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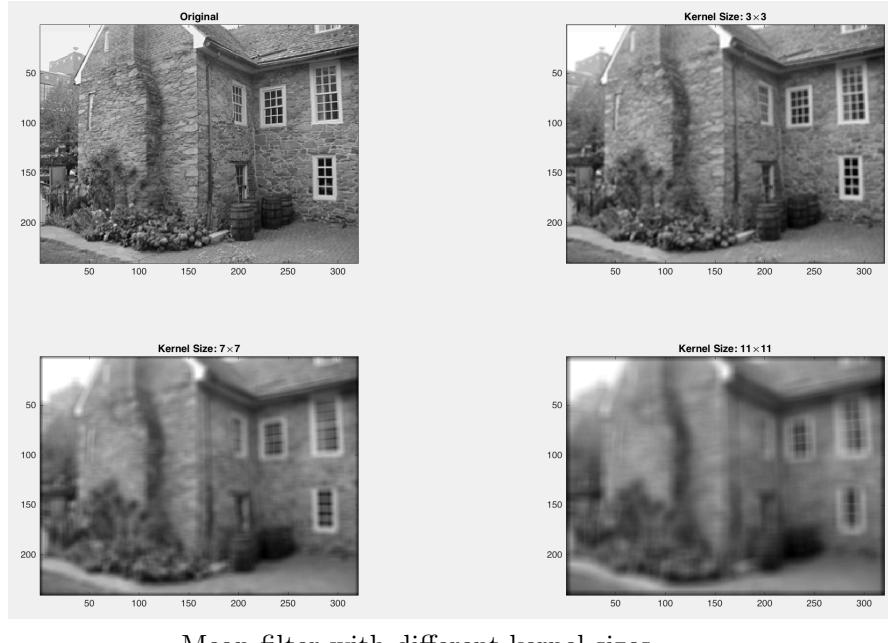
# Homework 6

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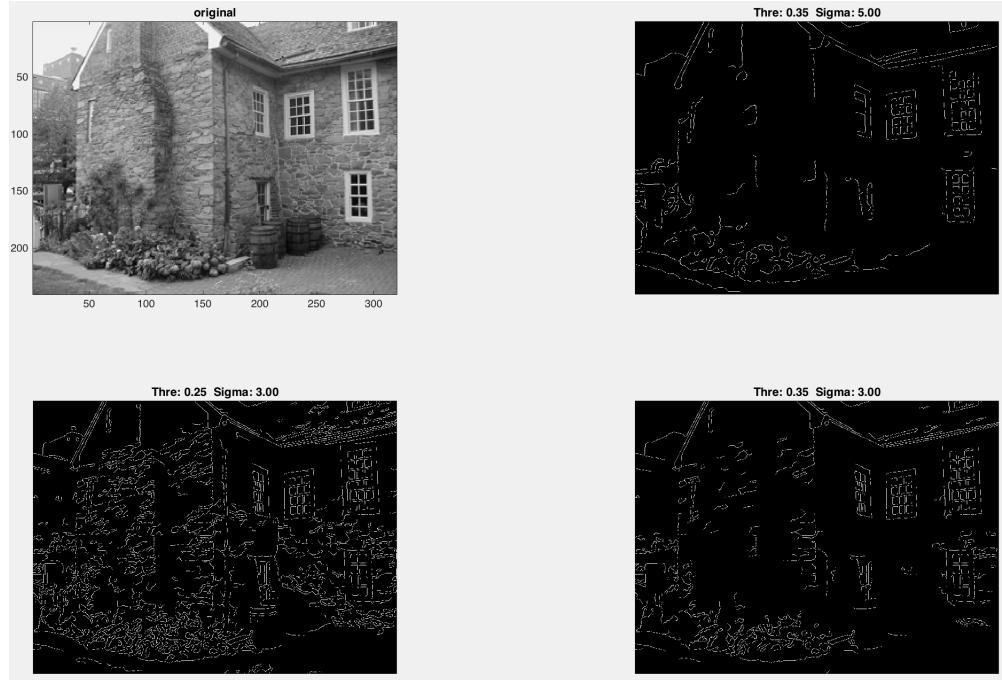
## 1. Mean Filter Results



