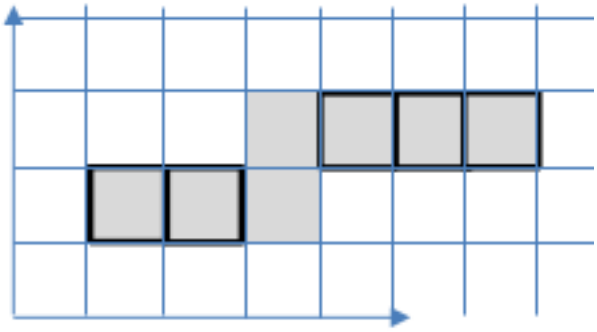
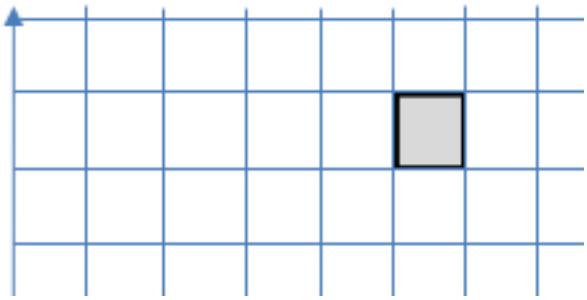
Daniel McDonough
CS 549
9/16/19
HW3

1a.



1b.



2.

$(f(x) * g(x)) * h(x) =$
$= I=0->J(\sum f[I]g[J-I]) * h(x)$
$= J=0\rightarrow K\sum I=0\rightarrow J\sum f[I]\ g[J-I]\ h[K-J]$
$=J=0\rightarrow K\sum J=I\rightarrow K\sum f[I]\ g[J-I]\ h[K-J]$
$=J=0\rightarrow K\sum J=0\rightarrow K-I\sum f[I]\ g[J]\ h[K-J-I]$
$=I=0\rightarrow K\sum f[I]\ (g[x] * h[x])$
$= f(x) * (g(x) * h(x))$

3.

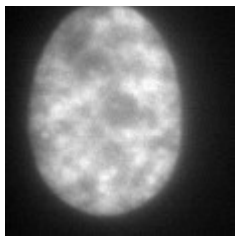
$DFT = 1/N * x=0\rightarrow N-1\sum hx*e^{(-j2\pi kx/N)} = H(x)$

$h(x) = J* \sin(Nx)$

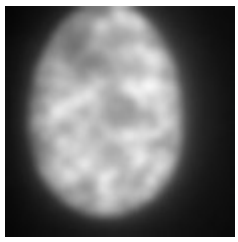
$o(x) = s(x)*h(x) =$
$= 1/N * x=0\rightarrow N-1\sum J * \sin(Nx)*e^{(-j2\pi kx/N)}$
$=$ **$J/N * e^{(-j2\pi kx/N)} * \sin(Nx)$**

4.

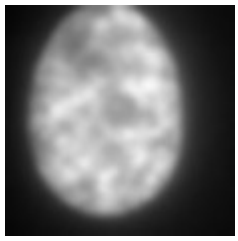
Original Image (Fixed Cell Nuclei):



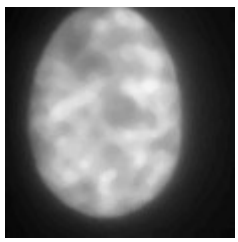
Box Filter (W = 5):



Gaussian (sigma = 3):

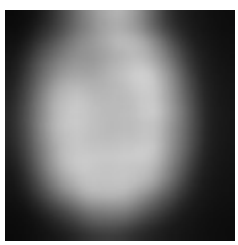


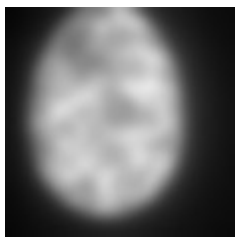
Median Filter (5x5):



Answer the following: What happens if you change the window size?

Box Filter (W=25):
Here as the window changes the central pixel is changed to a larger pool to be the mean of. The image becomes more uniform and the edges start to “fade”.





Gaussian Filter (W=25, sigma 3):
As the window size changes the amount of pixels to be taken into for the Gaussian kernel. As the window increases the image becomes gradually more blurred.

Median Filter (W=25):
As the window changes the central pixel is normalized to the median of the given window. As the window increases the same pixels are considered for the median, and the overall image becomes “more segmented”.