

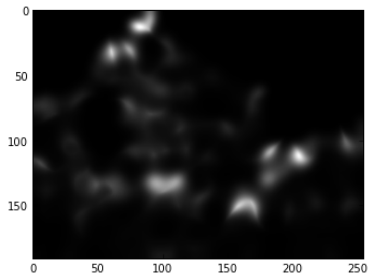

```
1 hdf = tables.openFile("1k.h5")
2 images = hdf.root.icons
3 image = mean(crop_black(images[77]),2)
4 imshow(image)
```



Harris Corners

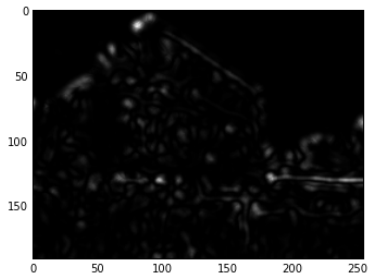
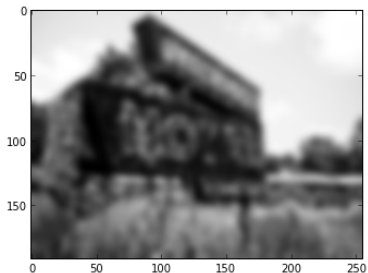
```
1 def harris(image, sigma=1.0, area=5.0):
2     dx = filters.gaussian_filter(image, sigma, (0,1))
3     dy = filters.gaussian_filter(image, sigma, (1,0))
4     sxx = filters.gaussian_filter(dx**2, area)
5     sxy = filters.gaussian_filter(dx*dy, area)
6     syy = filters.gaussian_filter(dy**2, area)
7     T = sxx+syy
8     D = sxx*syy-sxy**2
9     R = (T**2-4*D)**.5
10    hi = (T+R)/2
11    lo = (T-R)/2
12    return lo
```

```
1 subplot(121); imshow(image)
2 subplot(122); imshow(harris(image,2.0,6.0)**2)
```



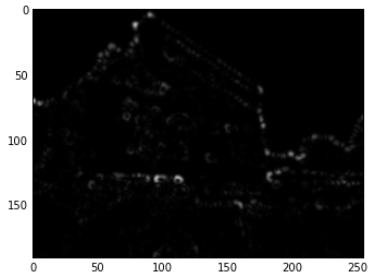
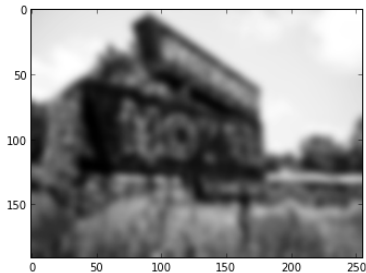
Corners from Median

```
1 smooth = filters.gaussian_filter(image,3.0)
2 subplot(121); imshow(smooth)
3 subplot(122); imshow(abs(smooth-filters.median_filter(smooth,10))
  **2)
```



Corners from Level Curves

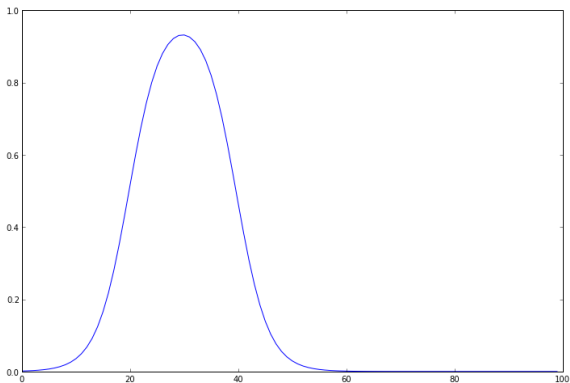

```
1 I = filters.gaussian_filter(image,3.0)
2 s = 2.0
3 Ix = filters.gaussian_filter(image,s,(0,1))
4 Iy = filters.gaussian_filter(image,s,(1,0))
5 Ixx = filters.gaussian_filter(image,s,(0,2))
6 Ixy = filters.gaussian_filter(image,s,(1,1))
7 Iyy = filters.gaussian_filter(image,s,(2,0))
8 k = Ix**2*Iyy + Iy**2*Ixx - 2*Ix*Iy*Ixy
9 subplot(121); imshow(smooth)
10 subplot(122); imshow(abs(k))
```



Orientation Histograms

```
1 I = filters.gaussian_filter(image,1.0)
2 s = 1.0
3 Ix = filters.gaussian_filter(image,s,(0,1))
4 Iy = filters.gaussian_filter(image,s,(1,0))
```

