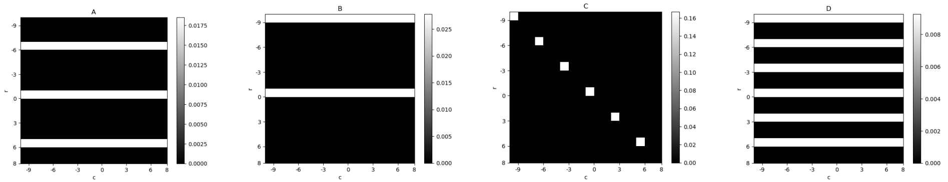
6.003: Signal Processing

Filtering Images

November 18, 2021

Filtering Images

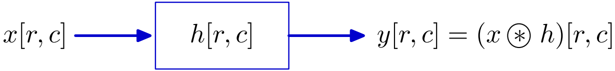
Which of the following space-domain images can be constructed by filtering one of the other images by the DFT of another of them?



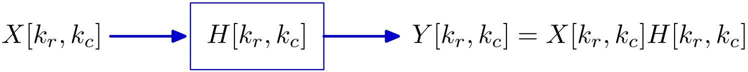
Filtering Images

Filter model:

Space-domain interpretation:



Frequency-domain interpretation:

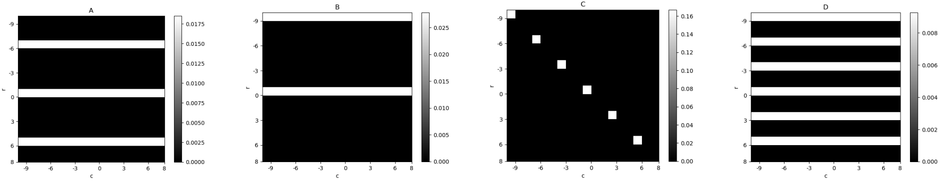


We should be able to understand the previous problem both ways.

Filtering Images

Which of the following images can be constructed by

- circularly convolving two of the other images
- inverse transforming the product of the DFTs of two images



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- circularly convolving two of the other images
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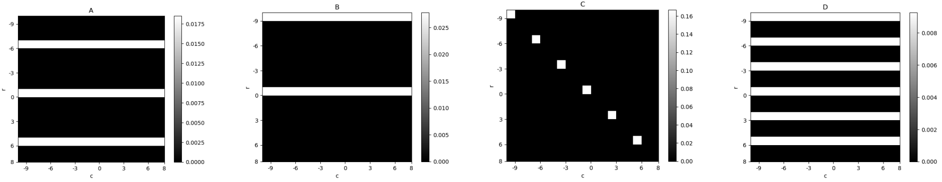


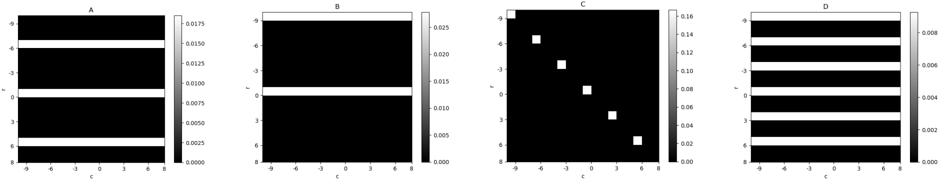
$D \propto A \circledast B.$

$D \propto A \circledast C.$

$D \propto B \circledast C.$

Filtering Images

Try the transform method.



