DIPARTIMENTO
DI INGEGNERIA
DELL'INFORMAZIONE

UNIVERSITÀ
DEGLI STUDI
DI PADOVA

COMPUTER VISION 2023 - LAB 2
REPORT

PART 1

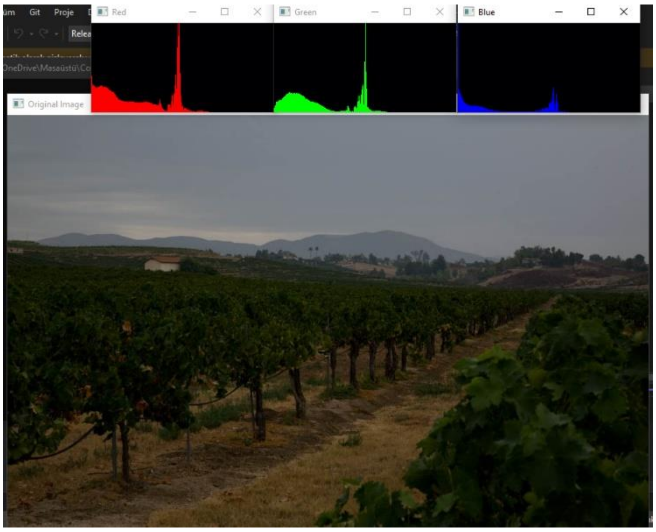

Figure 1. Original Image and Histograms

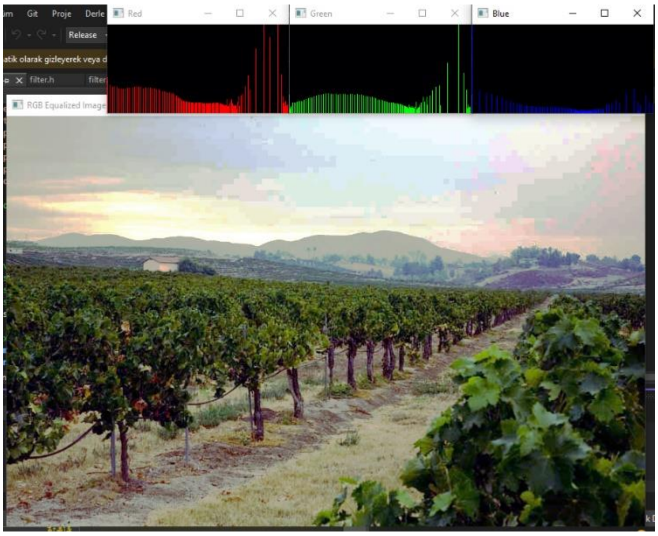

Figure 2. RGB Equalized Image and Histograms

Figure 3. Limunance Equalized Image and Histograms

For Figure 2. By equalizing the image, we can improve the overall appearance of the image by making it look more vibrant and enhancing the details that may have been lost due to poor lighting or exposure. The histograms of each channel of an RGB equalized image can give us insight into the distribution of pixel intensities in the image. The histograms show the frequency of pixel intensities in each channel , and can help us identify areas of the image where the intensities are too low or too high.

For Figure 3. The result of luminance equalization is an image with improved contrast and better visibility of details, as the equalization process balances the luminance values throughout the image. The histograms of a luminance equalized image show the distribution of luminance values in the image. A well-distributed histogram means that the luminance values are well-balanced throughout the image, and there are no areas that are too bright or too dark. A histogram that is skewed towards one side means that the luminance values are not balanced, and there may be areas in the image that are too bright or too dark.

PART 2

2.1) USING RGB EQUALIZED IMAGE

Figure 4. Median Filter, kernel size : 5

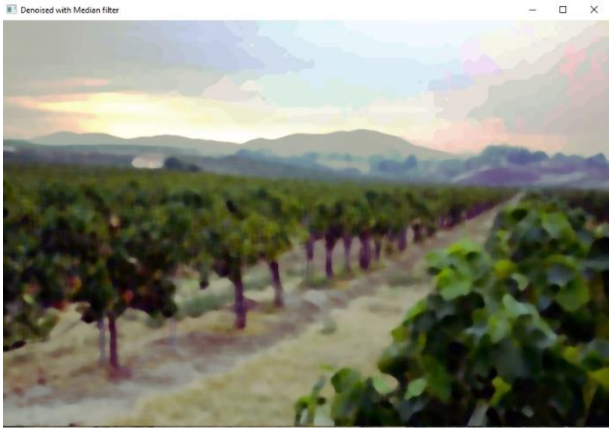

Figure 5. Median Filter kernel size : 11

Increasing the kernel size will increase the number of pixels in the neighborhood and lead to a stronger smoothing effect. A larger kernel size will also cause the filter to be less sensitive to small details in the image, as it considers a larger region around each pixel. Kernel size in the figures such as 11 means that the filter will consider a neighborhood of 11x11 pixels around each pixel in the input image. This will result in a moderate level of smoothing and noise reduction, while still preserving some of the smaller details in the image.

