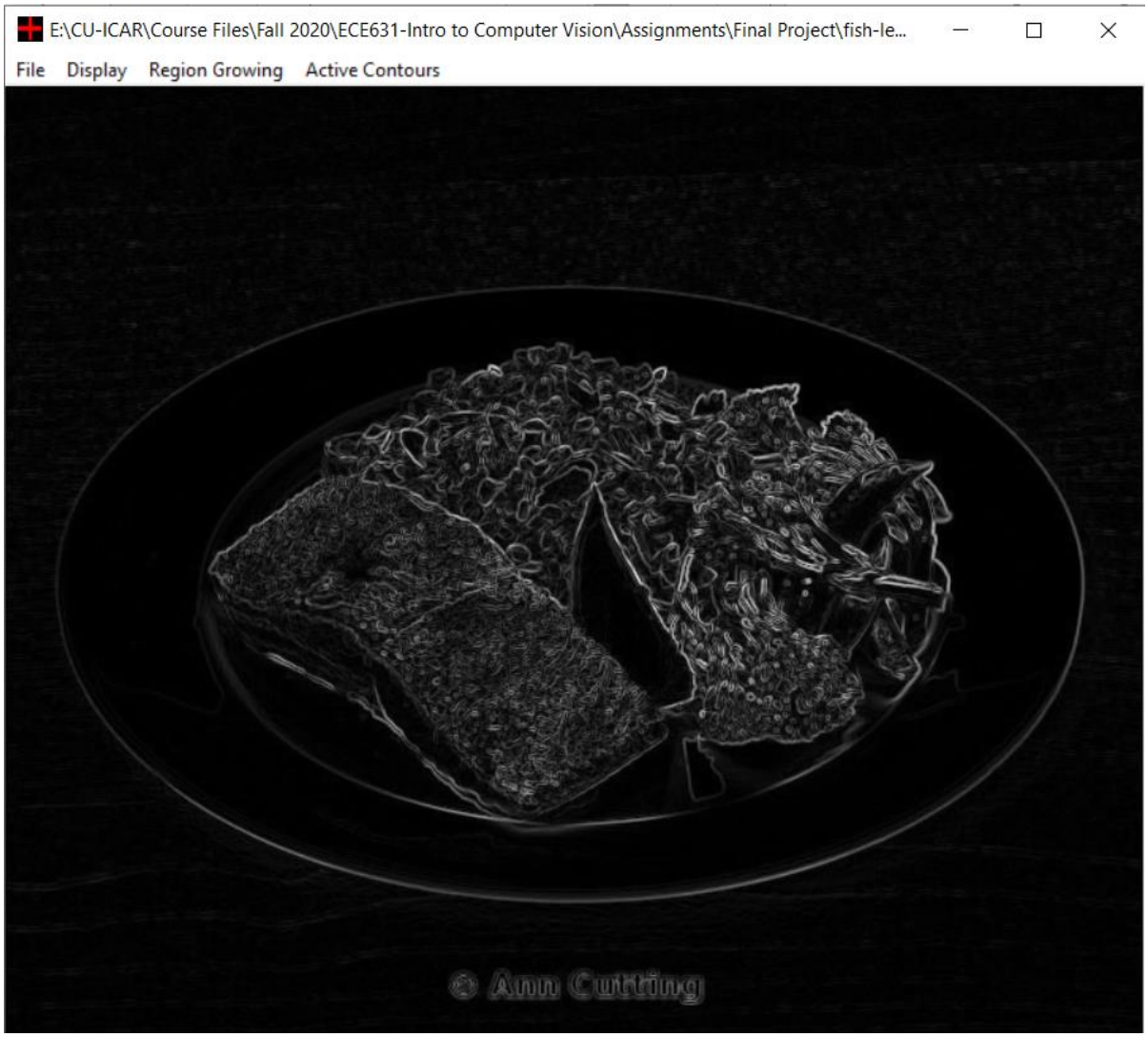
Different working aspects of the GUI application are shown here.

Drawing contours

Ans: On clicking the left mouse button and moving, it the mouse locations get saved. These points are down sampled to every 5th point and that is saved as the contour to be worked upon for the rubber band model.

On right clicking anywhere in the image, a circle is generated of radius 10 pixels. The points on this circle are down-sampled to every 3rd point, which are treated as the contour points for the balloon model.

Displaying Sobel Image



This is the Sobel image for the image being displayed.