Filtering Images

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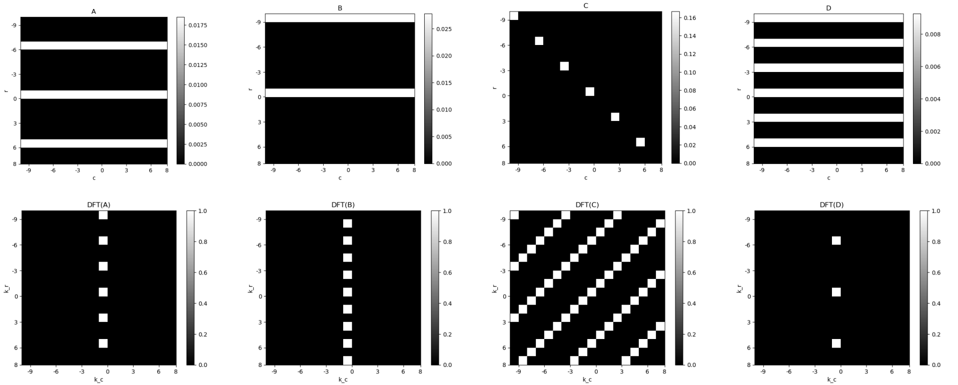
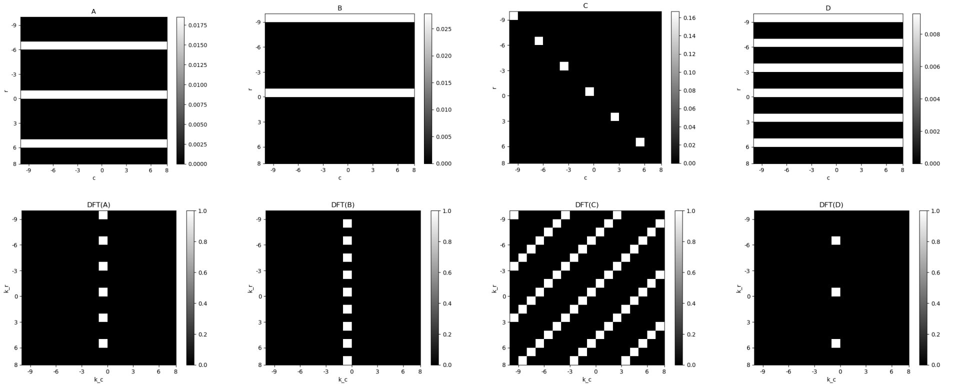


Filtering Images

Try the transform method.



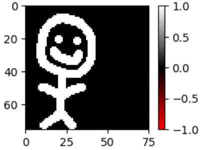
DFT(D) $\propto$ DFT(A) $\times$ DFT(B)

DFT(D) $\propto$ DFT(A) $\times$ DFT(C)

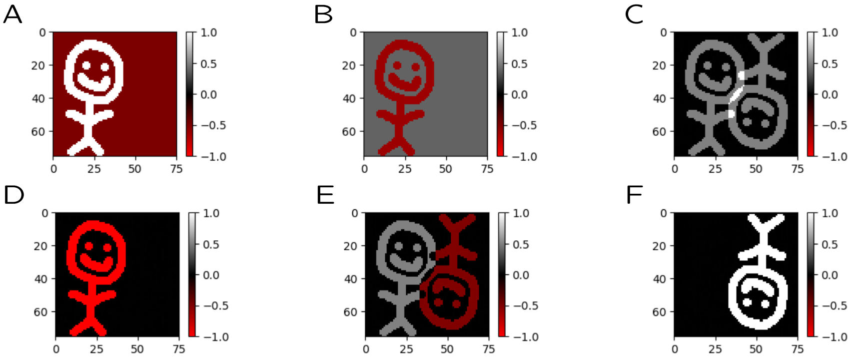
DFT(D) $\propto$ DFT(B) $\times$ DFT(C)

Stickmen

Let $X[k_r, k_c]$ represent the 2D DFT of the following image.



Which of A-F (if any) shows the iDFT of the real part of X?



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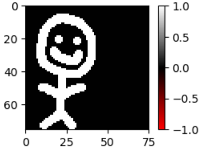
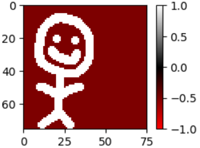
Let $X[k_r, k_c]$ represent the 2D DFT of the following image.

