Homework 2 Report

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Environment

Programming Environment:
Python 3.11.3
numpy 1.23.5
Pillow 9.5.0
matplotlib 3.7.1

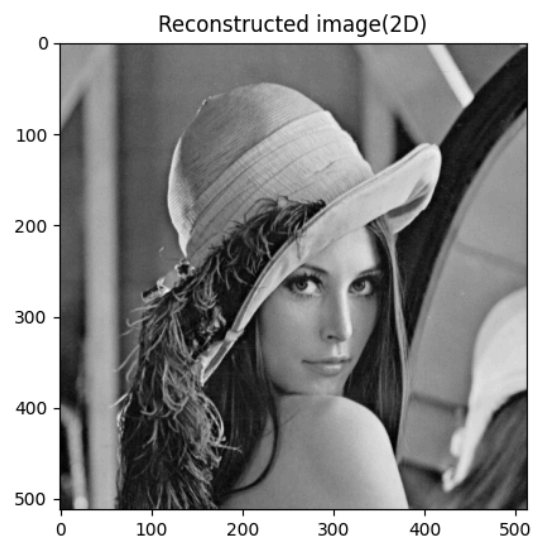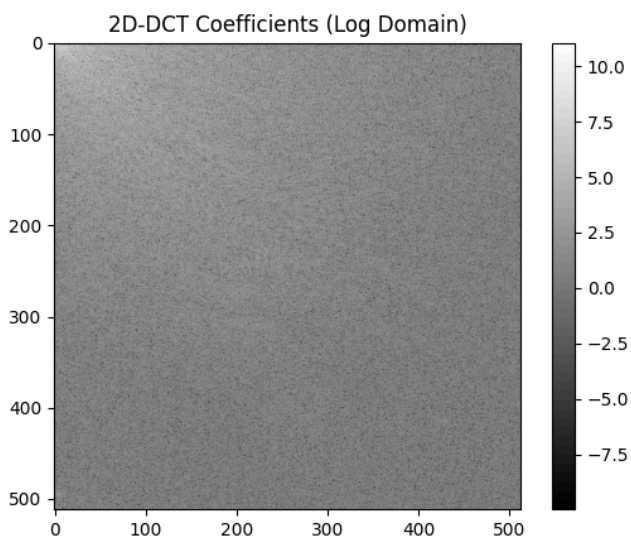**Execution Command:**
python3 main.py

2D–DCT

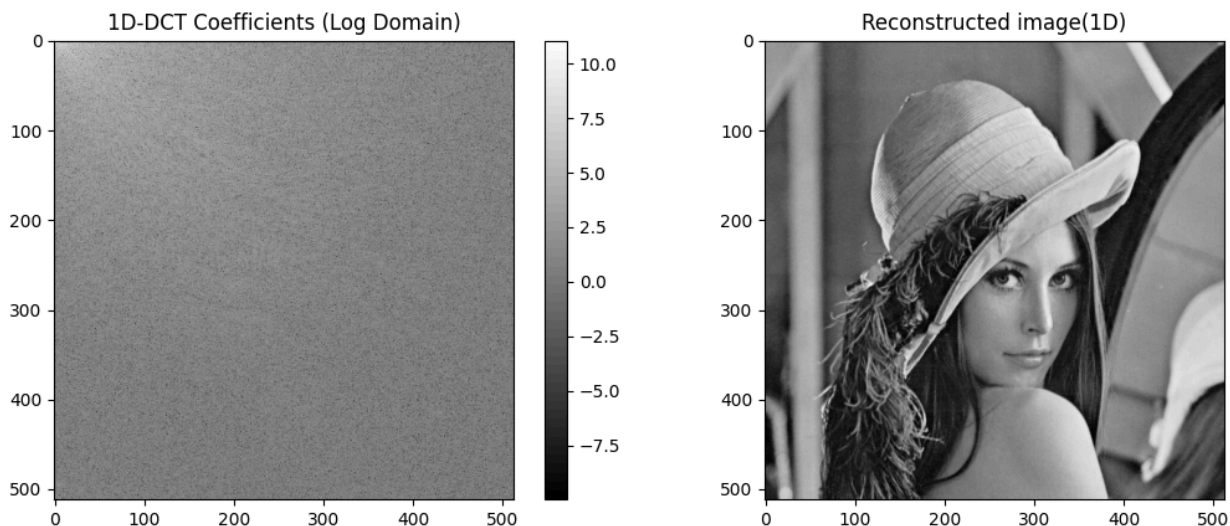**Time cost: 155.84s**

PSNR (by 2D–IDCT) : 274.53dB

Result Image:

1D–DCT

Time cost: 0.55s

PSNR (by 1D–IDCT) : 270.69dB

Result Image:

Conclusion

Runtime:

The runtime of 2D–DCT is 306 times of 1D–DCT, because I design the algorithm of 1D–DCT by apply matrix operation to replace original multiplication and summation. On the other hand, I just vectorize little part of 2D–DCT algorithm, because it is too complex to vectorize all algorithm. If I can vectorize the 2D–DCT algorithm overall, maybe it can be faster.

PSNR:

The reason that the PSRN of 1D–DCT is different from 2D–DCT is the various algorithm designing. In 1D–DCT, I use matrix operation to replace original multiplication and summation. In 2D–DCT, I just vectorize little part of algorithm. Therefore, there are some error in the process of lots of calculations.