Assignment 3 (Due: Dec. 25, 2016)

1. **Programming.** Adaptive median filter is more effective than the classical median filter, especially when dealing with highly intensive salt-and-pepper noises. In this assignment, you are required to implement the adaptive median filter mentioned in our lectures. With the adaptive median filter implemented by you, try to restore the following noisy image containing severe salt-and-pepper noises.

![Noisy Image](image)

(The above test image can be downloaded from our course website.)

2. **Programming.** Using image smoothing to improve global thresholding. As we have mentioned in our lectures, noise can turn a simple thresholding problem into an unsolvable one. A simple approach to deal with noisy images is to perform a noise reduction preprocessing step before the segmentation. For the following image \( f \), at first please try to segment it using the Otsu’s global threshold. Maybe the segmentation result is not quite satisfied. You can try to smooth \( f \) with a 5 by 5 mean averaging kernel to get \( f' \). Then, you can perform the segmentation to \( f' \) by using the Otsu’s global threshold.
3. **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.

(The above test image can be downloaded from our course website.)