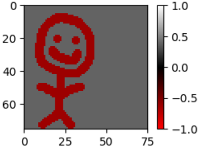


Which of A-F (if any) shows the iDFT of the real part of X? C

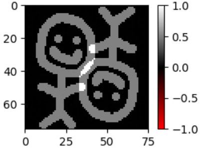
A



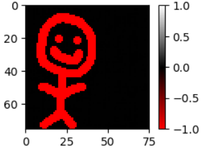
B



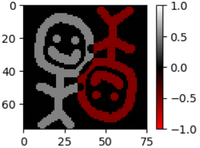
C



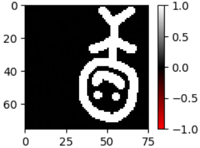
D



E

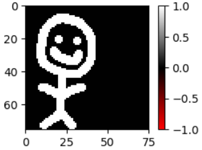


F

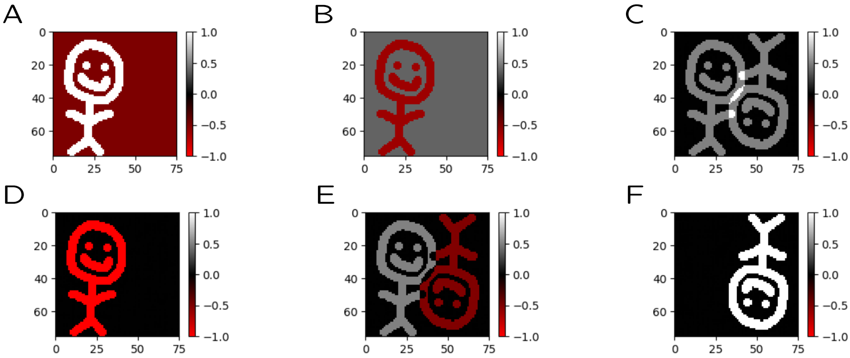


Stickmen

Let $X[k_r, k_c]$ represent the 2D DFT of the following image.

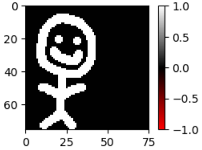


Which (if any) shows the iDFT of the imaginary part of X?



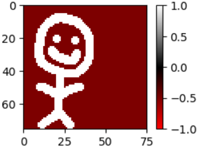
Stickmen

Let $X[k_r, k_c]$ represent the 2D DFT of the following image.

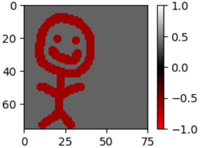


Which (if any) shows the iDFT of the imaginary part of X? None

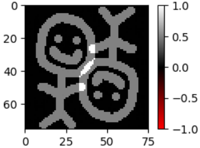
A



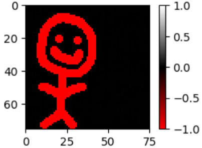
B



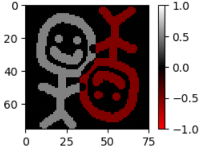
C



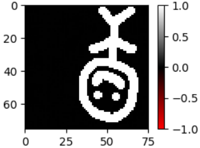
D



E

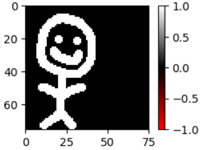


F



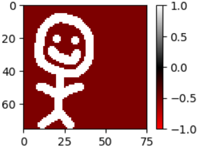
Stickmen

Let $X[k_r, k_c]$ represent the 2D DFT of the following image.

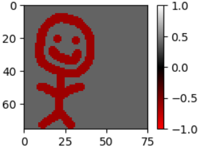


Which (if any) shows the iDFT of j times the imaginary part of X?

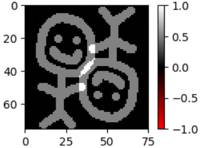
A



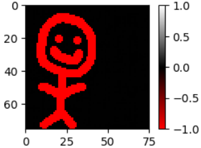
B



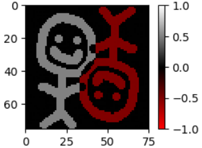
C



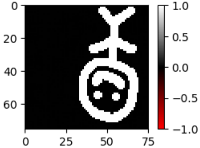
D



E



F



Stickmen

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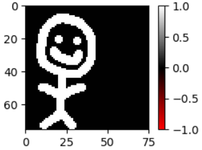
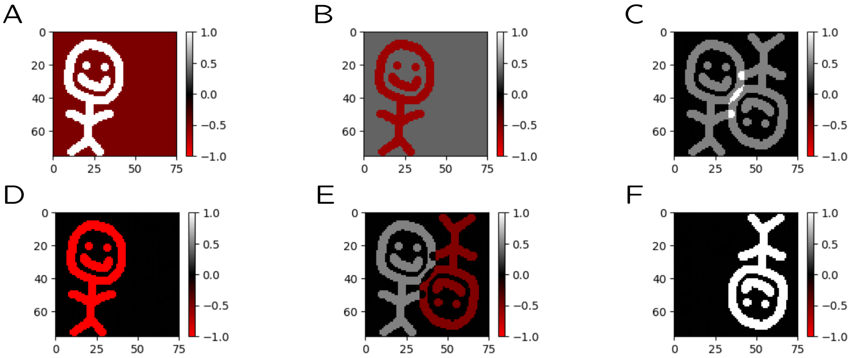


