

# IMAGE ENHANCEMENT USING GAUSSIAN FILTERS

Dr. Padmaja V K1, S Jayanth Srinivas<sup>2</sup>, S Lokesh<sup>3</sup>

<sup>1</sup>Professor, Dept. of Elec. & Comm. Engineering, GITAM University, Bengaluru, Karnataka, India

<sup>2</sup>Student, Dept. of Elec. & Comm. Engineering, GITAM University, Bengaluru, Karnataka, India

<sup>3</sup>Student, Dept. of Elec. & Comm. Engineering, GITAM University, Bengaluru, Karnataka, India

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**Abstract** - Reducing noise has consistently been one of the standard issues of the image analysis. Frequently however, simultaneously as reducing the noise in an image, it is essential to safeguard the edges. Edges are of basic significance to the visual appearance of pictures. Filtering is a technique for adjusting or improving a picture. Filtering is a local activity, wherein the estimation of some random pixel in the yield picture is controlled by applying some calculation to the estimations of the pixels in the area of the relating input pixel. A pixel's neighborhood is some arrangement of pixels, characterized by their areas comparative with that pixel. Gaussian filter has been end up being a decent decision for expelling noise drawn from an ordinary dispersion and the multi-scale space portrayal of a picture can be acquired effectively by Gaussian smoothing with expanding difference. This is utilized for edge location or un-sharp masking. The primary advantage of utilizing the Gaussian filter is that it is quicker in light of the fact that duplicating and including the pixel estimations of pictures is quicker than sorting and arranging. The quality of the restored image can be defined by measurements.

**Key Words:** MATLAB, Gaussian-blur, Gaussian-Sharpening, Filtering, FERET, Metrics.

## 1. INTRODUCTION

In computer science, digital image processing is the utilization of a digital computer to process digital images through an algorithm. As a subcategory or field of digital signal preparing, advanced picture handling has numerous focal points over analog image processing. It permits an a lot more extensive scope of calculations to be applied to the information and can keep away from issues, for example, the development of noise and distortion during processing. Since images are characterized more than at least two measurements advanced picture preparing might be displayed in the structure of multidimensional systems. The images can be upgraded utilizing digital image processing. For the upgrade of the images, filters are utilized. Gaussian filters are utilized to show the improvement of images in this task.

In image processing, a Gaussian blur (also known as Gaussian smoothing) is the aftereffect of obscuring a picture by a Gaussian function. It is a generally utilized impact in illustrations programming, regularly to reduce image noise and diminish detail. The enhanced visualization of this obscuring procedure is a smooth haze

taking after that of review the image through a translucent screen, particularly unique in relation to the bokeh effect delivered by an out-of-centre focal point or the shadow of an item under normal enlightenment.

The main aim of the smoothing is to diminish the effect of camera noise, spurious pixel values, missing values etc. This is also called neighborhood averaging. Each pixel in the smoothed image is obtained is obtained from the average pixel value in the neighborhood of the input image.

Un-sharp masking (USM) or Gaussian sharpening is an image sharpening technique, regularly accessible in digital picture processing software. Its name gets from the way that the procedure utilizes a blurred, or unsharp negative picture to make a mask of the original image. The unsharp-masking is then joined with the original positive image, making a image that is less blurry than the original. Digital unsharp masking is a adaptable and incredible approach to expand sharpness, particularly in scanned images. Lamentably, it might make undesirable obvious edge impacts or increase image noise.

## 2. LITERATURE SURVEY

Diminishing noise has consistently been one of the standard issues of the picture examination and preparing network. Frequently however, simultaneously as decreasing the commotion in a picture, it is essential to save the edges. Edges are of basic significance to the visual appearance of pictures. Along these lines, it is alluring to safeguard significant highlights, for example, edges, corners and other sharp structures, during the denoising procedure. This part presents an audit of some noteworthy work in the region of picture denoising.

