ENGN 1610/2605 Image Understanding

Lab #3 Edges

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Problem 1. Types of Edges Give a few examples of each of these types of edges in the Images in Figure 1.

Figure 1

Reflectance Edges: The brightness display of windows and walls on the same wall of a building under the same light is obviously different in the picture, because different materials will have different reflection characteristics under the same angle and light. When they are adjacent to each other, because of the different reflection characteristics, reflective edges will be generated.

Texture Edges: The label of the bottle in the picture has many patterns and words, this change is not caused by the physical boundary of the object or the change of lighting, but due to the change in the the texture caused by the surface ink printing in the picture.

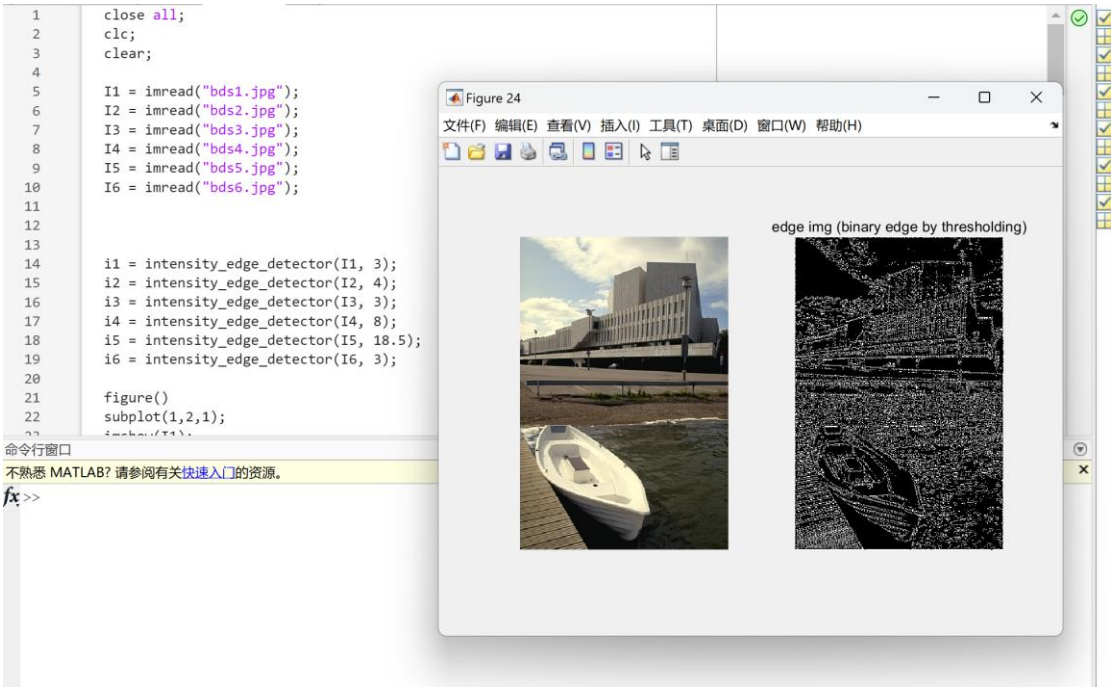
Highlight Edges: The bright spots on the bottle in the picture are the highlight edges, which are areas of significant changes in brightness, marking the boundary between bright and dark, but the boundary is gradual, not a flat or sharp change in brightness. Because in transparent plastic bottles, the highlight edge may be due to specular reflection or refraction effects. These edges show the path of the light.

Shadow Edges: The shadow edge on the plate in the picture is caused by the difference in brightness caused by uneven illumination or the presence of shelter when the light shines on the surface of the object. It is caused by the blocking of the

light source by the plastic bottle and the spoon, and like the highlighted edge, its edge is also gradual.