Which (if any) shows the iDFT of j times the imaginary part of X? E



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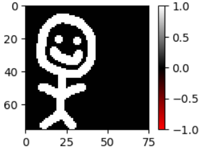
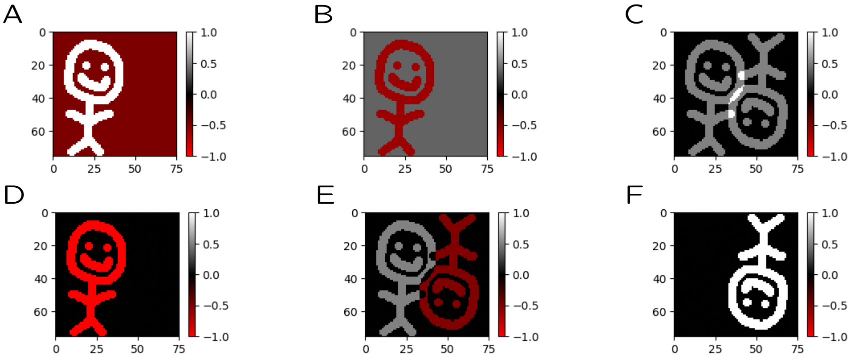


Which (if any) shows the iDFT of X after setting $X[0,0] = 0$.



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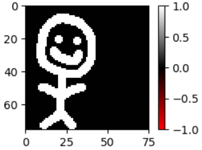
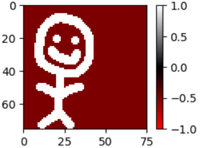
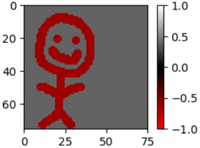


Which (if any) shows the iDFT of X after setting $X[0,0] = 0$. A

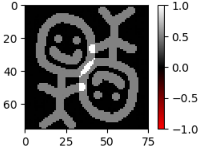
A



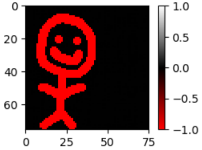
B



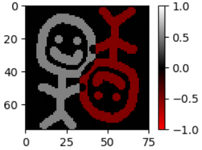
C



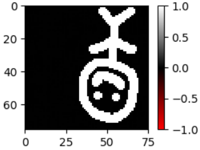
D



E



F



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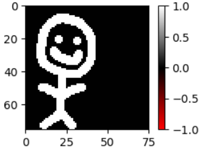
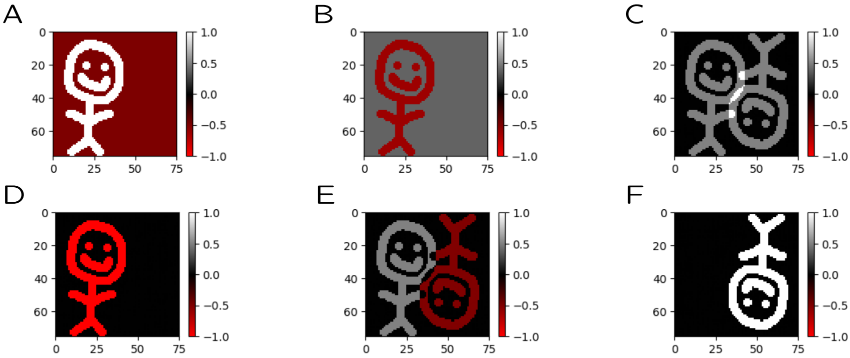


Which (if any) shows the iDFT of X after multiplying every value by $e^{j\pi}$.



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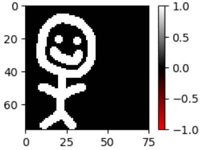

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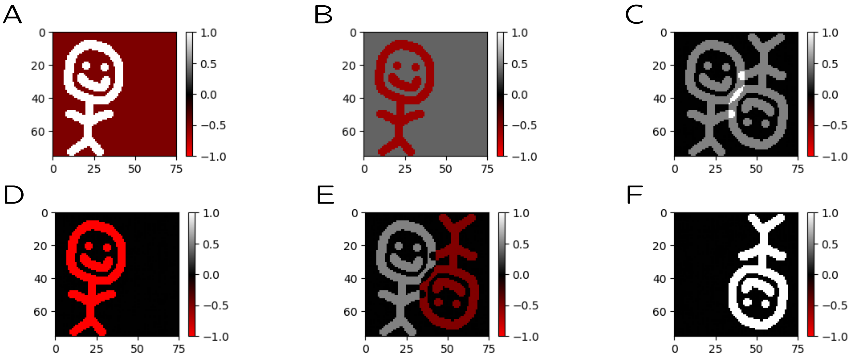
D



