



Ecole Supérieure Informatique Sidi Bel Abbès
Second Cycle
Computer Vision
LAB -2-: Image Convolution Lab

November 5, 2024

1. Objective:

- To understand the basics of image convolution and its applications in image processing.

2. Programming Language and Library

- Python .
- matplotlib library.
- Opencv.
- Jupyter Notebook or a code editor for Python

3. Lab Procedure:

- Select an image from your directory.
- Load the image using matplotlib.

```
import numpy as np
from matplotlib import pyplot as plt
```

```
img = plt.imread('images/flowers.png')
plt.imshow(img)
plt.title('image')
plt.axis('off')
plt.show()
```

- **Mean Filter:** The Mean Filter is a basic convolution kernel that helps in image blurring by calculating the average value of pixel intensities within a defined neighborhood.
 - Read in your favorite image on the disk,
 - Create a kernel as a small matrix. For example, you can use a 3x3 mean filter:
 $G_1 = [111; 111; 111]/9$,
 - Convolve your image with G_1 .
 - What happens?
- Create some new kernel
 - Create G_2 , a filter that multiplies the image intensities by 2,
 - Create G_3 , a filter that sharpens the image (you should define G_3 in terms of G_1 and G_2).

- Try applying both of these to an image, and take a look at the results.
 - Try this filter: $G_4 = \begin{bmatrix} -1 & -1 & 0 \\ -1 & 3 & 0 \\ 0 & 0 & 0 \end{bmatrix}$.
 - When you use `cv2.imshow` to view the result, the image will look mostly black,
 - This is because the entries of this kernel sum to 0, instead of 1.
 - To fix this, add 0.5 to the resulting image.
 - look at filter G_1 again.
 - What if we want to blur more?
 - We could blur the image with G_1 once, then blur the result again with G_1 .
 - This will give a **twice-blurred** image.
 - This is equivalent to the operation: $((F * G_1) * G_1)$. Try this out, and see what the result looks like.
 - Apply Sobel Filter to the loaded image.
 - Sobel Filter for Horizontal Edges,
 - Sobel Filter for Vertical Edges.
4. **Assignment:** Provide a report on the outcomes, including the code used and the purpose of applying these techniques to the chosen images.