

Image processing algorithms, and its understanding

1. Gamma Correction

Definition:

Gamma correction is a nonlinear transformation applied to pixel values to adjust the luminance or brightness of an image. It compensates for the nonlinear response of display devices or the human eye to light.

Use:

- Adjusting image brightness in a visually accurate way.
- Preparing images for display on monitors and TVs.
- Enhancing details in dark or bright areas of an image.

Knowledge used:

I have taken an image of person, in which his eyes are not visible clearly (i.e. looks dark) so I applied Gamma correction to make visible the eyes of the person, you can check in the [index.html](#) by uploading the image with respect to the filter or you can also visualize in the following figure.

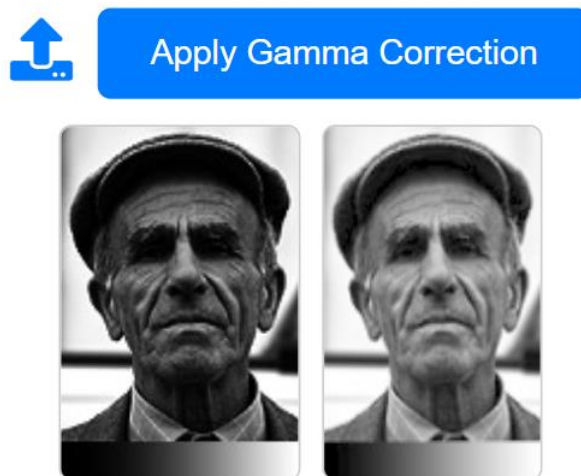


Fig. 01

2. Laplacian Filter

Definition:

The Laplacian filter is a second-order derivative filter used to detect edges in an image by highlighting areas of rapid intensity change.

Use:

- Edge detection.
- Sharpening images.
- Enhancing regions with rapid intensity variation.

Knowledge used:

I have taken an image of Taj Mal, which edges are not visible so as I applied Laplacian filter, its edges got visible. You can check in the index.html by uploading the image with respect to the filter or you can also visualize in the following figure.

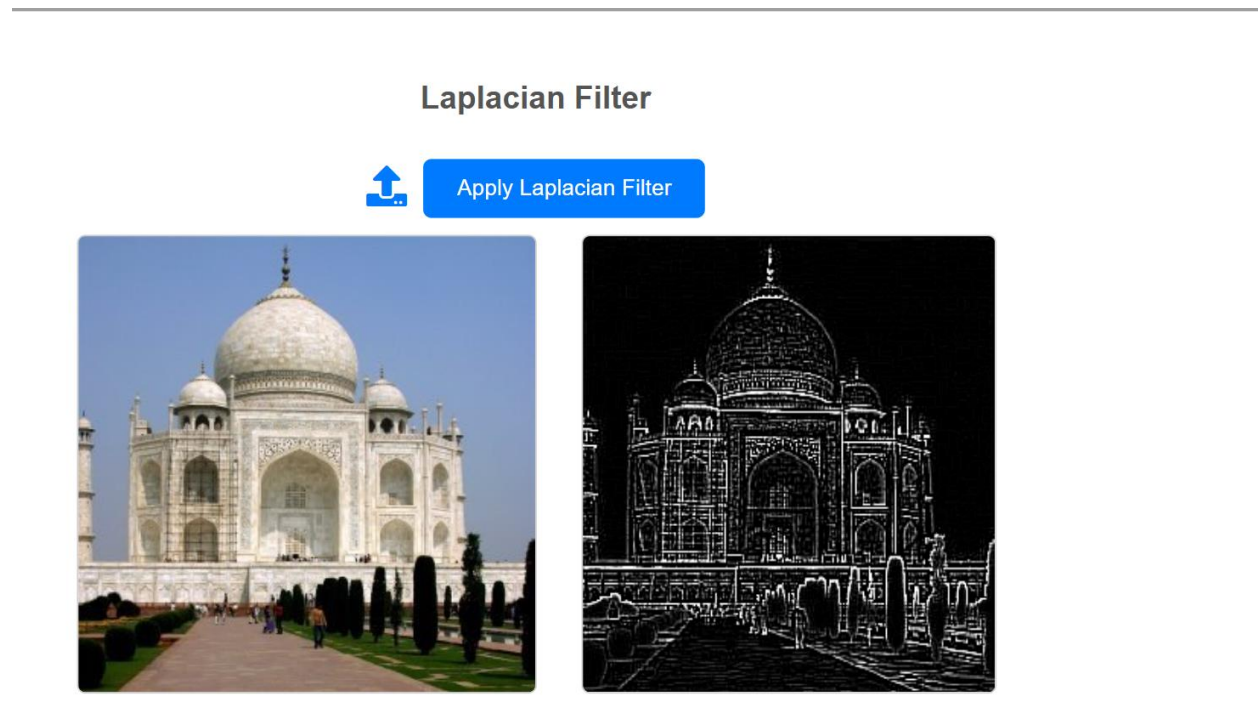


Fig: 02

3. Sobel Operator

Definition:

The Sobel operator is a first-order derivative filter that computes the gradient magnitude and direction in an image. It uses convolution with kernels to detect edges along specific orientations (horizontal and vertical).