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Part3:

Working of the rubber band model

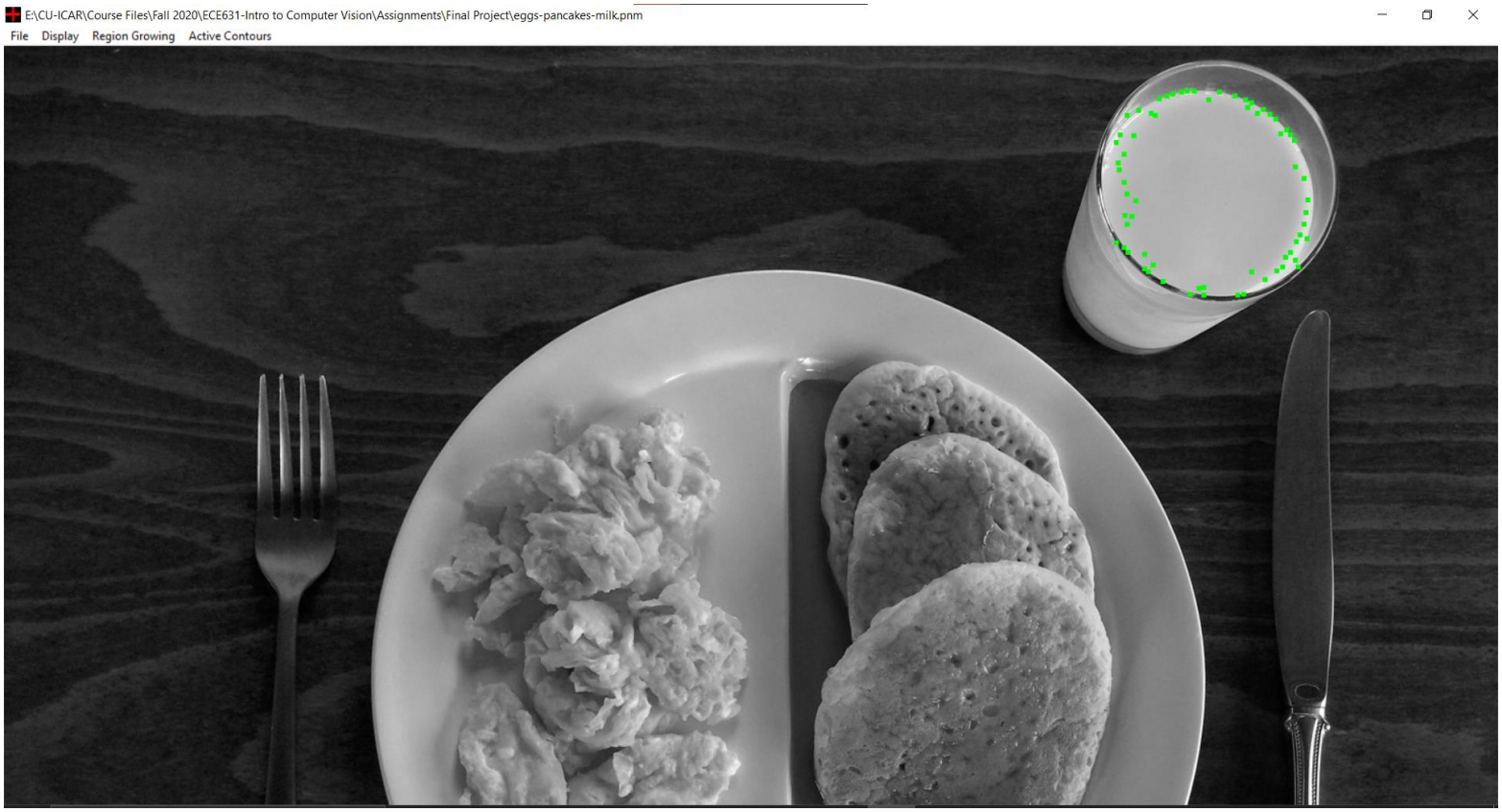
As can be seen, one part of the contour gets a little pulled towards the bread and doesn't lock into the hushpuppy. This is because the window size was kept at a relatively small value of 5, and hence, it found a local minimum there due to the strong gradient of the bread's edge and got pulled there. Selecting a larger window size and also adding an energy terms, which depended on the variance of the color of the image would have helped a lot.

Anchoring points at a different location and running the contour again

The orange points (on the top left of the contour) are the points which are anchored. This operation is performed by shift clicking on a point and dragging it to a position of your liking. Upon selecting the Neutral contour, they will not move, but the other points will. As, the contour was at a good enough location, it did not move much.