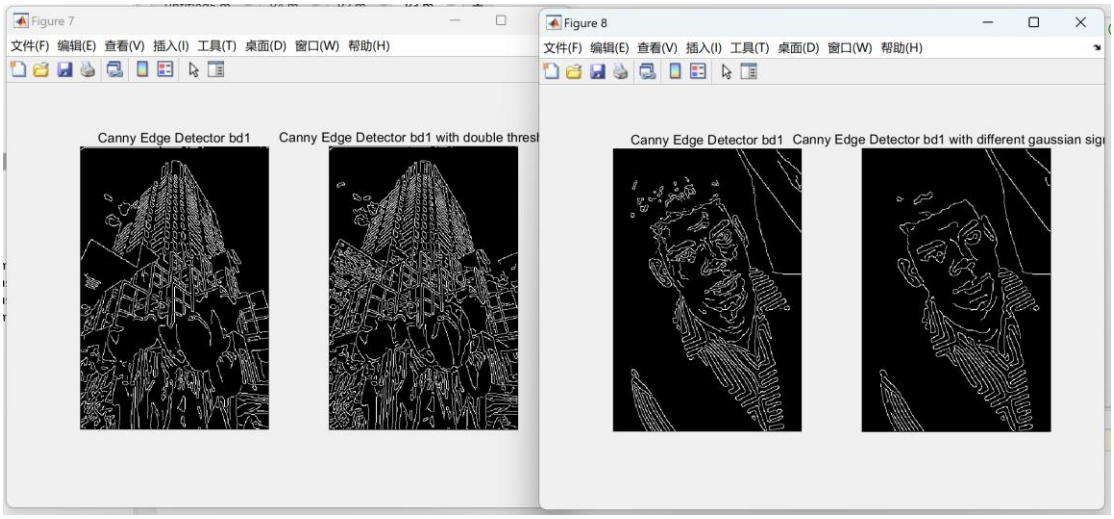
Problem 2. Intensity Based Edge Detection

The code for this result is in "P2.m" file.



Problem 3: Canny Edge Detector

The code for this result is in "P3.m" file.

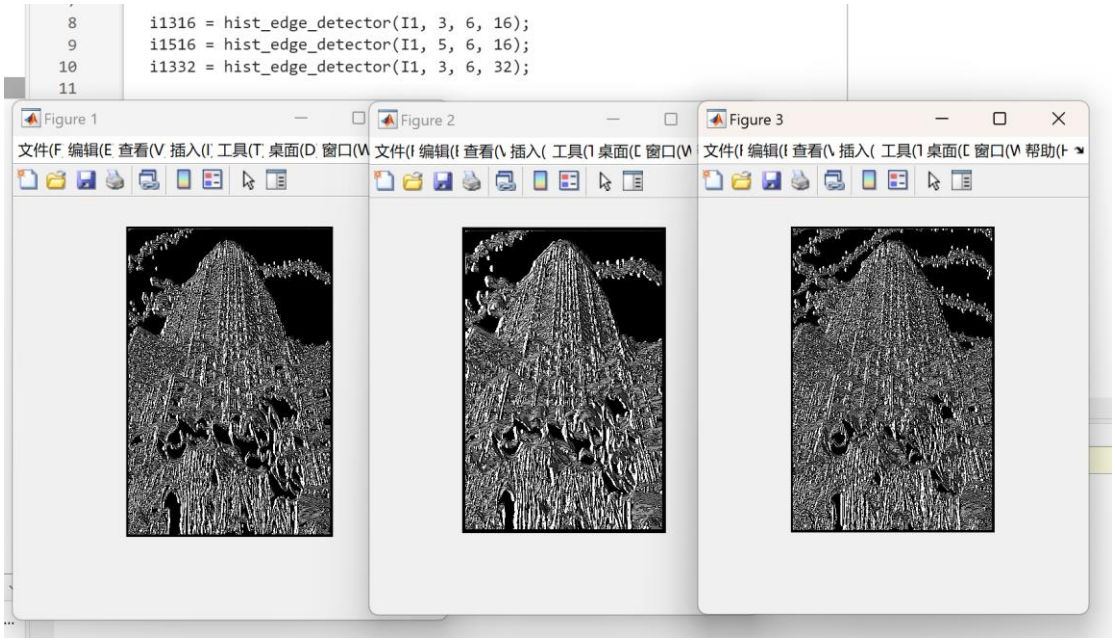


Which of the edge types above are most easily detected?
Canny operators are often able to detect subtle edges that may be created due to changes in brightness caused by different textures or colors of the target object. And

Canny operator has certain robustness to noise when detecting edge. It uses Gaussian filtering to smooth the image, thus helping to reduce noise interference to edge detection.