Use:

- Detecting edges.
- Highlighting changes in intensity.

Knowledge used:

I have taken an image of an industrial tool, which edges are not visible so as I applied Sobel operator, its edges got visible. You can check in the index.html by uploading the image with respect to the filter or you can also visualize in the following figure.

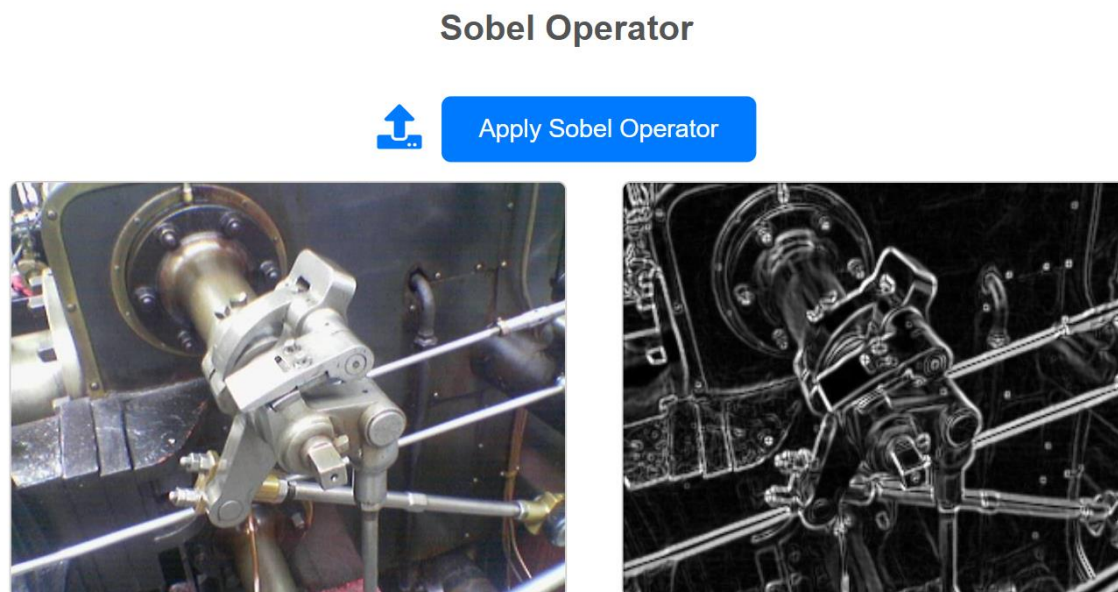


Fig: 03

4. Low Ideal Filter

Definition:

A low-pass filter that suppresses high-frequency components in an image and preserves low-frequency components. It is often applied in the frequency domain.

Use:

- Smoothing or blurring images.
- Reducing noise.

Knowledge used:

I have taken an image of a plant, which is clearly visible but after applying the low pass ideal filter it got blurred or smoothen. You can check in the index.html by uploading the image with respect to the filter or you can also visualize in the following figure.