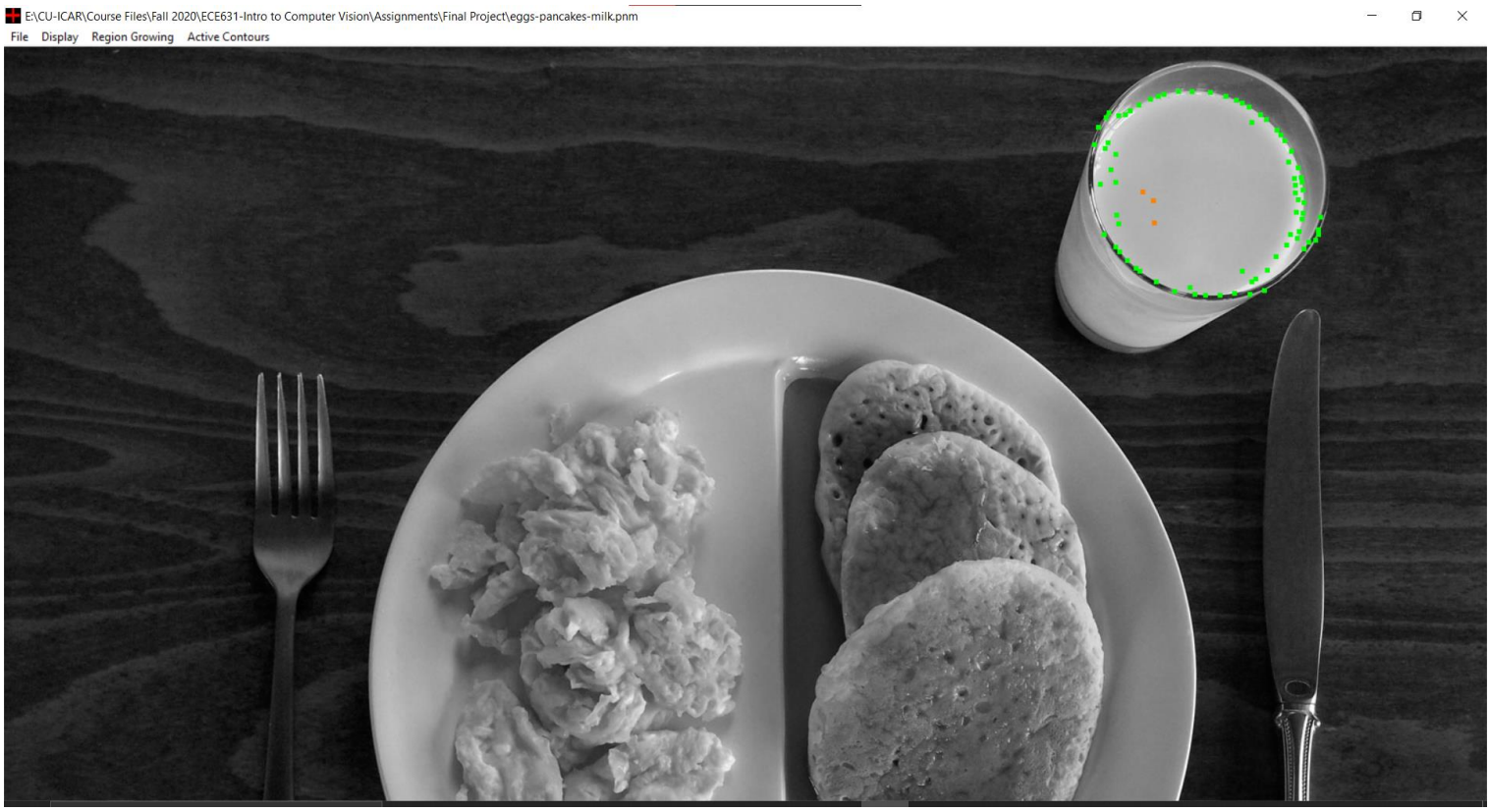
Working of the rubber band model

The subsequent image is of the balloon model being implemented.



The green points are the expanded contour points. As can be seen, they have stuck to the shape of the glass quite well. A variable weightage system has been employed here while the contour expands. Depending on how many iterations have elapsed, the weightage of the energy terms changes, to help control the expansion. Here, too an external energy term dependent on the variance in color would have helped tremendously.

Anchoring points at a different location and running the contour again



The orange points are the anchored points. Upon running the neutral contour, the remaining points realign themselves across the rim of the glass and are much better spaced now.

CONCLUSION:

This report showed the working of the GUI application developed for the Final Project of the class. The code performs well and achieves all the objectives set out in class. Nevertheless, there is lot of room for improvement and is the future scope of this project.