Image Processing
Project 1

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Prezi

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utput

- Take
  dimens
- Get ma
  the oth
- Analyze

Task 1

- Read an intensity image g(x, y) of width w and height h
- Compute a new image $\tilde{g}$(x, y) according to following rule:

$$\tilde{g}(x,y) = \begin{cases} 0, & \text{if } r_{\text{min}} \leq \|(x,y) - (\frac{w}{2}, \frac{h}{2})\| \leq r_{\text{max}} \\ g(x,y), & \text{otherwise} \end{cases}$$

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Approach

- Used scipy.misc.imread()
- scipy.misc.imsave()
- numpy arrays
- Matplotlib for visualization

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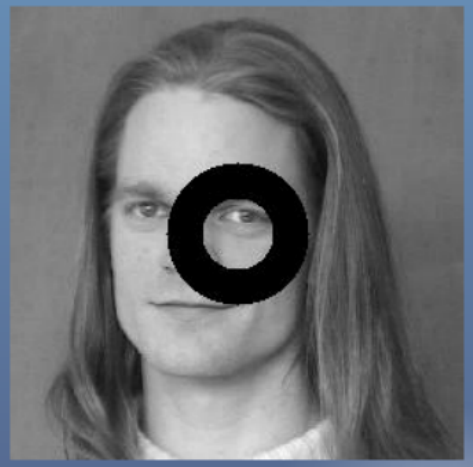
Final Output

Input



Output

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Task 2

Band Pass Filter:

- Read an image g(x, y)
- Compute its Fourier transform G(μ, ν)
- Suppress frequencies outside the band rmin and rmax to obtain $\tilde{G}(\mu, \nu)$
- Finally compute the inverse Fourier transform $\tilde{g}(x, y)$ of $\tilde{G}(\mu, \nu)$

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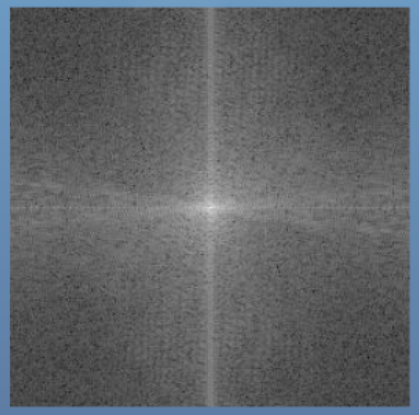
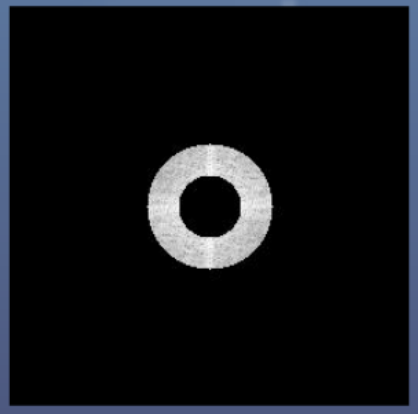
Final Output

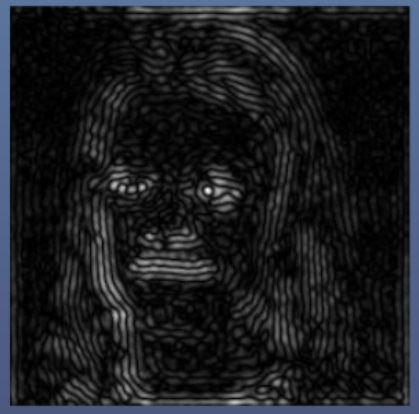
$g(x, y)$



$\log|G(\mu, \nu)|$



$\log|\tilde{G}(\mu, \nu)|$



$\tilde{g}(x, y)$

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Task 3

Importance of Phase:

- Take any two images of identical dimensions
- Get magnitude from one and phase from the other to create a new image
- Analyze the resulting image

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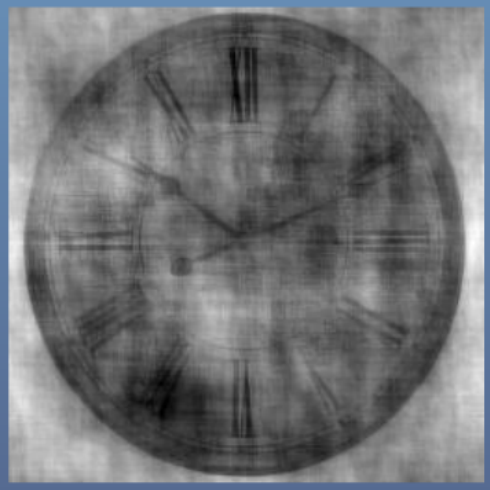
Final Output

magnitude from "clock.jpg"
phase from "bauckage.jpg"



magnitude from "bauckhage.jpg"
phase from "clock.jpg"

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An observation

During calculation of magnitude information for an image, initially we were using this formula:
re = mag/np.sqrt(1+np.square(np.tan(phase)))

But as we can observe this will never evaluate to a negative number because of np.square

So rather use re = mag*np.cos(phase)

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Final Observations

- Fourier transform converts an image into its sine and cosine components
- Changes an image from spatial to frequency domain
- Final conclusion: Phase of an image holds a great deal of the information needed to reconstruct the image

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