CSCI-631: Foundations of Computer Vision

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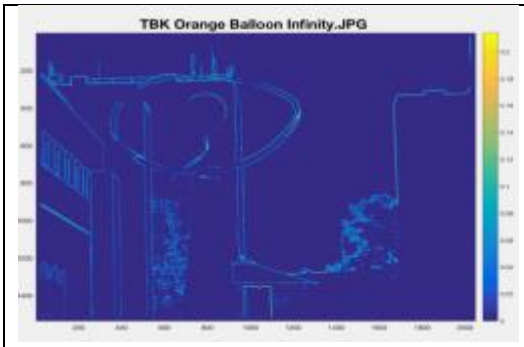
HOMEWORK – 6

Write up:

1. **Write up the following information:**
   - **a. Change the name of the file to use the correct file name.**
     Done
   - **b. Make sure that the code runs on your computer, and that you have all the images downloaded from MyCourses that you need.**
     Done
   - **c. Document the code, so that you can remember what it does when you study from it.**
     Done
   - d. **The processing deletes some information before displaying the images. Does it allow you to identify the images? Could you still tell what was in the image?**
     I observed that edges of the faded parts in the images are deleted after processing them. Also, by applying margins on every border of image we are removing 20 pixels from top, bottom, left and right borders.
   - **e. What information is being removed before the edge images are displayed?**
     Output of the program will show the edges. But all those edges that are below the threshold value (top 5% in our case) are removed.
     In our case, we took 5% as threshold value. So only top 5% sharpest edges are visible.
   - **f. What do you observe about the resulting images?**
     Resulting images are smooth images and we have extracted the sharpest edges from the green channel of original image.
   - g. **Are there any edges that you would expect to see that are not showing up? In particular, in the Science Frog image and the Camo Failure image, are there any missing lines?**
     Output is not showing up all the edges present. Rather its showing the edges where gradient changes are more.
     In Camo Failure image, it's hard to determine from the output that a boy is standing by the wall. While in Science frog image, edges of text written and the frog is also visible, but the frame of the board is not visible. But in images where change in gradient is less, then we will have lighter edges and the program will discard those edges.
   - h. **Why do you think the edges of the Road Home show up so well?**
     When we move from dark to light or light to dark we have more change in gradient. Larger value of change in gradient means clear edges. In our program, we are discarding unclear edges. In Road home image we have more higher contrast object so that makes more change in gradients and hence clear edges.
   - **i. Are there any missing edges you would expect to see around the infinity symbol in the image with the orange balloon at infinity?**

	I cannot see the lower left edge of the balloon. I think the reason behind that is shadow of the Balloon. The light is coming from top right so lower left part of balloon is darker and the background is also darker so change in gradient for left lower edge is lesser and hence discarded by the program. Also, the window edges are not visible in output.

j. Could you read all of the text information? Was some of the text more difficult to read than others?
Text is visible in almost all the images except in ANPR_Yellow_IMG_0764.jpg and TBK_OLD_LANDMARK_Dr.jpg

k. The code runs twice over each image. What does it do differently the second time through?
The output of the second iteration is little bit more clearer then the first one. The only difference is in second iteration the value of edge_bin_inc is 0.0001, while in first iteration the edge_bin_inc is calculated by dividing edge_maxx value by 256 and which leads to wider range of bin_edges in second iteration.

l. What general shape do you notice about the histogram that results from this processing?
Histogram generated by first iteration have high peaks. But the peaks are very low for second part. Also lines in histogram are very close in second part as the edge_bin_inc value is very less.

m. Do some images generate different shaped histograms? (Be sure to watch the histograms, and not just the images.)
Histogram for TBK_WALL_IMG_1066.jpg image is different as it ended in the half way.

n. What does the magenta line on the histogram represent? What is to the left or right of the line?
The magenta line represents the cutoff partition. All the edges left to it are discarded by our program and the edges towards the right are accepted.

o. Do any edges show up on the kite that you would not expect to see?
I can see the lines on the surface of the kite. I was not expecting those lines to show up as we are working to find the edges and those lines does not represent object boundaries.

p. In my original idea for this homework, you would set the fraction of the edges to reject for each image. Each image has more or less "edginess" too it. Instead, I set the constant fraction of 0.95. Change this value to 0.75. What differences do you see?
By doing so we are reducing the cutoff value so more edges will be qualified to show up in the output. By doing so I can see more edges and these edges looked very smooth. I can read the text in the images, also the balloon's boundary is complete. In Camo Failure image, I can recognize a boy standing by the wall. Also, he Magenta line got shifted to left as the cutoff value decreased to 0.75.

q. Change the constant fraction to a value of 0.98. What difference do you see?
By changing the constant fraction to 0.98 situation worsens even more. Output has lesser edges as compare to 0.95 because many other pixels could not come under consideration as cutoff increased. Only remaining 2% sharpest edges qualify to show up. Also, Magenta line shifted to right.

r. List new matlab functions you learned about. These include `numel`, `histcounts`, `find`, and several others…

- numel :- It returns the number of elements in matrix.
- histcounts:- histcounts partition the values into bin_edges and then returns the count in each bin as well as bin edges.
- find :- find returns a vector of indexes of input elements where we have non zero element value. Ir has various other parameters as well that I have described in program comments.
- plot :- plots vector Y vs X over y and x axis respectively.
- cumsum :- Returns a vector with cumulative sum of elements in given vector.
- stem :- stem(Y) plots the data sequence Y as stems from the x axis terminated with circles for the data value.

- gcf :- to get the handle of current figure.

2. **Conclusions**:
Write a paragraph or two about your learnings on this homework about cell arrays, and about the statistics of images.
Feel free to incorporate example images or figures in your write-up to demonstrate your learnings.
I learnt a lot from this homework. Before this homework, I knew how to find sobel edges using magnitude and angles. But this homework helped in learning how to select top x% of edges as all the edges are not always useful. Since this program was very generic, we can change the cutoff to any value and we can extract those many sharp edges accordingly.
Also, how learnt how to draw line in histogram to show the partition of qualified and disqualified edges. We can put line in any program to get clear visual statistical data using this.
Implemented cell array in last homework too, but doing it again made me more comfortable to work with it.