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Assignment 3: Seam Carving for Content-Aware Image Resizing

CPSC 635

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Questions

1.For instance if we maximize the energy according to how this energy is calculated we will delete high frequency which is edges. the seem includes strong edges as these are the places change happen very fast (high frequency). one alternative function I can think of I the mean and variance of gradients in a line and minimize them.

2.

a- One way I think about is exactly do the same as we do to delete a seem, instead, we add the average of the minimum energy seam with its neighbours and add between them.

b- think about a image that there are some objects and a very simple background our original seam carving (that we already have) ,for instance the vertical version tend to delete the spaces vertically from background and make the objects closer to each other horizontally. but if we delete the minimum energy in each row, our shapes will lose their original shape after a few run of the algorithm.

c- In [1] they characterize two major factors that limit their seam carving approach. The first is the amount of content in an image. If the image is too condensed, in the sense that it does not contain ‘less important’ areas, then any type of content-aware resizing strategy will not

succeed. The second type of limitation is the layout of the image content. In certain types of images, albeit not being condensed, the content is laid out in a manner that prevents the seams from bypassing important parts (Figure 1).

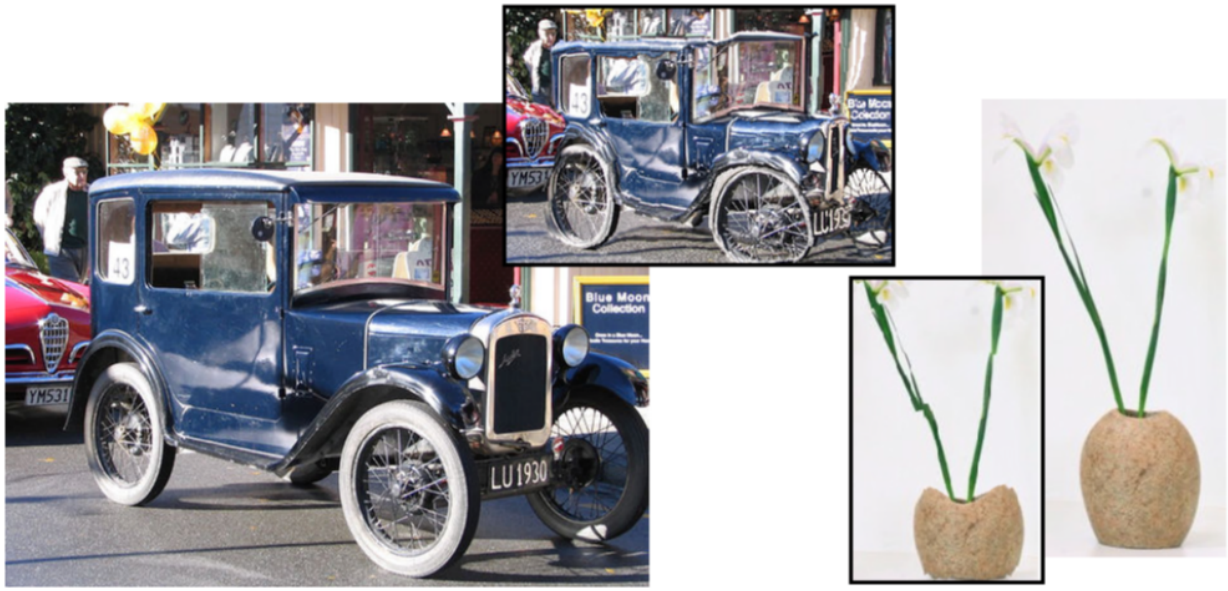

Figure 1:Examples when resizing using seams fails: images that are too condensed (left) or where the content layout prevents seams to bypass important parts (right). In such cases the best strategy would be to use scaling.[1]

Moreover,Sometimes the algorithm, by removing a low energy seam, may end up inadvertently creating a seam of higher energy. The solution to this is to simulate a removal of a seam, and then check the energy delta to see if the energy increases. If it does, prefer other seams instead.[2]

3. As the image get smaller the energy of minimum energy seam will become more (most of the time not always). To clarify, from a point the minimum energy seam will contain important part of the image like edges and deleting seam from that point will effect the shape of the objects in image.

4. As in the Figure 1 can be seen. if we have a big object in image or if we carve the image and make a object big enough to be hit by any seam, the artifact like violating straight line will happen, for instance, lines broken from some parts. on way I think we can deal with them is instead of doing every thing automatic we manually have some restriction on part of image not be touched by the algorithm and it will work way better.

Results

As you can see in the image below this is the result of removing 200 px from width and 200 px from hight of boat image provided in the assignment.

Figure 2: original picture of boat

Figure 3: removing 200 px from width and hight of the Figure 2. as you can see in the image and we covered in the Question section of the assignment the straight line has been violated and become broken.

