

# Digital Image Processing

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## Problem 9 Requirement

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### 9. Image segmentation (Test image: fig3.tif)

(a). Develop a program to implement the Roberts, Prewitt, Sobel, the Marr-Hildreth and the Canny edge detectors. Use the image 'building.tif' to test your detectors. (For technique details of Marr-Hildreth and Canny, please refer to pp.736-747 (3<sup>rd</sup> edition, Gonzalez DIP) or MH-Canny.pdf at the same address of the slides.)

(b). Develop a program to implement the Otsu's method of thresholding segmentation, and compare the results with the global thresholding method using test image 'polymersomes.tif'. (For technique details, please refer to pp.763-770 (3<sup>rd</sup> edition, Gonzalez DIP), or Otsu.pdf at the same ftp address of slides.)

## Problem 9 solution

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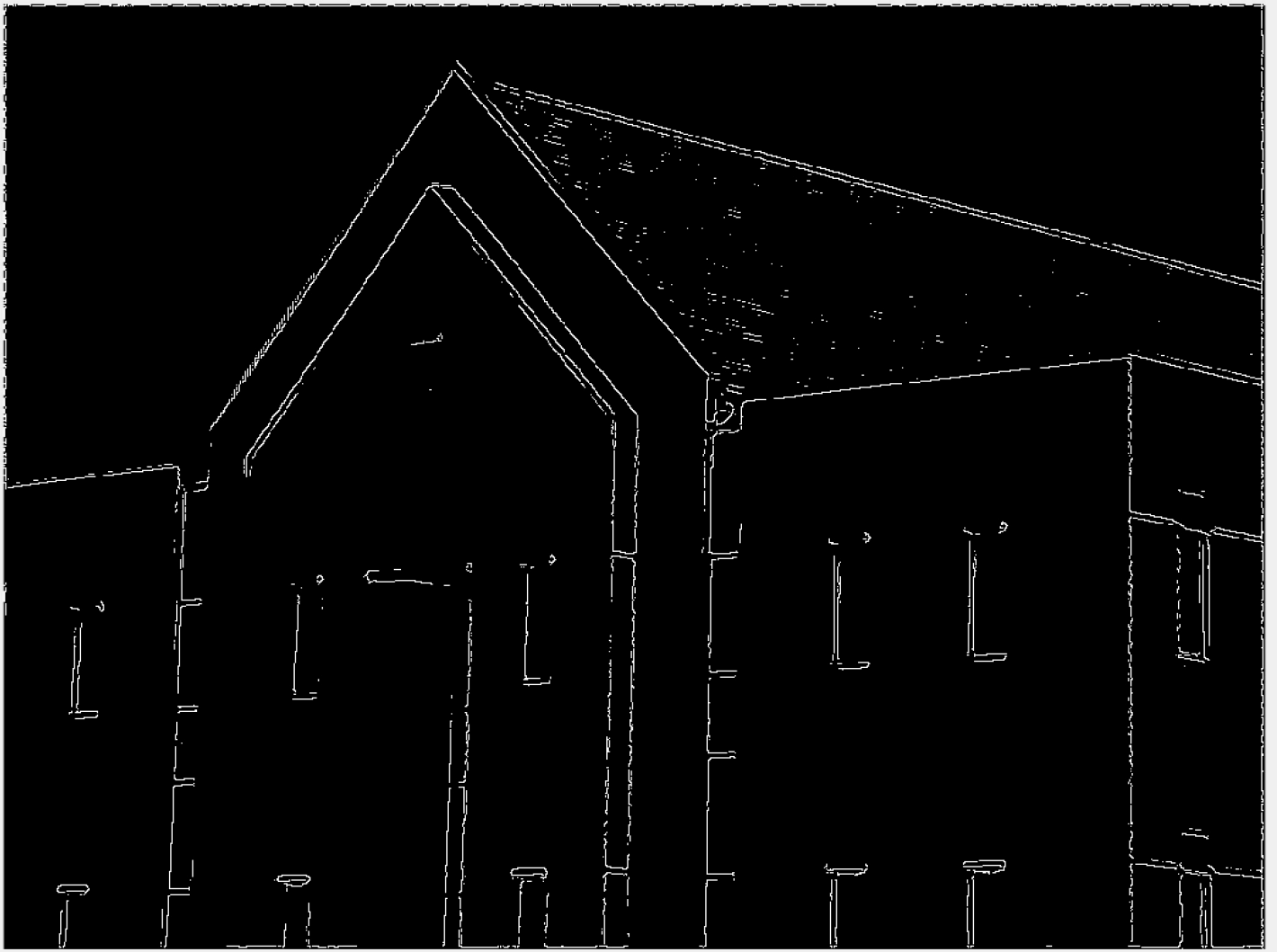
edge\_detection.m

```
1  img = imread('building.tif');
2  gray_img = mat2gray(img);
3  thresh = 0.33;
4  ave_filter_img = imfilter(gray_img,ones(5,5)/25);
5
6  robert_img = edge(ave_filter_img,'Roberts');
7  prewitt_img = edge(ave_filter_img,'Prewitt');
8  sobel_img = edge(ave_filter_img,'Sobel');
9
10 marr_img = edge(ave_filter_img,'log',0.0008,4);
11 canny_img = edge(ave_filter_img,'Canny',[0.04 0.1],4);
12
13 % imshow(canny_img);title('robert');
14
15 subplot(2,3,1),imshow(img);title('original');
16 subplot(2,3,2),imshow(robert_img);title('robert');
17 subplot(2,3,3),imshow(prewitt_img);title('prewitt');
18 subplot(2,3,4),imshow(sobel_img);title('sobel');
19 subplot(2,3,5),imshow(marr_img);title('marr');
20 subplot(2,3,6),imshow(canny_img);title('canny');
```