Figure 6. Gaussian Filter, kernel size:7, σ = 0

Figure 7. Gaussian Filter, kernel size:11, σ = 10

Changing the size of the Gaussian kernel will affect the amount of blurring applied to the image. A larger kernel size will result in more smoothing and a more blurred output image. Changing the standard deviation of the Gaussian kernel will also affect the amount of blurring applied to the image. A larger standard deviation will result in more smoothing and a more blurred output image.

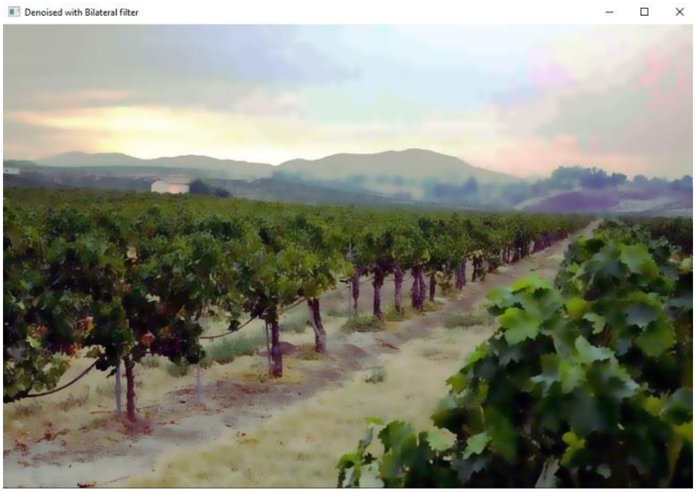

Figure 8. Bilateral Filter, d= 15, sigmaColor=sigmaSpace=75

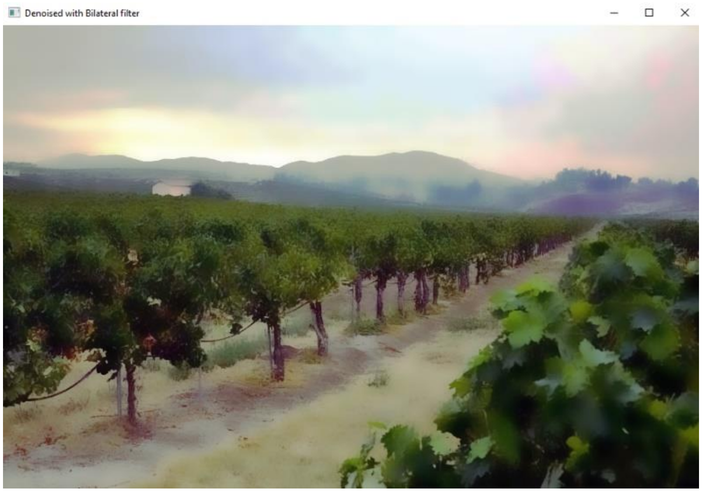

Figure 9. Bilateral Filter, d= 25, sigmaColor=sigmaSpace=100

The other three filters will smooth away the edges while removing noises, however, this filter can reduce noise of the image while preserving the edges. The drawback of this type of filter is that it takes longer to filter the input image. Changing the diameter of the pixel neighborhood affected the amount of smoothing applied to the image. A larger value includes more pixels in the neighborhood and produces a stronger smoothing effect. Changing the color sigma parameter affects how much the filter blurs pixels that are different in colour. A larger value blurs more pixels, which reduces noise but also blur out details in the image. Changing the space sigma parameter affects how much the filter blurs pixels that are spatially far away from each other. A larger value blurs more pixels, which can reduce noise but also blur out details in the image

2.2)USING LUMINANCE EQUALIZED IMAGE

Figure 10. Median Filter kernel size : 5

Figure 11. Median Filter kernel size : 11

Figure 12. Gaussian Filter, kernel size:7, σ = 0

Figure 13. Gaussian Filter, kernel size:11, σ = 10

Figure 14. Bilateral Filter, d= 15, sigmaColor=sigmaSpace=75

Figure 15. Bilateral Filter, d= 25, sigmaColor=sigmaSpace=100