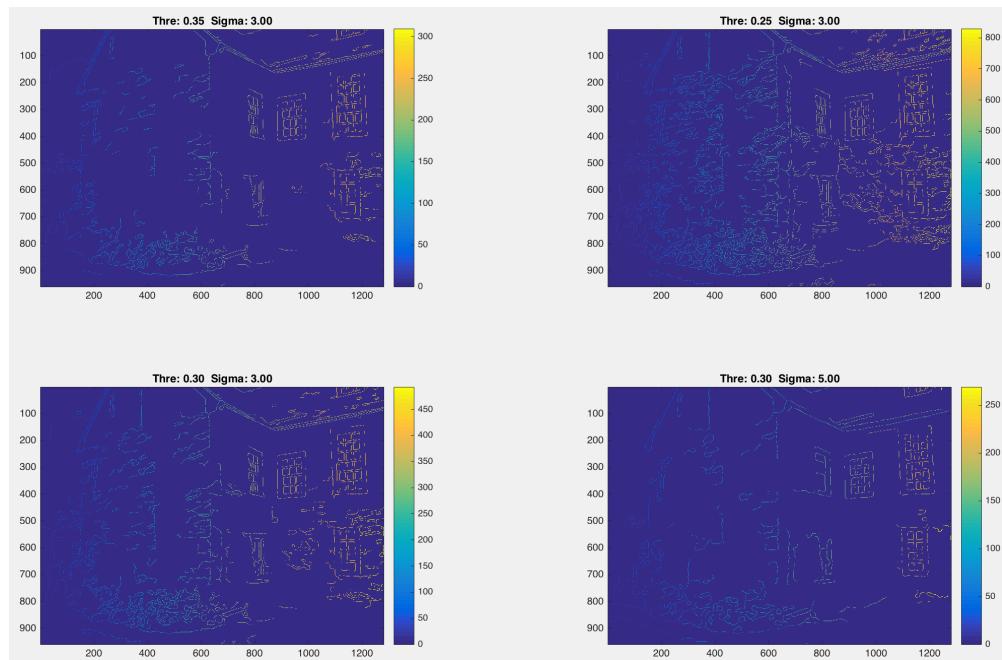
Mean filter with different kernel sizes

When the kernel size grows, the new value is the mean of more pixels' values in the neighborhood, which will make the locally distinctive points less stand out. Thus the image will be more blurred when the kernel size goes up.

## 2. Edge Detection

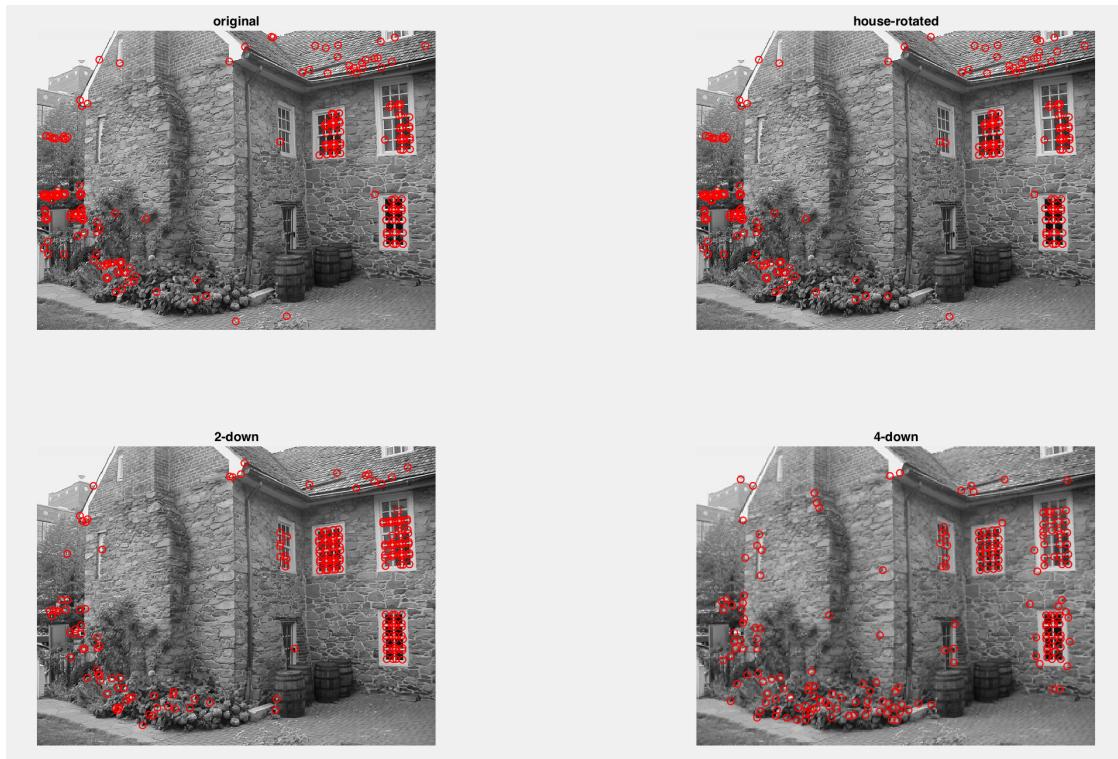


Canny edge result



Connected component edge result

### 3. Corner Detection



Harris corner experiment result

a) Harris Corner is Rotation Invariant

The two images from the first row of the plot are identical, which means the harris corner detection is invariant to rotation. This is because harris corner is characterized by the local property along the direction of the smallest increase.

