

DCT Image Compression using MATLAB

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1. Introduction

Image compression is a crucial part of image processing, aiming to reduce storage requirements while preserving visual quality. One of the most commonly used techniques is the Discrete Cosine Transform (DCT), which forms the basis of standards like JPEG.

This project demonstrates the basic process of DCT-based image compression in MATLAB.

2. Objectives

Load a grayscale image

Apply 2D DCT to the image

Quantize the DCT coefficients

Apply Inverse DCT to reconstruct the image

Compare original and reconstructed images visually

3. Tools and Environment

MATLAB R2023a

Image Processing Toolbox

4. Methodology

The following steps were implemented in the MATLAB script:

1. Load and display the original image



Figure 1: Original Image

2. Apply 2D DCT

The image is transformed to the frequency domain.

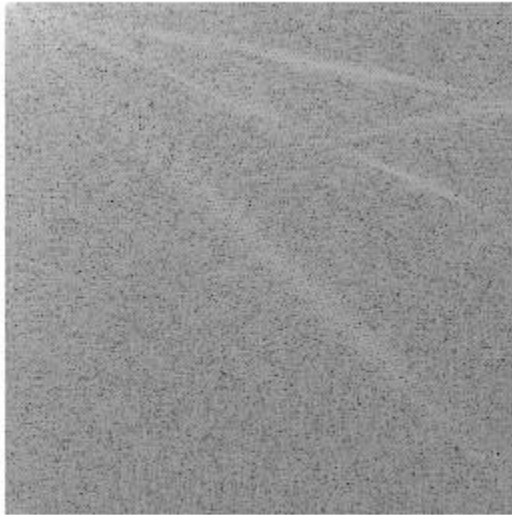


Figure 2: DCT of the Image

3. Quantize DCT coefficients

Low-magnitude coefficients are zeroed to simulate compression.

4. Apply Inverse DCT

The quantized frequency components are transformed back.

Reconstructed Image after Quantization and IDCT



Figure 3: Reconstructed Image after Quantization

5. Results

The reconstruction retains the general structure of the original image but loses some details due to quantization. This illustrates the trade-off between compression rate and visual quality.

6. Conclusion

This project provided a hands-on understanding of how DCT can be used for image compression. While simple, it sets the foundation for more advanced compression methods and practical applications.