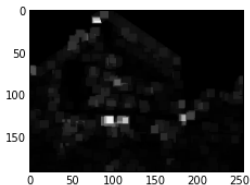
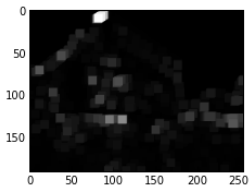
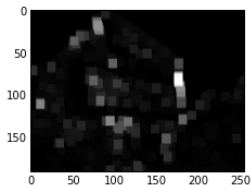
```
1 def between(x,a,b,r=0.03):  
2     return 1.0/(1+exp((a-x)/r))/(1+exp((x-b)/r))  
3 plot(between(linspace(0.0,1.0,100),0.2,0.4))
```



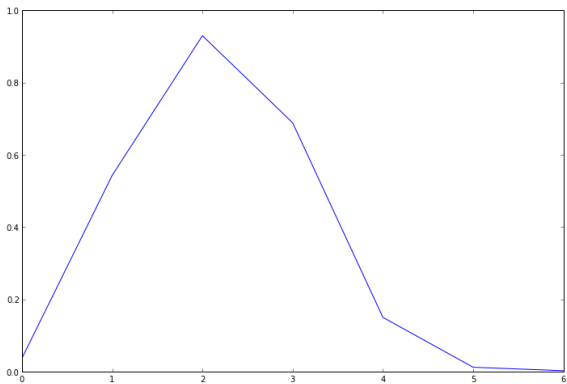
```

1 bins = []
2 for i,a in enumerate(linspace(0,pi,8)[: -1]):
3     p = abs(cos(a)*Ix+sin(a)*Iy)
4     p = between(p,0.6,1.0,0.05)
5     f = filters.maximum_filter(p,10)
6     f /= amax(f)
7     bins.append(f)
8 subplot(131); imshow(bins[0])
9 subplot(132); imshow(bins[2])
10 subplot(133); imshow(minimum(bins[0],bins[3]))

```

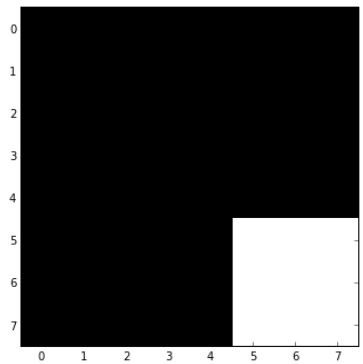
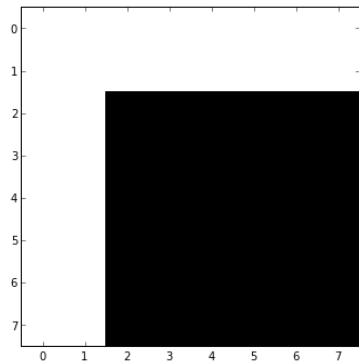


```
1 ohist = transpose(bins,[1,2,0])  
2 plot(ohist[5,80])
```



Morphological Corner Detection

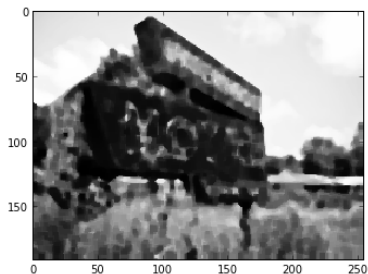
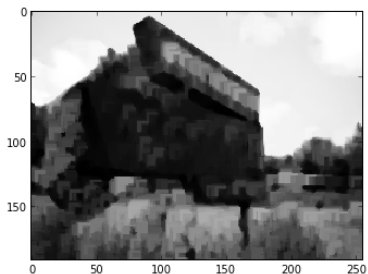
```
1 outside = zeros((8,8),'B')
2 inside = zeros((8,8),'B')
3 outside[:2,:] = 1; outside[:, :2] = 1
4 inside[-3:,-3:] = 1
5 subplot(121); imshow(outside)
6 subplot(122); imshow(inside)
```




```
1 smooth = filters.median_filter(image,5)
2 imshow(smooth)
```



```
1 oimage = morphology.grey_opening(smooth, footprint=outside)
2 iimage = morphology.grey_closing(smooth, footprint=inside)
3 subplot(121); imshow(oimage)
4 subplot(122); imshow(iimage)
```



```
1 imshow(maximum(0,oimage-image)**2)
```

