

# CS 663 Home Work Assignment 3

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## Contents

|          |   |          |
|----------|---|----------|
| <b>1</b> | <b>Question 1</b>                         | <b>2</b> |
| 1.1      | Original image fourier diagrams . . . . . | 2        |
| 1.2      | Ideal low pass filter . . . . .           | 2        |
| 1.3      | Gaussian low pass filter . . . . .        | 4        |
| 1.4      | Comments on images . . . . .              | 6        |

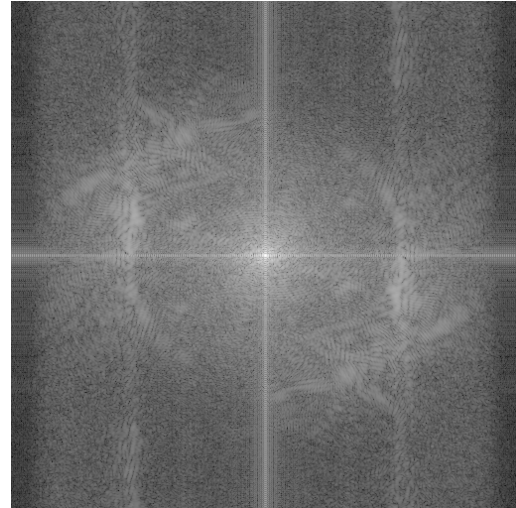
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## 1 Question 1

### 1.1 Original image fourier diagrams



(a) Given Barbara image



(b) Log absolute fourier of given image

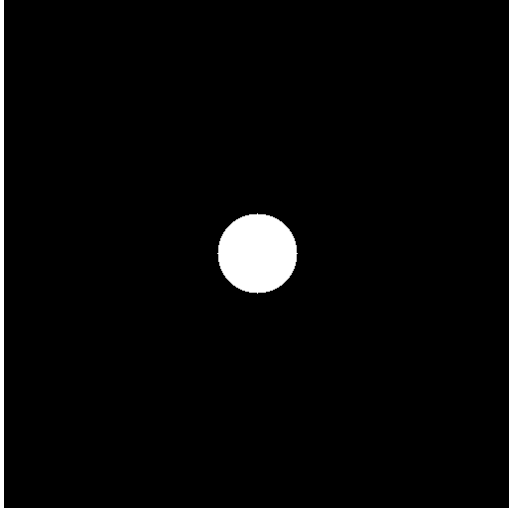
### 1.2 Ideal low pass filter



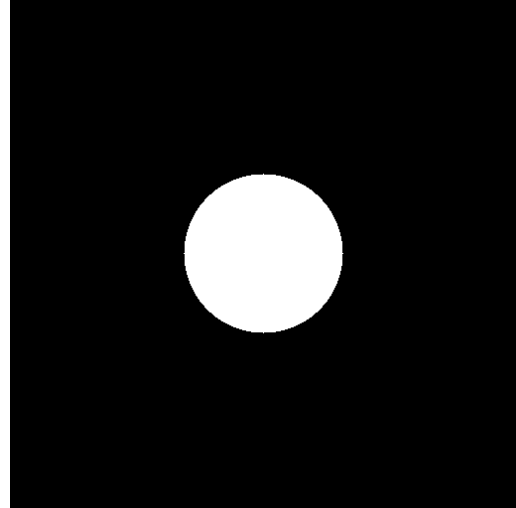
(a) Filtered image with ideal filter having  $D=40$



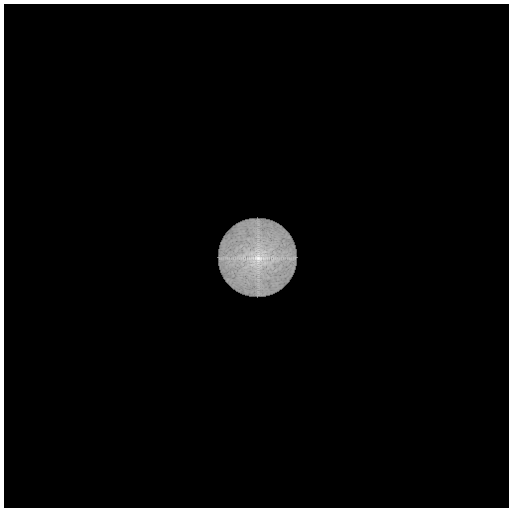
(b) Filtered image with ideal filter having  $D=80$



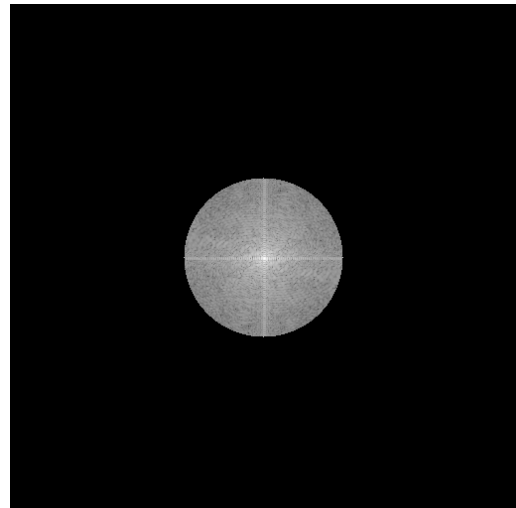
(a) Log frequency response for ideal filter with  $D=40$