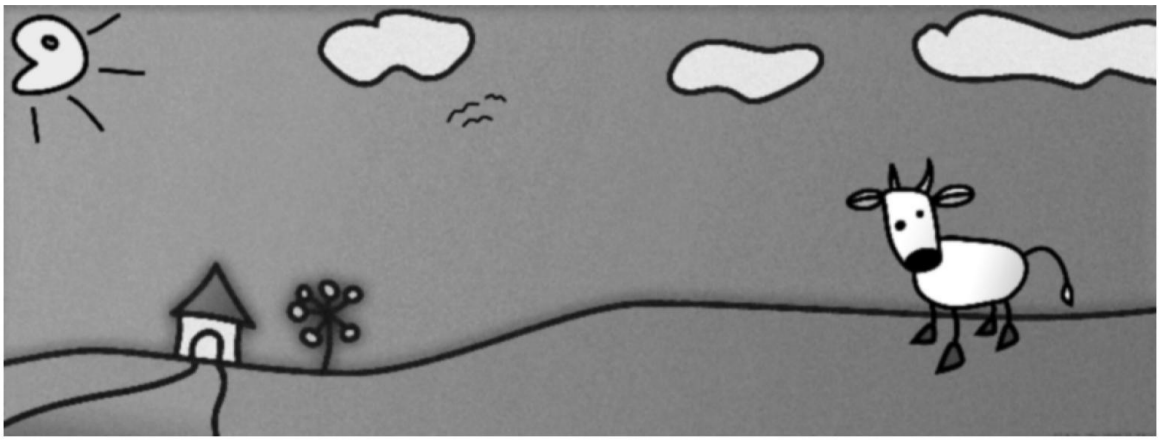

Figure 4: original picture provided in the assignment description.

Another example is done the algorithm with the image provided in the assignment description

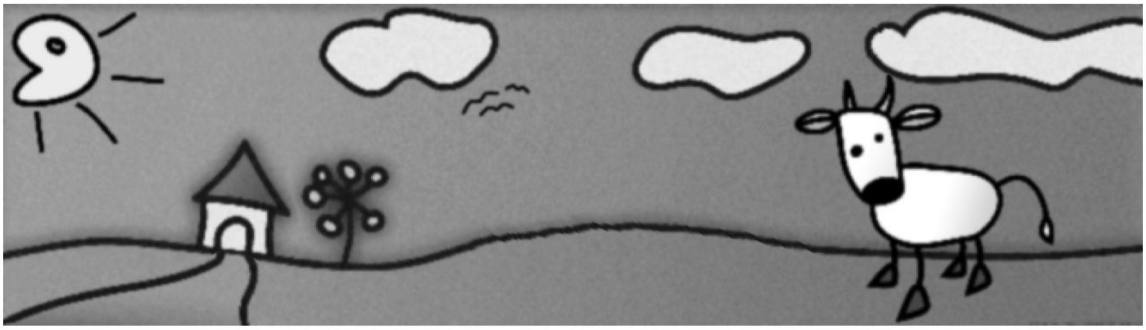

Figure 5: removing 200 px from width and hight of the Figure 4.the difference between my result and the result in the assignment description is due to I take snip of the image in the assignment description and the size of the image is bigger than what it really is.

Comparing Speed of the Code

As I search in the internet for implementation of the Seam Carving I find [3] that was implement by Matlab and get the backtracking idea from it. After implementing my code I compare the speed of them in my machine(with tic; toc;). Unfortunately [3] did not delete the seam from and I can only compare my finding seam and backtracking with it.

the [3] code takes about “2.5 sec” for computing the seam with applying Gaussian and then find the gradient and calculate the energy and run dynamic programming and then backtracking to find the seam. but my code on each iteration when applied to the boat image takes “0.0634 sec”, this result is the average of each time calculating the seem and delete from the image in first 100 pixels vertically.

The time result in detail coms as follow:

smoothing, find energy and solve the Dynamic Programming : 0.0492

backtracking to find the seem : 0.0014

deleting the seam : 0.0101

Code Guide

to start with code “seam_test.m” will run any given image to it. the program is made with

functions and as it can be seen in “seam_test.m” you can use “seam_carve” function to

do seam carving in each direction in as many times as you want.

References

[1] Seam carving for content-aware image resizing. Shai Avidan and Ariel Shamir. ACM Transactions on Graphics, SIGGRAPH 2007, 26(3), 2007.

[2] Improved Seam Carving for Video Retargeting. Michael Rubinstein, Ariel Shamir, Shai Avidan. SIGGRAPH 2008.

[3] http://www.mathworks.com/matlabcentral/fileexchange/46227-seam-carving-with-dijkstra-and-dynamic-programming