Fourier Transform and Frequency Filtering

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# Introduction

# This document is the report of my Assignment 2 from my Fall 2023 class CAP-5400 Digital Image Processing, as a graduate student. The individuals who are overviewing this assignment are our professor Dr. Dmitry Goldgof and Mr. Anthony McCofie (Teaching Assistant). The purpose of this algorithm is to discrete Fourier transform in grey-level images along with High/low filter cut-off frequency. Additionally

# Discrete Fourier Transform

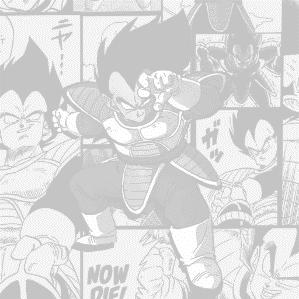
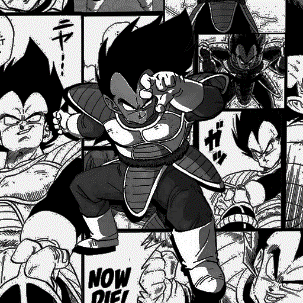
## Histogram Stretching

Histogram stretching is a technique used to improve the overall contrast and visual quality of an image. It works by redistributing the pixel intensity values in an image to span a wider range. For my implementation the range must be provided by the user, but for an ideal performance select a range of the widest range (0, 255).

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Description automatically generated

**Figure 1: Histogram Equalization**

**Figure 3: Left image - Original image, Right image - Histogram Equalized image**

# Conclusion

In conclusion, histogram stretching is a valuable image enhancement technique used to improve the contrast and visibility of image details. However, when it comes to preserving natural color balance and achieving better control over contrast enhancement, histogram equalization in the HSI (Hue, Saturation, Intensity) color space often outperforms its counterpart in RGB (Red, Green, Blue). By separating the luminance (intensity) from the color information, HSI-based equalization allows for precise control, preventing unnatural color shifts and maintaining the image's overall visual appeal. This makes HSI-based histogram equalization a preferred choice for various image processing tasks where color fidelity and natural appearance are essential.