The most straightforward type of sifting is an unequivocal Linear Translation Invariant (LTI) separating, which can be executed utilizing a nearby neighborhood. Generally basic of LTI channels are the Gaussian smoothing channel [Shapiro and Stockman (2001), Gonzalez and Woods (2008)] and Weiner channel [Jain (1989), Benesty et al.(2010)].

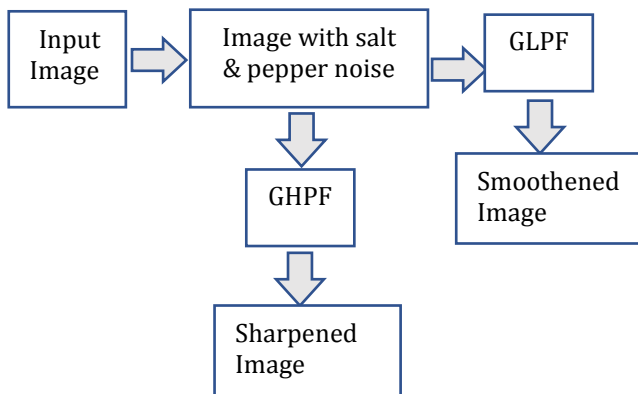
The loads for Gaussian channel are picked by the state of a Gaussian capacity. Gaussian channel has been end up being a decent decision for expelling clamor drawn from an ordinary circulation and the multi-scale space portrayal

of a picture can be gotten effectively by Gaussian smoothing with expanding change.

LTI separating is the snappiest methodology for smoothing the noise however some significant structures are additionally frequently get obscured alongside commotion. To diminish these unwanted impacts of straight separating, an assortment of edge preserving filtering techniques have been proposed during the most recent couple of years.

### 3. METHODOLOGY

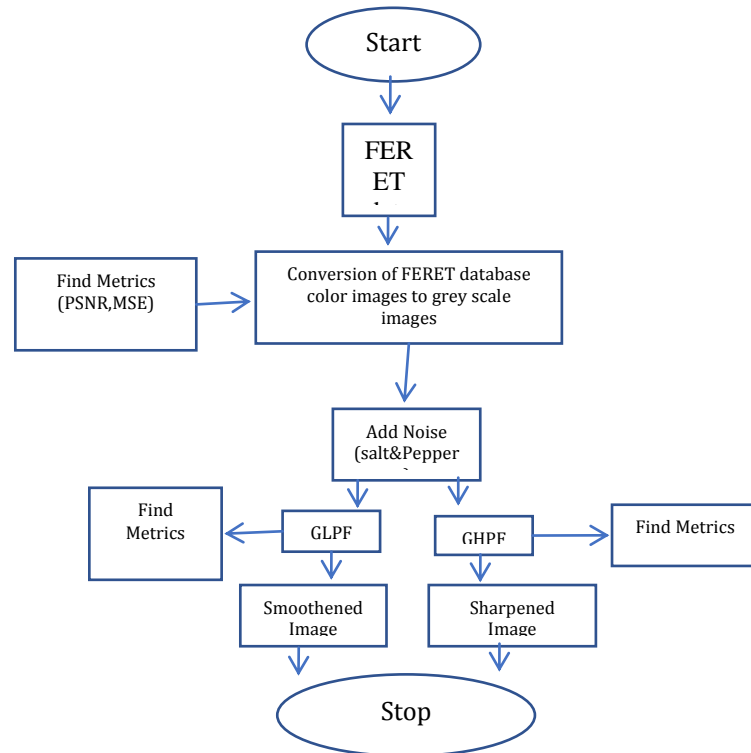
#### A. PROPOSED ARCHITECTURE



#### B. ALGORITHM

- Step:1) Store FERET database color images.
- Step:2) Convert the FERET database color images into gray scale images.
- Step:3) Calculate the Metrics i.e., PSNR, MSE.
- Step:4) Add noise to gray scale images (Optional step).
- Step:5) Apply GLPF to the noisy gray scale images.
- Step:6) Smoothened images without noise will be obtained.
- Step:7) Calculate Metrics values for these smoothened images.
- Step:8) Apply GHPF to noisy gray scale images.
- Step:9) Sharpened images without noise will be obtained.
- Step: 10) Calculate Metrics values for sharpened images.
- Step: 11) Compare Metrics values from sequence wherever they are found.
- Step: 12) Stop.