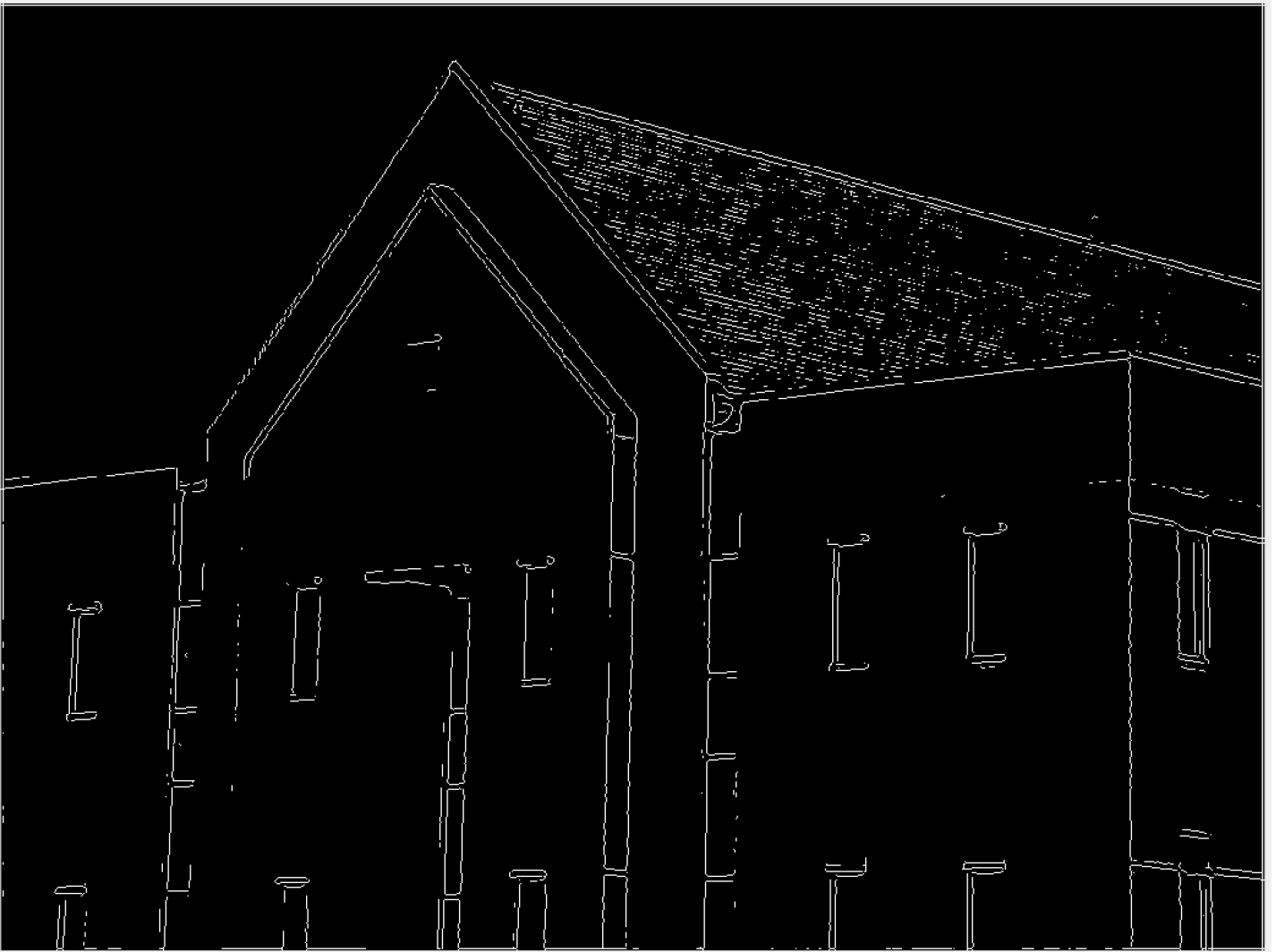
## Original



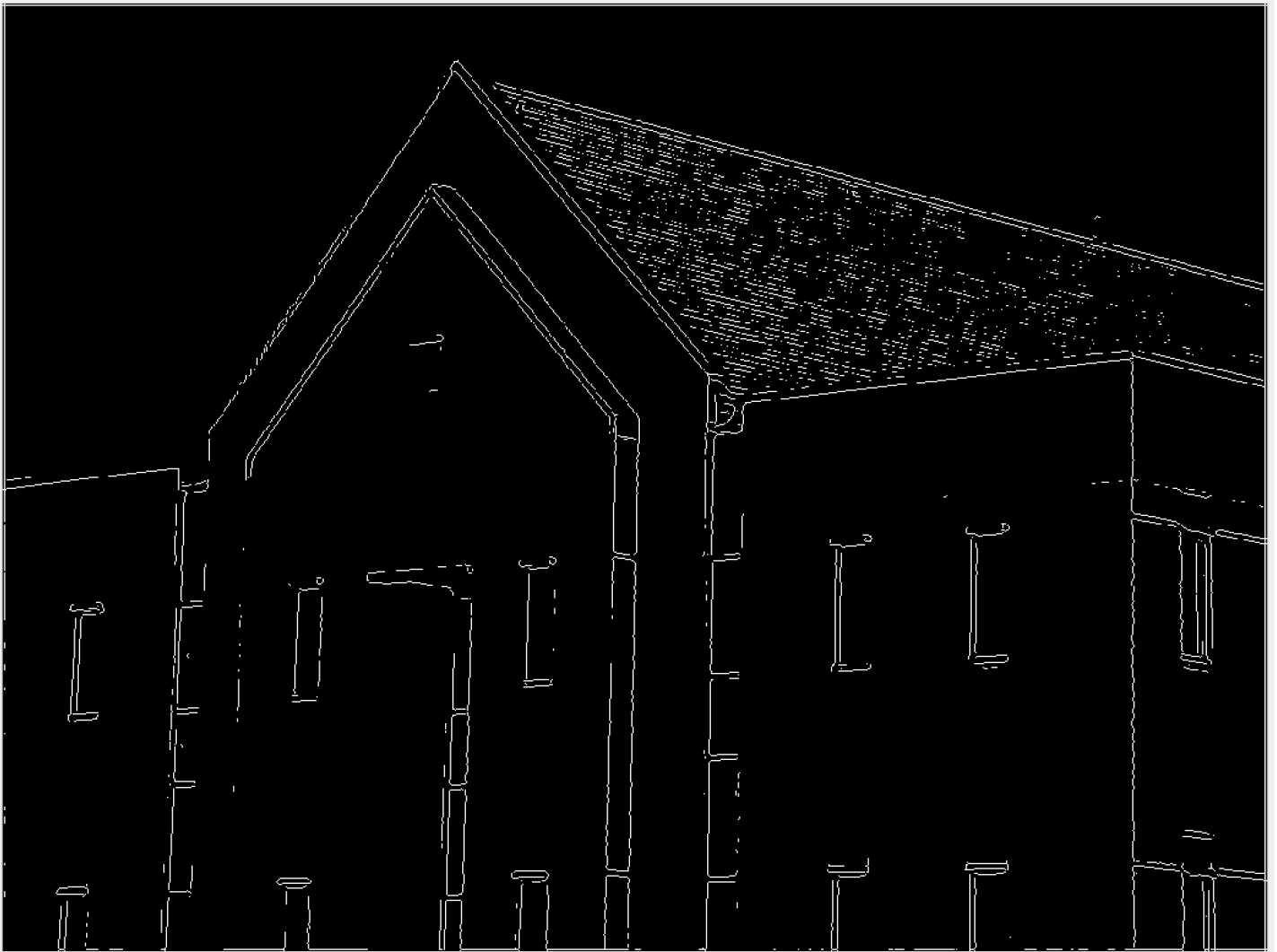
**Roberts**



**Prewitt**



**Sobel**



**Marr-Hildren**



**Canny**



thresh\_seg.m



```
1 function T=gbt(x)
2
3 [M,N]=size(x);
4 T=x(randi(M-1),randi(N-1));
5 T0=0;
6
7 mean1=sum(sum(x(x<=T)))/sum(sum(x<=T));
8 mean2=sum(sum(x(x>T)))/sum(sum(x>T));
9
10 while abs(T-T0)>10^-8
11     T0=T;
12     T=(mean1+mean2)/2;
13     mean1=sum(sum(x(x<=T)))/sum(sum(x<=T));
14     mean2=sum(sum(x(x>T)))/sum(sum(x>T));
15 end
16
17 img = mat2gray(imread('polymersomes.tif'));
18 gbt_img = im2bw(img,gbt(img));
19 otsu_thresh = graythresh(img);
20 otsu_img = im2bw(img,otsu_thresh);
21
22 imshowpait(gbt_img,otsu_img,'montage');
```

