631 Computer Vision
Homework 7

Name: Kriti Sharda

1. Main Routine:

The main routine sets the path to TEST_IMAGES folder and loops over all the images present in the TEST_IMAGES folder. The program first calls the 'countMelons' function that counts and returns the number of melons present in the image. The 'cutMelons' function takes the number of melons as parameter and prints out a blue line in between the skin and flesh of each slice of the melon.

Original Image

2. Counting Melons:

- The image is converted into lab color space and the a-channel is selected for this function because it gives the maximum separation between the green and red color, i.e. the skin and the flesh color.

- Histogram projection is used to obtain the image projection along the horizontal direction. This helps us get peaks in the histogram at places where the melons have been detected.

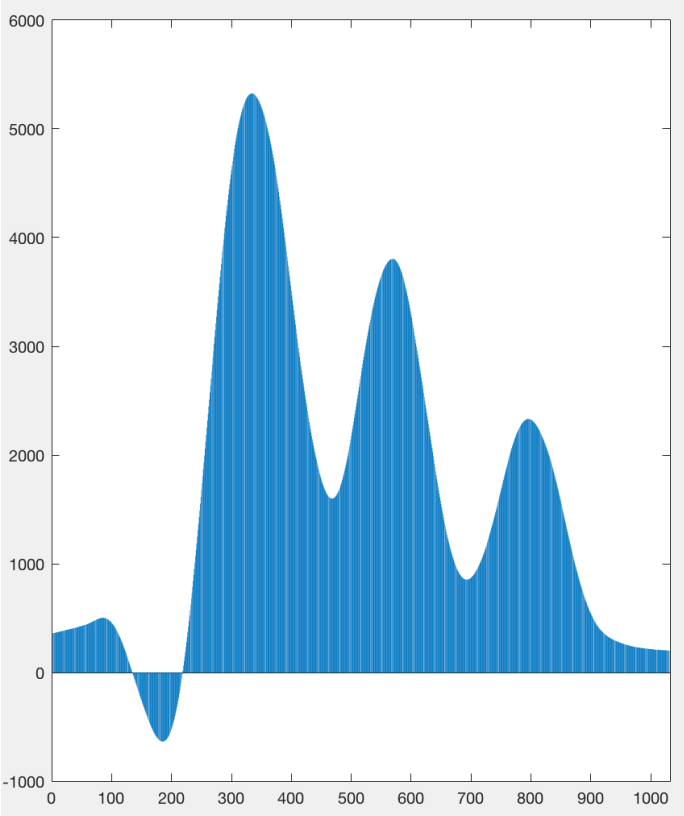
- The histogram is smoothened out in order to get rid of sharp, pointy and

abrupt peaks, that arise in the data.

- All the peaks are counted above a certain threshold value. The threshold value makes sure that we are not selecting any peaks that have been cause by some noise in the image.

- The total count of the peaks is retuned back to the main function.

- In the following graph we can see that there are 3 peaks. This means that there are three melons on the image.



Histogram projection

3. Edge Identification for cutting:

- This function takes the filename and the number of melons as input parameters.

- The image is converted into lab color space and the a-channel is selected for this function because it gives the maximum separation between the green and red color, i.e. the skin and the flesh color.

- To adjust the contrast and exposure of the image, adaptive histogram is used on the a-channel.

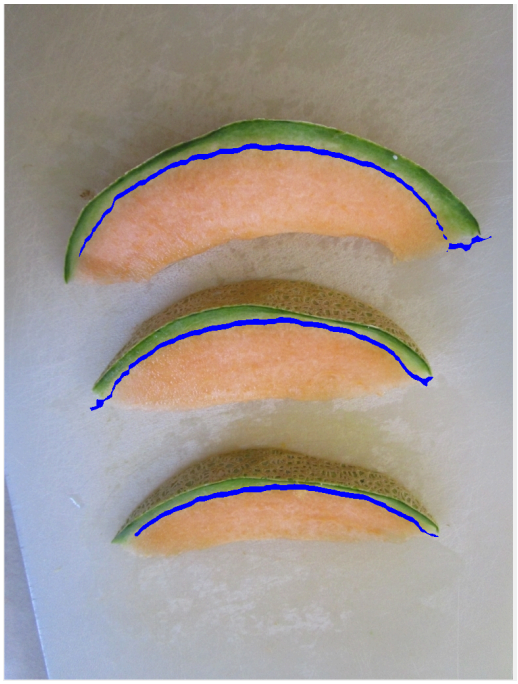
- Now, we are detecting the gradient along the vertical directing in order to get the horizontal edges in the a-channel image. We are using an appropriate filter to make sure that only the lower edges are detected because we want the edges between the skin and the flesh. We will not be using the horizontal gradient because it doesn't fulfill the purpose of this function.

- For noise removal, a Gaussian filter has been used on the image that contains the edges that have been detected. This helps us get ride of unwanted noise in the background.

- Binary Thresholding is done next in the image chain to detect only the bright edges in the pre-processed image. The famous Otsu's Threshold has been used to convert the image to binary image.

- Bwlabel is used to get the total number of regions in the image. All the regions above a certain area are selected and they are matched with the total number melons that the function had received as the input parameter. The new regions are stored in a new vector. These regions are the ones that contain the melons.

- Erosion is done to remove small salt and pepper noise from the image. And finally this region map is plotted back on the original image and the corresponding pixel values are set to blue color.



Conclusion:

This was a very interesting assignment as it made me explore a lot of ways to get the given two functions to work.

I got a chance to implement and make use of histogram projection function. I faced issues while finding the peaks because the original histogram data was very noisy and had a lot of small, sharp and pointy peaks. Later I realized by smoothening the data, we can easily get what we are looking for.

I had also tried morphology and Mahalanobis distance for this assignment but I faced a lot of issues while removing noise and making the functions work as they were intended to work. But never the less, I got an opportunity to explore these techniques as well and learnt a lot from this assignment.

Finally, I can say I am getting much better in detecting the exact steps for pre processing and post processing that I need to include in my image chain.