#### C. FLOWCHART



#### D. PROPOSED SYSTEM

A MATLAB code is developed that helps out to remove the noise present in the input images, (in other words Image Enhancement) by using Gaussian filters(LPF & HPF). LPF helps out in smoothing of the image and HPF helps out in sharpening of the image. Above is the algorithm for removing the noise from the image. The extent to which the filtering needs to be done is based on the value of D0. Larger the D0 value larger will be the cut-off frequency and hence larger will be the extent of filtering. In the above algorithm it is not necessary to add the noise (salt & pepper noise) if the image is found noisy. The input may be a color image or a gray scale image. If it is a color image it is to be converted in to gray scale image. This is because it is easy to apply filtering to a gray scale image due to the reason that it has only two colors, black and white respectively. Black represents low frequency part and white represents the high frequency part which makes it is for the filtering process. The output obtained will be either sharpened image or smoothened image depending on the filtering that is performed.

#### 4. SOFTWARE USED

MATLAB is the software which is utilized to build up the code for the undertaking of 'Image Enhancement using Gaussian Filters'.

#### Description:-

MATLAB (Matrix Laboratory) is a programming domain for calculation improvement, information examination, perception, and numerical calculation, created by MathWorks. MATLAB is broadly utilized for framework based calculation intended for logical and designing use. It is additionally useful for some types of numeric calculation and representation. MATLAB can be utilized in wide scope of utilizations, including sign and picture handling, interchanges, control configuration, test and estimation, budgetary demonstrating and investigation, computational science and so on.

In spite of the fact that MATLAB is expected fundamentally for numerical processing, a discretionary tool kit utilizes the MuPAD emblematic motor permitting access to representative figuring capacities. An extra bundle, Simulink, includes graphical multi-space simulation and model-based plan for dynamic and inserted frameworks.

The MATLAB application is worked around the MATLAB programming language. Regular utilization of the MATLAB application includes utilizing the "Command window" as an intuitive scientific shell or executing content documents containing MATLAB code.

#### 5. FUTURE SCOPE

Image processing is being applied in numerous fields in this day and age. A portion of the segments or fields which uses this process are:

- **Automotive sector:** In making propelled drivers facilitate for semi-self-sufficient vehicles and furthermore smartly utilised in self-sufficient/driver-less vehicles.
- **Image enhancing:** The camera applications in cell phones and advanced cameras utilizing image processing to upgrade the image quality, video adjustment and commotion evacuation then forth.
- **Robotics:** Versatile robot's route in obscure condition (SLAM), management of the mechanism by handling the video feed from the camera on mechanism to separate the live scene around it.
- **Gaming:** Propelled recreation comforts like Xbox kinect utilizes image getting ready from movement investigation of the human player.
- **Manufacturing:** to acknowledge surrenders within the procedures and moreover to manage the robots in playing out specific undertakings. for ex. absconds in grouping of a computer circuit Board (PCB) can be watched utilizing high goals image process

#### 6. CONCLUSIONS

The problem of noise removal from an image (Image enhancement) can be overcome by using Gaussian filters up to maximum extent when compared to other methods. It

may be either low pass filter or high pass filter depending on how an image is to be enhanced or improved. With this project work it can be concluded that using Gaussian filters can be an effective way to improve or enhance the quality of the images. The main advantage of using this method is that the quality of the digital image can be improved based on the requirement. Here the amount of smoothening (low pass filtering) or sharpening (high pass filtering) or the extent to which the image is to be filtered will be based on the value of cut-off frequency, which means how far an image should be enhanced depends on cut-off frequency. And the enhancement can be observed by calculating the metrics values of filtered image to that of original input digital image.

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