Problem 4. Histogram Based Edge Detection

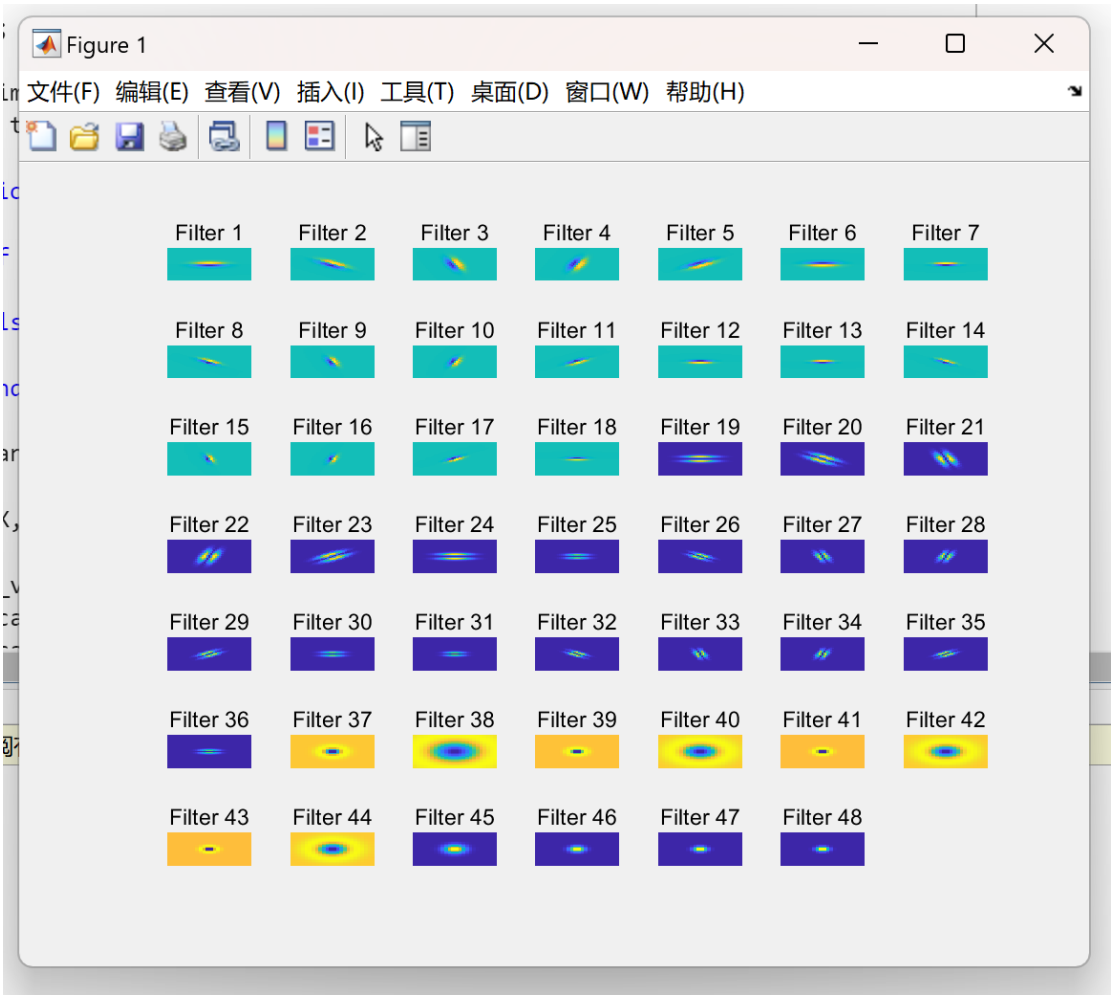
The code for this result is in "P4.m" file.



Increasing the radius will make the features detected by the edge more intense, and if more bin is used, the error will be increased because the chi-square distance will be larger.

Problem 5. Texture Based Edges

The code for this result is in "P5.m" file.



Problem 6. Edge Linking

The code for this result is in "P6.m" file.

