

laboratory report

Title: Image Compression

Time: 2021.12.24

Class: 2019211112

no: 2021523016

Name: 徐川峰

1.Purpose

Master the difference between lossy compression and lossless compression, understand the meaning of gray level, DCT (discrete cosine transform) in JPEG compression algorithm, data quantization, and experience the advantages of JPEG algorithm in actual images.

2.Tool



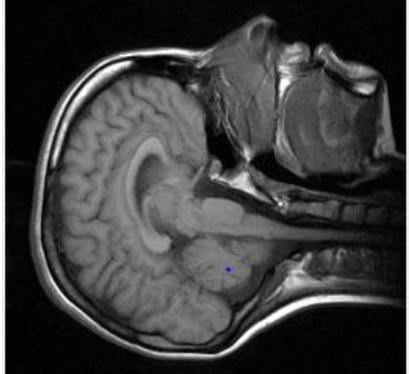
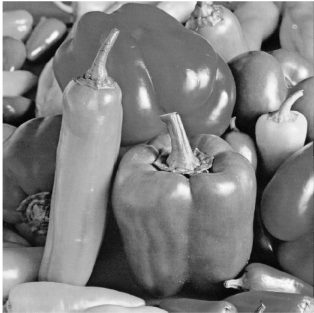

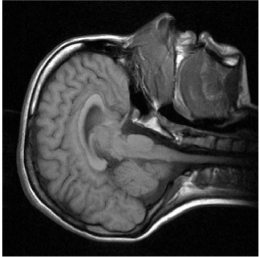


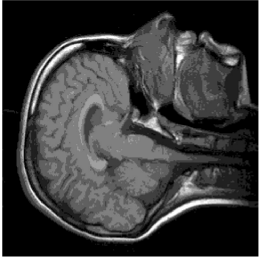
Matlab software.

3.Result



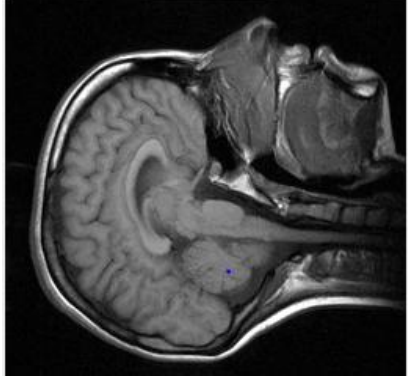
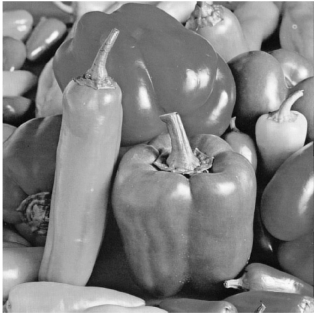

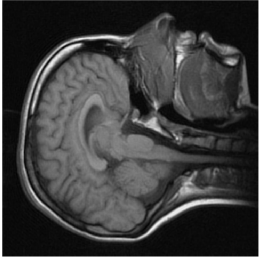
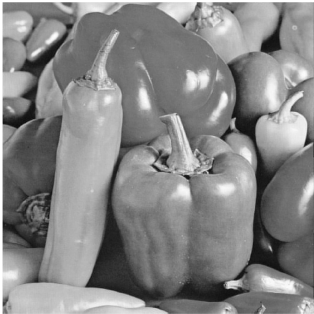

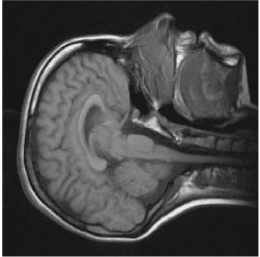
<1>exercise1

	peppers_gray.pgm	flowers.pgm	brainscan_8bit.pgm
compressi on factor	257/916 =0.2805676	191/257 =0.7431906	62/187 =0.3315508

