

Algorithm Assignment 4: Filter

CS123: Introduction to Computer Graphics

Due: Thursday, October 22 5:00 pm

Filter is worth 10% of your final grade, and this Algorithm assignment is worth 10% of the project. Remember that collaboration is only allowed in accordance with our collaboration policy. You may talk about problems with others, but you must not take away written notes or answers from any collaboration sessions.

Tip: Be sure to run the signal processing applets before diving into this assignment:

<http://www.cs.brown.edu/exploratories/freeSoftware/catalogs/signalprocessing.html>

Your name: _____
CS login: _____

1 Blur

Let's perform a 1D blur using the following kernel

0.25	0.50	0.25
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on the following image:

0.8	0.6	0.3	0.4	0.5	0.1	0.8
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For the following questions, assume zero-based indexing into the kernel and image arrays.

(2 points) Blurring at an image point x , fill in the blanks in the inner loop. Don't worry about image boundary conditions yet (see the next question), and keep in mind that the kernel width is 3.

$$\sum_{i = \boxed{}}^{\boxed{}} \text{image}[\boxed{}] \cdot \text{kernel}[\boxed{}]$$

(1 point) How will you handle edge cases in your inner loop (part 1)? Be sure to explain how you will keep your image's lightness constant.

2 Scaling

(1 point) What is the filter support width when you scale by a factor of $n > 1$ (scaling up)?

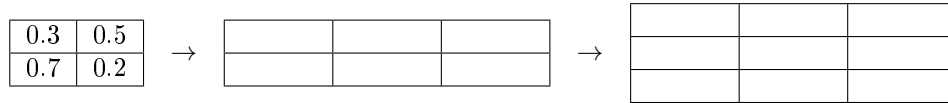
(1 point) What is the filter support width when you scale by a factor of $0 < n < 1$ (scaling down)?

(2 points) When scaling up and down, when do you and when don't you have to normalize the filtered pixel values?

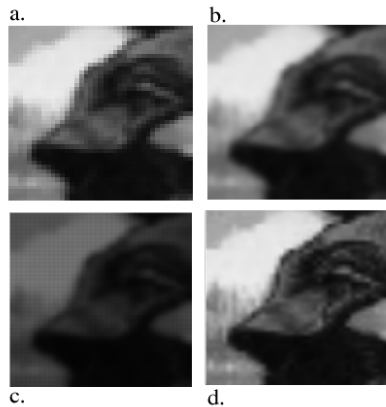
Suppose we would like to scale an image up by 1.5 in two steps using a triangle filter.

(1 point) What is the filter's support width?

(1 point) Manually scale the image:



(1 point) The following are four scalings of the region shown in the image. One was scaled using a gaussian filter, another using a triangle filter, another using a linear (constant) filter, and one using a very badly designed filter. Which is which?



- Gaussian filter _____
- triangle filter _____
- linear (constant) filter _____
- very badly designed filter _____