

KOGW-PM-KNP: Edge detection

Questions - Gaussian filtering

July 4, 2016

Complete the tasks using python. Your answers should include the code you wrote and written answers to the questions with relevant output images.

Task 1. Gaussian filtering of an image

1. Using the given equation for a 2D Gaussian filter, plot the output of a filter-convolved image with an appropriate sigma σ value.

$$G(x, y) = \frac{1}{2\pi\sigma^2} e^{-\frac{x^2+y^2}{2\sigma^2}}$$

Hint: Use `PIL.Image.open` to import your image, and from `scipy.signal` use the `convolve2d` (with `mode='same'`) function for the convolution.

2. What type of filter results from a high σ value?
3. Can you think of a way of extracting high frequency components from an image using only a low frequency filtered image? Plot such an image and comment on its quality

Task 2. Difference of Gaussian filtering of an image

1. Create a Difference of Gaussian (DOG) filter by applying two different sigma valued Gaussian filters to the original image and then subtracting the two outputs from each other.
2. Try to find optimum sigma values for detecting edges in an image.
3. Comment on differences between this filter and the first.

Task 3. Phase and Fourier 1

Task 4. Phase and Fourier 2