b) Harris Corner is Not Scale Invariant

When the image scale changes, harris corner detection reports different results. So it is not scale invariant. It turns out that arbitrary window size couldn't handle the same corner of images of different scales.

### 4. Correspondences

a) SSD Based Correspondence Checking

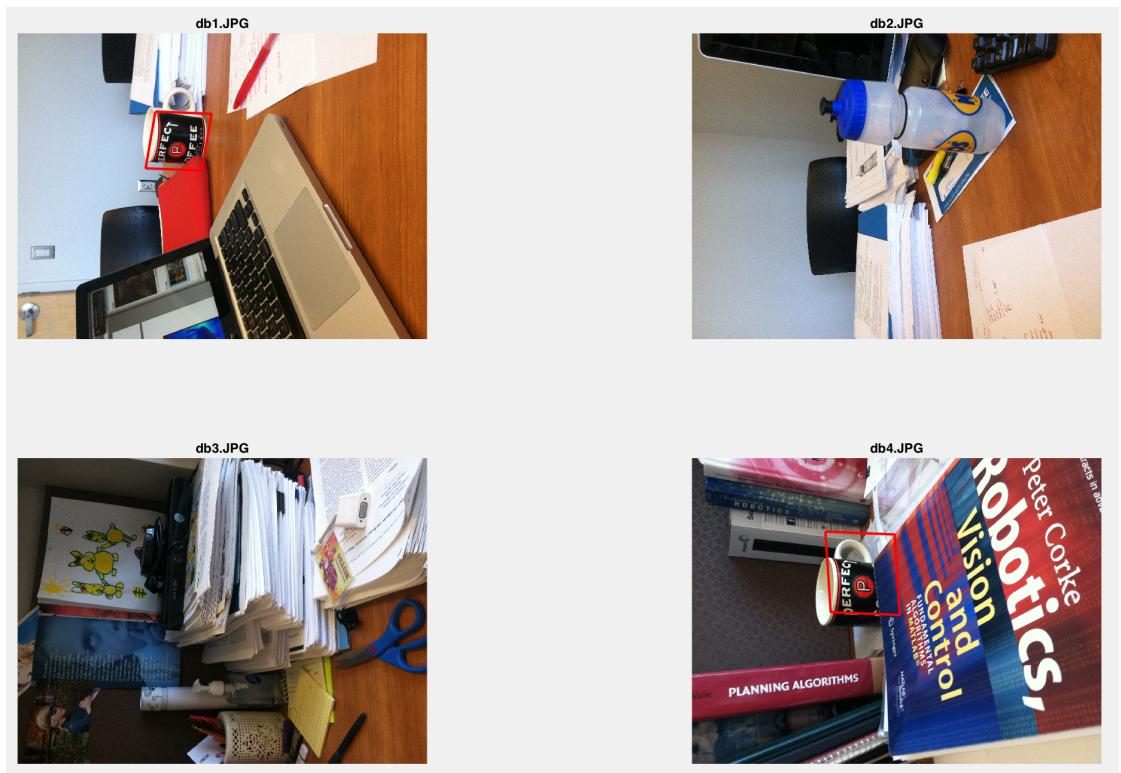
b) SIFT Descriptor Based Correspondence Checking



Correspondence Result

Comparison between the two methods

- i. SSD can detect some matching pairs when the viewpoint variations are not big, while it misses most of matching when rotation and scale variations dominate.
- ii. SIFT is invariant to viewpoint, rotation and scale changes in the test images.
- c) Object detection



Object detection result

#### Algorithm for finding the object

- i. Using SIFT feature to match between two images, keep only the feature pairs which appear in both direction of matching. If the left feature pairs are few(10 in the program), make a decision that the object is not in the database image.
- ii. Using RANSAC to fit the affine model from query image to database image
- iii. Transfer the hand-labeled bounding box in the query image to database image using the computed affine transformation model