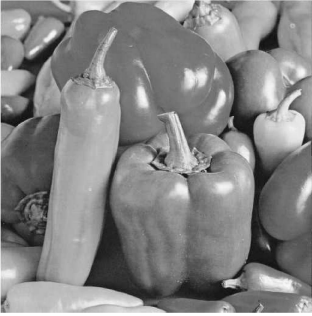

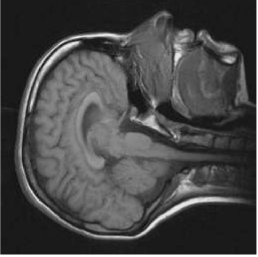


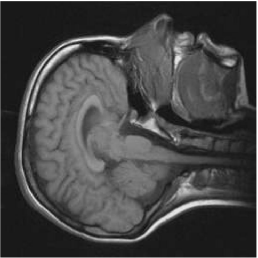


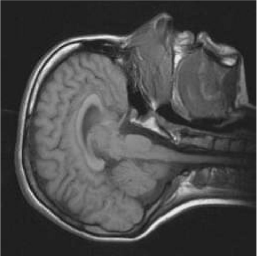
<2>exercise2

	peppers_gray.pgm	flowers.pgm	brainscan_8bit.pgm
original			
2x fewer gray levels			
RMSE	0.707726910871060	0.624261037757218	0.703949169751446
32x fewer gray levels			
RMSE	8.863489127547918	8.113174753679365	8.195225921551732



<3>exercise3



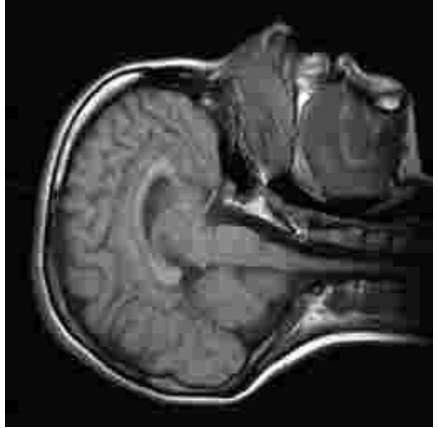
	peppers_gray.pgm	flowers.pgm	brainscan_8bit.pgm
original			
Omit 50% of spatial frequencies (full DCT)			
RMSE	2.887310014949699	3.438000203911396	3.035174862124648
Omit 50% of spatial frequencies (block DCT)			
RMSE	3.326279071591288	4.351273470558131	4.217051173514657

<4>exercise4

	peppers_gray.pgm	flowers.pgm	brainscan_8bit.pgm
the original matrix			
RMSE	4.389058082978905	5.157843774571845	4.842446988701531
the same matrix scaled by a factor of 2 (half as many bits)			
RMSE	4.421835630374769	5.180126909260268	4.871649045402524
zero out high DCT frequencies in subblocks.			
RMSE	4.437975745349617	5.475392288102130	5.355849022515545

<5>exercise5

	peppers_gray.pgm	flowers.pgm	brainscan_8bit.pgm
original			
JPEG Q=90			
RMSE	2.769230276091442	2.466042107908645	2.338904496375186
compression factor	62/917 =0.067612	68/257 =0.264591	18/187 =0.096256
JPEG Q=50			

RMSE	4.395325015118380	5.020196180423770	4.789889240935503
compression factor	20/917 =0.021810	28/257 =0.108949	7/187 =0.037433
JPEG Q=10			
RMSE	7.565341384153729	9.553328759812802	9.378574351166149
compression factor	8/917 =0.008724	12/257 =0.046693	3/187 =0.016043

4.Conclusion

- 1、The more redundancy a image have, the larger compression factor the image can have.
- 2、DCT, also known as discrete cosine transform, is a kind of block transform. It only uses cosine function to express signal, which is closely related to Fourier transform.
- 3、DCT is commonly used in image data compression. By dividing the image into equal size (8 * 8 in general) blocks, DCT is used to transform them to get more concise data. Because of the large spatial correlation between image pixels,.
- 4、DCT can greatly reduce these correlations, so that the image energy is concentrated in the upper left corner region, which is conducive to data compression. The transformed data is called DCT coefficient. This process is nondestructive.