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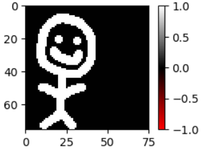
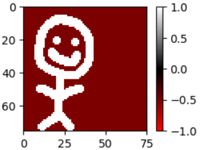
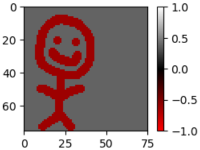


Which (if any) shows the iDFT of X after multiplying every value except $X[0,0]$ by $e^{j\pi}$.

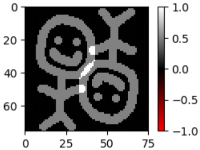
A



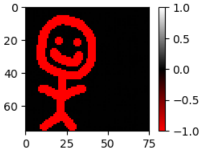
B



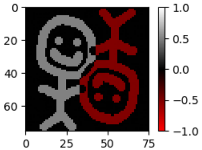
C



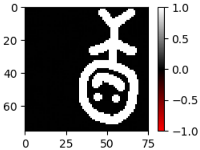
D



E



F



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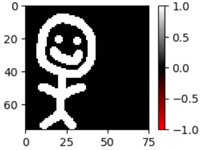
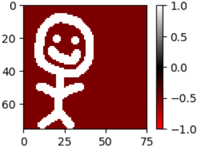
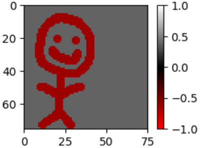


Which (if any) shows the iDFT of X after multiplying every value except $X[0, 0]$ by $e^{j\pi}$. B

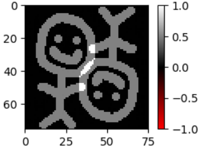
A



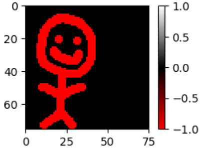
B



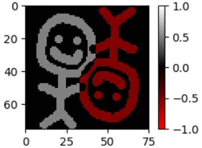
C



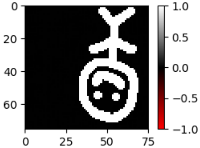
D



E

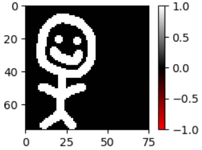


F



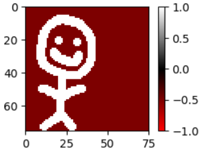
Stickmen

Let $X[k_r, k_c]$ represent the 2D DFT of the following image.

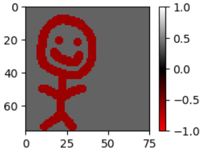


Which (if any) shows the iDFT of X after negating the phase of each point in X.

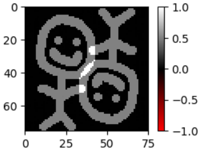
A



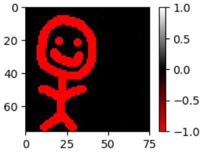
B



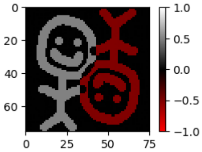
C



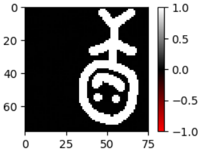
D



E

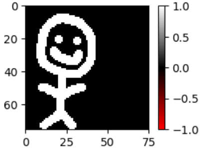


F



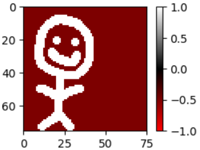
Stickmen

Let $X[k_r, k_c]$ represent the 2D DFT of the following image.

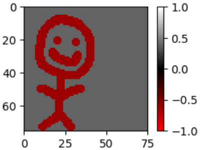


Which (if any) shows the iDFT of X after negating the phase of each point in X. F

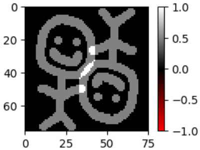
A



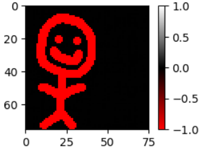
B



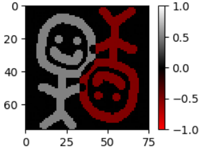
C



D



E



F