Assignment 1 (Due: Apr. 03, 2016)

1. (Math) Gaussian function is

\[ G(x, y; \sigma) = \frac{1}{2\pi\sigma^2} \exp\left(-\frac{x^2 + y^2}{2\sigma^2}\right) \]

The scale-normalized Laplacian of Gaussian (LOG) is

\[ \nabla^2 G = \sigma^2 \nabla^2 G \]

Please verify that Difference of Gaussian (DOG)

\[ DoG = G(x, y; k\sigma) - G(x, y; \sigma) \]

can be a good approximation of LoG.

2. (Programming) Hough transform is a widely used model fitting algorithm. Please use Hough transform to detect circles (boundaries of coins) in the following image. For the output, you are required to superimpose the fitted circles on the original image.

3. (Programming) Get two images, taken from the same scene but with scale transformations. Detect the scale invariant points on the two images. You can use the center of the circle to indicate the spatial position of the point and use the radius of the circle to indicate the characteristic scale of the point, just like the following example.