(b) Log frequency response for ideal filter with  $D=80$



(a) Log fourier transform of ideal filtered image with  $D=40$



(b) Log fourier transform of ideal filtered image with  $D=80$

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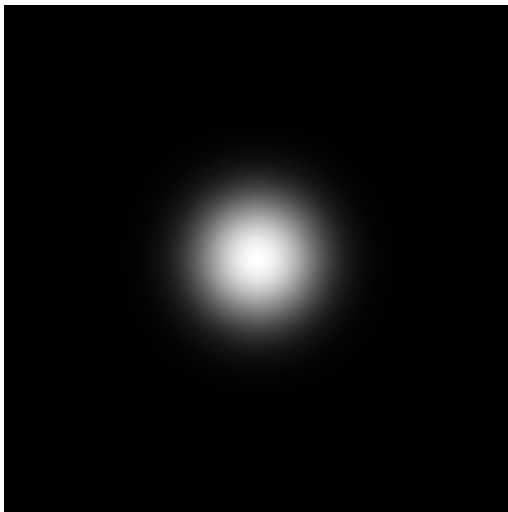
### 1.3 Gaussian low pass filter



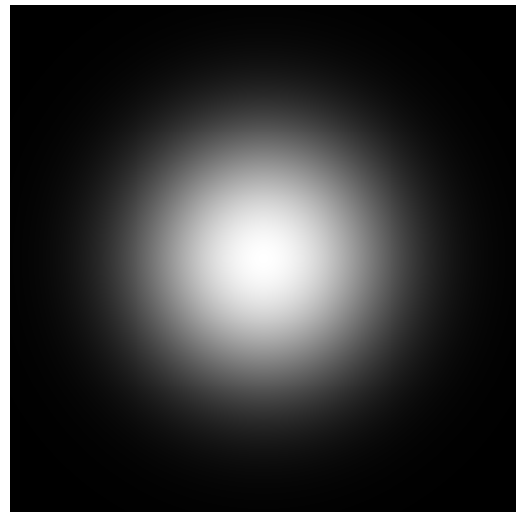
(a) Filtered image with gaussian filter having sigma=40



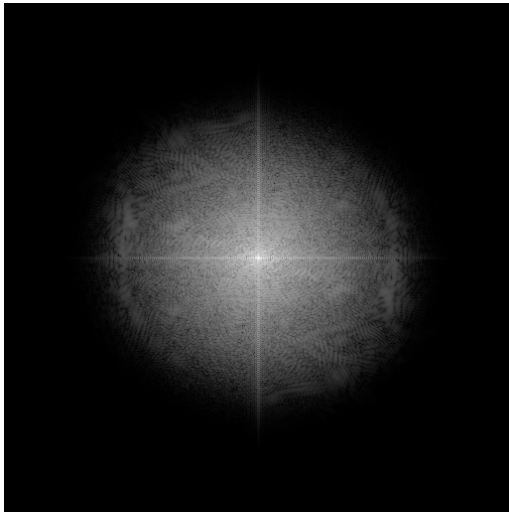
(b) Filtered image with gaussian filter having sigma=80



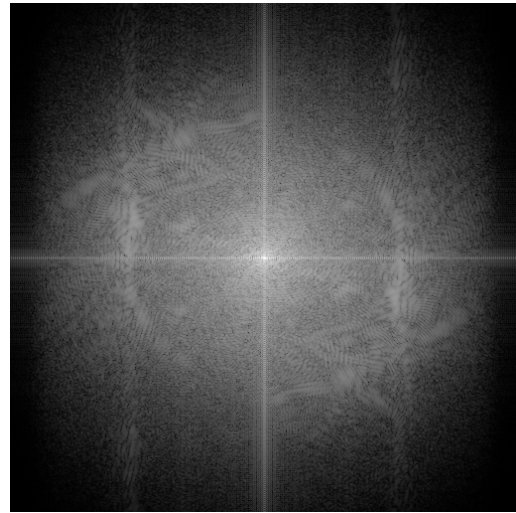
(a) Log frequency response for gaussian filter with sigma=40



(b) Log frequency response for gaussian filter with sigma=80



(a) Log fourier transform of gaussian filtered image with  $\sigma = 40$



(b) Log fourier transform of gaussian filtered image with  $\sigma = 80$

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## 1.4 Comments on images

- The value of  $D$  or  $\sigma$  determines which frequencies are allowed (in case of ideal) or which frequencies are more attenuated (in case of gaussian). Higher the parameter the higher frequencies are less attenuated.
- In case of ideal filter we observe ringing artifacts since higher frequency are completely removed making sudden changes in intensity of pixel difficult so we get rings
- In case of gaussian filter the frequencies are not completely zero leading to reduction of this ring effects but because of removal of higher frequencies we see a blurred image
- We can see from log fourier transform of filtered image that higher frequency is completely eliminated in ideal filter whereas attenuated in gaussian filter