Exercise 4   Edge Detection

Image Segmentation is the process of subdividing an image into its constituent regions or objects.

In simple terms, segmentation is the process of assigning labels to pixels.

In gray level images, edge detection algorithm is used to segment objects.

In this exercise, we mainly apply Canny edge detection algorithm.

Exercise Goal:

- Understand how to use simple edge detection methods
- Examine the impact of various thresholds

- **Task:** Canny algorithm for edge detection
  - Convert the given image 'test04.jpg' to grayscale
  - Apply the Canny algorithm on this grayscale image
  - Use a 5×5 Gaussian Filter Coefficient (with sigma=2) to smooth the image
  - You can simply set the low and high thresholds to 0.5 and 2 for convenience
  - Then, as explained in the course, evaluate the thresholds

- After finishing this task, you can experiment with different parameters to see how filter masks affect the results (Gaussian Filter Coefficient, thresholds and etc.).

MATLAB:

- For this task, you may use the function ***conv2*** to compute the two-dimensional convolution of the matrices
- Binarize 2-D grayscale image or 3-D volume by thresholding: ***Imbinarize***
- Converts the truecolor image RGB to the grayscale image ***rgb2gray***
- Gaussian filter ***imgaussfilt(A,sigma)***
- Double thresholding
  NewImage = YourImage >= T1 & YourImage <= T2
- **laplacian**()
- Edge detection:

https://au.mathworks.com/help/images/edge-detection.html#:~:text=The%20most%20powerful%20edge%2Ddetection,are%20con

nected%20to%20strong%20edges

BW1 = *edge*(I,'sobel');
BW2 = *edge*(I,'canny');

Image Processing in OpenCV

https://docs.opencv.org/4.x/d2/d96/tutorial_py_table_of_contents_imgproc.html

Thresholding

https://docs.opencv.org/4.x/d7/d4d/tutorial_py_thresholding.html

Erosion, Dilation, Opening and Closing

https://docs.opencv.org/4.x/d9/d61/tutorial_py_morphological_ops.html

Canny edge detection

https://docs.opencv.org/4.x/da/d22/tutorial_py_canny.html

edges = cv2.Canny(image,100,200)

Histograms

https://docs.opencv.org/4.x/de/db2/tutorial_py_table_of_contents_histograms.html