

Task 4 video number 27 : Image Gradients and Edge Detection using Laplacian
Objective: To understand the concept of image gradients and edge detection using Laplacian and gain hands-on experience with applying the Laplacian filter.

Instructions:

1. Find an image of your choice, preferably one that has a clear and distinct edge. You can use an image from your personal collection or download one from the internet.
2. Read the image into Python using a suitable library, such as OpenCV or Pillow. Display the image using a suitable function from the library to ensure that the image has been read correctly.
3. Convert the image to grayscale using a suitable function from the library. Display the grayscale image to ensure that the conversion has been done correctly.
4. Apply the Laplacian filter to the image using a function such as `cv2.Laplacian()` in OpenCV or `ImageFilter.Laplacian()` in Pillow. Experiment with different kernel sizes and observe the effect on the output. Display the output image to observe the edges detected by the filter.
5. Observe the output and identify the edge(s) in the image. Note down the position of the edge(s) and the direction in which they are oriented.
6. Experiment with different values of the kernel size and observe the effect on the output. Note down your observations and compare them with the previous results.
7. Implement your own Laplacian filter function using convolution and apply it to the image. Compare your output with the output obtained using the built-in functions in the library and note down any differences. You can also experiment with different kernel sizes and observe the effect on the output.
8. Mention the equation of Laplacian and how it works.
9. Write a short report summarizing your observations and conclusions. Include any challenges you faced during the task and how you overcame them.

Deliverables:

1. The image used for the task.
2. Python code for reading and converting the image to grayscale.
3. Python code for applying the Laplacian filter using built-in functions and implementing your own function using convolution.
4. Output images obtained using the Laplacian filter and your own function.
5. A short report summarizing your observations and conclusions.

By completing this task, you will gain hands-on experience with image gradients and edge detection using Laplacian. You will also learn how to apply built-in functions in libraries and implement your own functions using convolution. This task will help you deepen your understanding of the topic and develop your programming skills.