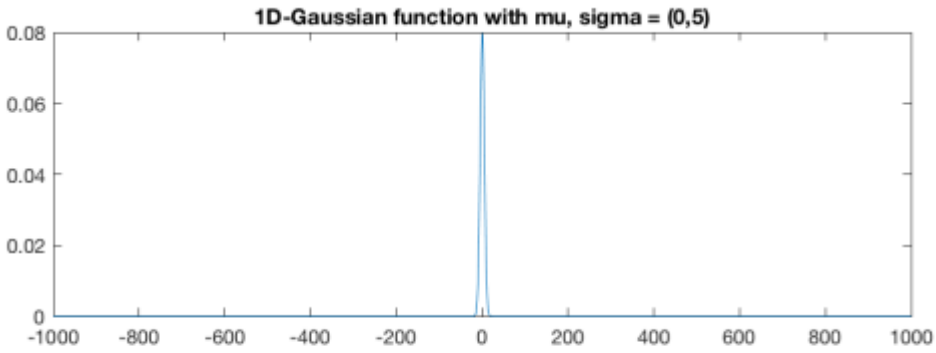
CV HW1 Gaussian Filter

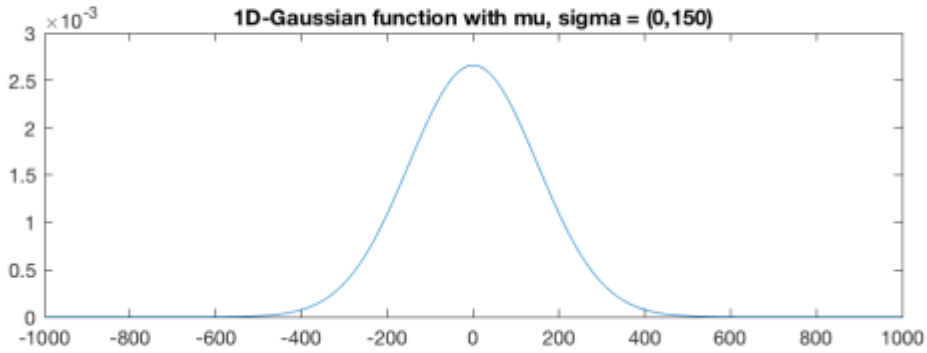
404410030 資工三 鄭光宇

2-1 Plot Gaussian Distribution

1. Plot the 1-D Gaussian curve for x = -1000 to 1000 with step size=1 (-1000, -999, -998,…,998, 999, 1000) and the following mu and sigma:
   a) mu=0, sigma = 5
   b) mu=0, sigma = 150

   Ans:





2. Produce the 3*3 Gaussian filter by 2-D Gaussian formula with
   a) mu=0, sigma = 1 and

$$\begin{pmatrix} 0.0751 & 0.1238 & 0.0751 \\ 0.1238 & 0.2042 & 0.1238 \\ 0.0751 & 0.1238 & 0.0751 \end{pmatrix}$$

   因為是作為圖像 filter 使用，所以有 normalize。

   b) mu=0, sigma = 4.

$$\begin{pmatrix} 0.1088 & 0.1123 & 0.1088 \\ 0.1123 & 0.1158 & 0.1123 \\ 0.1088 & 0.1123 & 0.1088 \end{pmatrix}$$

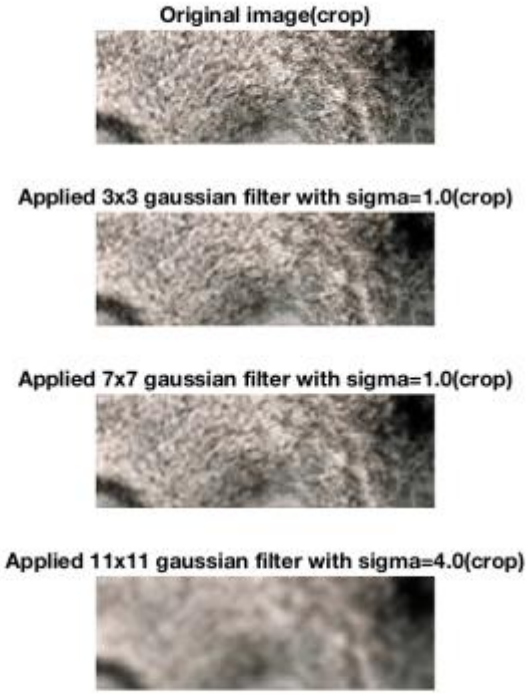
   因為是作為圖像 filter 使用，所以有 normalize。

3. Implement the CONVOLUTION operation and apply the two masks a) 3*3, mu=0, sigma = 1, b) 7*7, mu=0, sigma = 1 to Koala.bmp. Compare the results of a) and b) and draw your conclusion.

   使用 Convolution Theorem，也就是將圖片與卷積核先做 DFT，轉到頻域，將兩這的結果點積起來，再用 IDFT 轉回頻域，就會是兩者卷積後的結果。

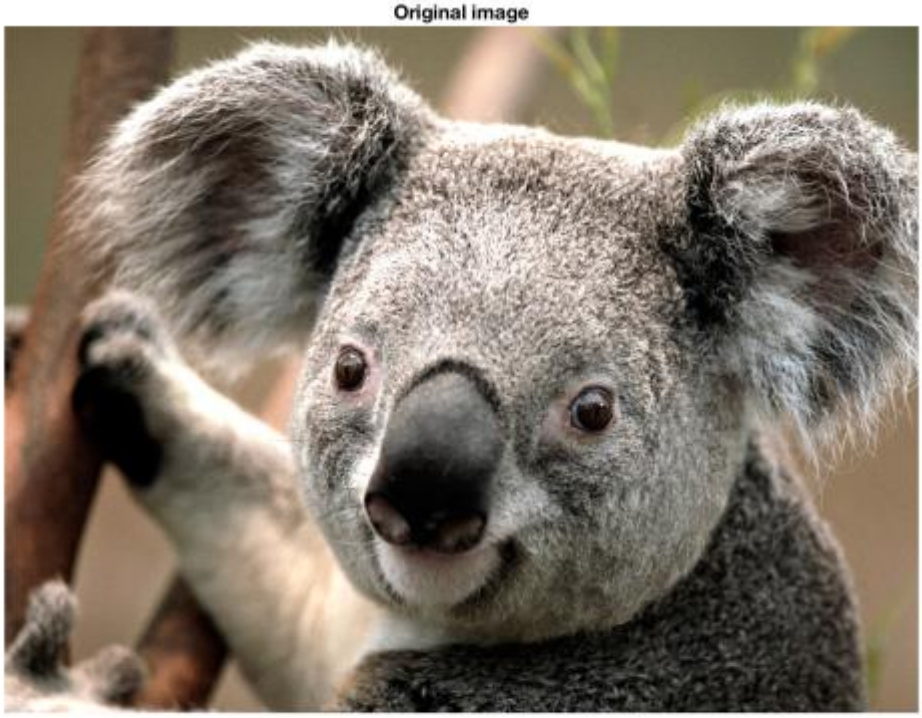
   Ans:

   可以看出，Filter 尺寸越大，產生的結果愈模糊，比較圖片如下：



以下是完整圖片可供參考：

Original image



Applied 3x3 gaussian filter with sigma=1.0

Applied 7x7 gaussian filter with sigma=1.0

Applied 11x11 gaussian filter with sigma=4.0

追加一張 Lenna.tiff 上的效果：