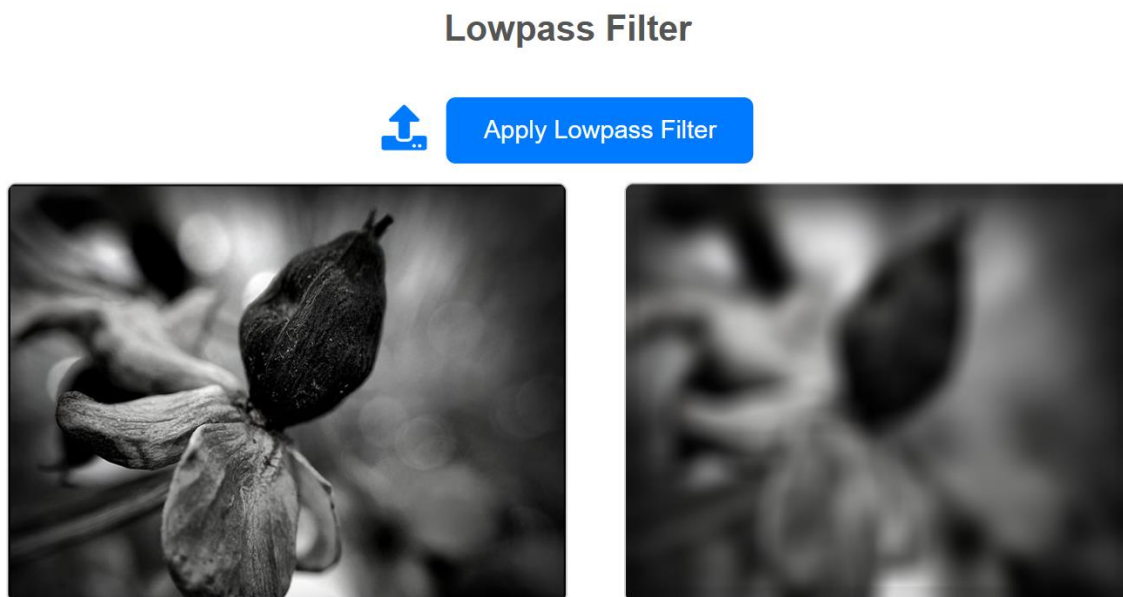


Fig: 04

5. High pass Gaussian Filter

Definition:

A filter that attenuates low-frequency components and amplifies high-frequency components in an image. The Gaussian filter applies a smooth and gradual transition in the frequency domain.

Use:

- Sharpening images.
- Enhancing edges or textures.

Knowledge used:

I have taken an image of a logo, which is visible clearly, I wanted to sharpen the image, or try to enhance the edges of the image that's why I applied High Gaussian filter. You can check in the index.html by uploading the image with respect to the filter or you can also visualize in the following figure.

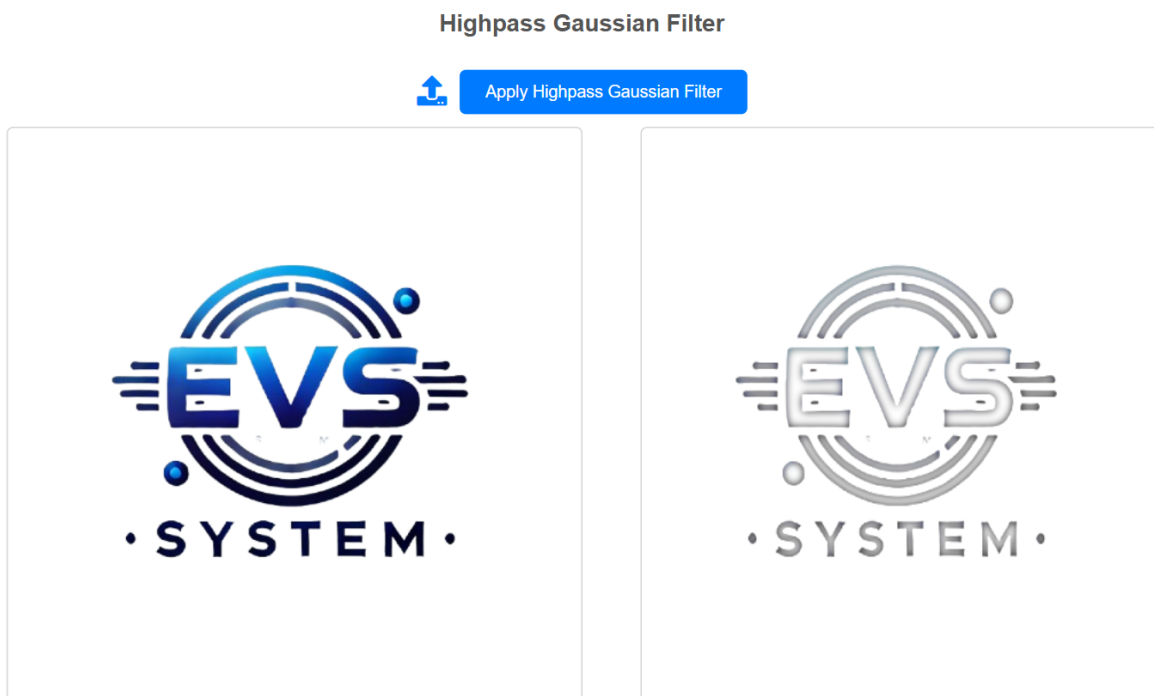


Fig: 05