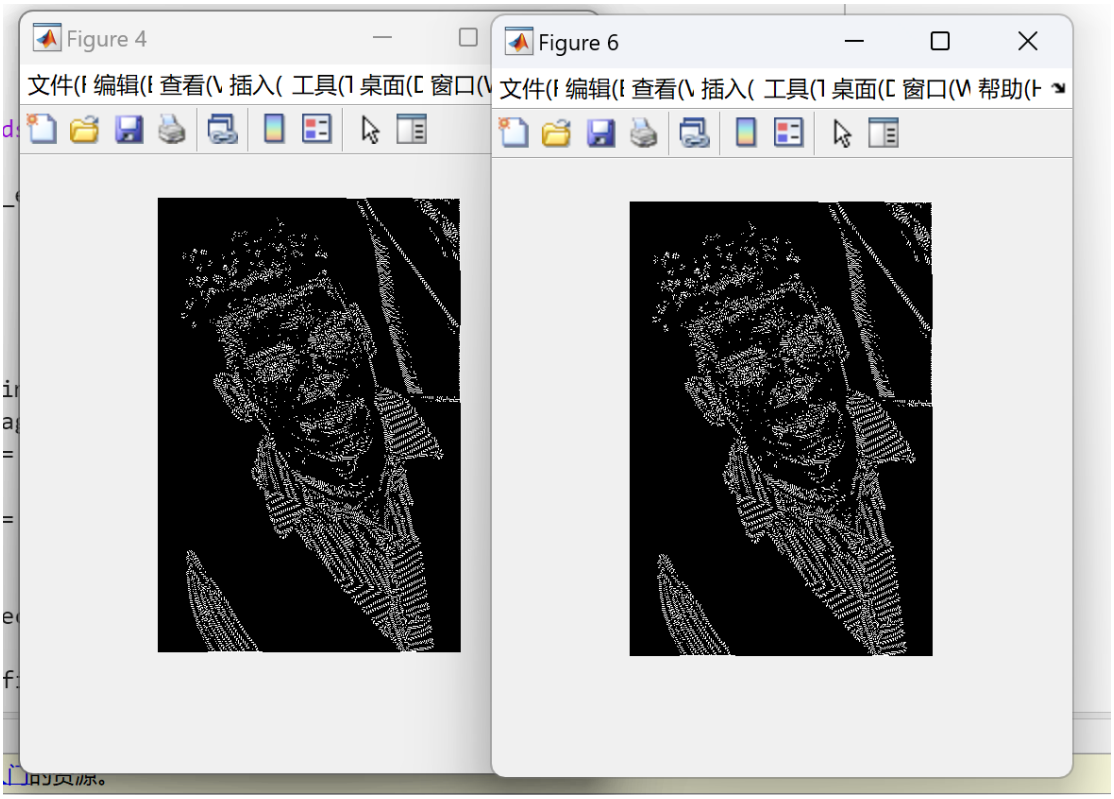


Figure 4
Figure 6

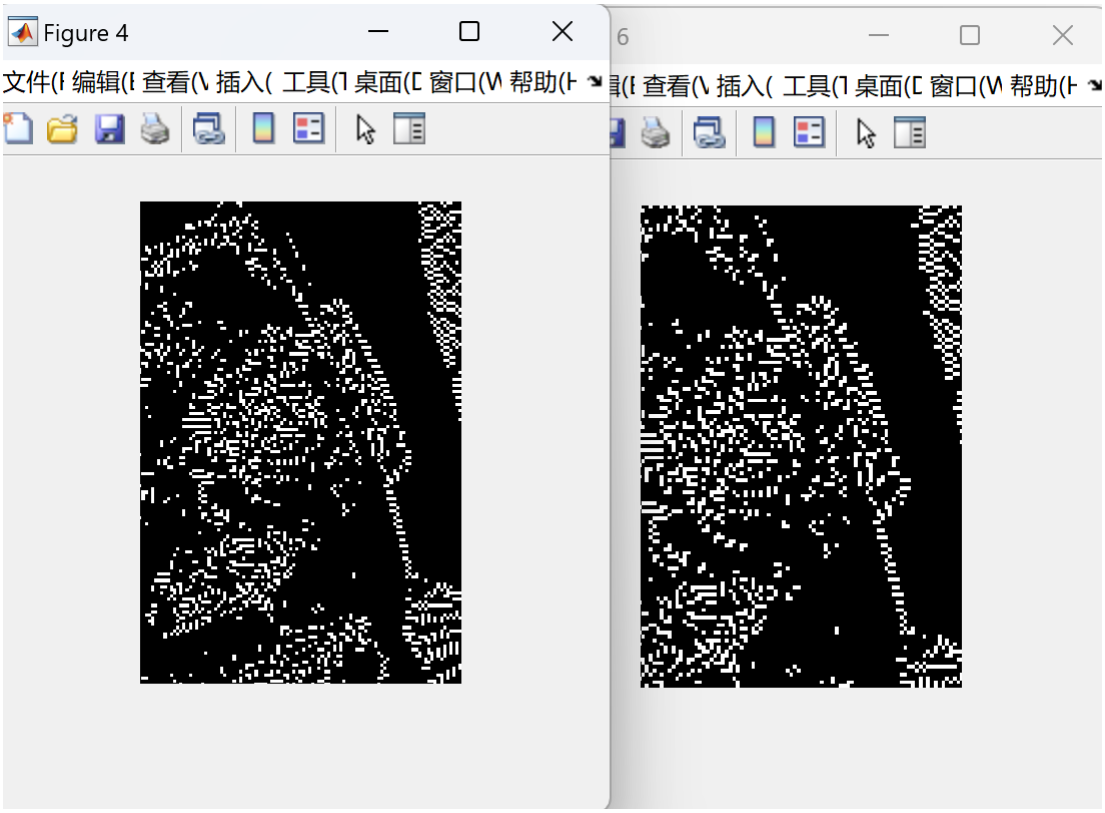


Figure 4