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ECE 5460

Optional Homework

12/9/15

Within this homework, I heavily compressed an image, much like it is done in JPEG image files. I took a gray scale image, and applied the DCT using a block structure. The DCT-II is defined as:

$$B_{pq} = \alpha_p \alpha_q \sum_{m=0}^{M-1} \sum_{n=0}^{N-1} A_{mn} \cos\frac{\pi(2m+1)p}{2M} \cos\frac{\pi(2n+1)q}{2N}, \quad \begin{matrix} 0 \le p \le M-1 \\ 0 \le q \le N-1 \end{matrix}$$

where

$$\alpha_p = \begin{cases} \frac{1}{\sqrt{M}}, & p = 0 \\ \sqrt{\frac{2}{M}}, & 1 \le p \le M-1 \end{cases}$$

and

$$\alpha_q = \begin{cases} \frac{1}{\sqrt{N}}, & q = 0 \\ \sqrt{\frac{2}{N}}, & 1 \le q \le N-1 \end{cases}$$

(MATLAB help)

Because the DCT has frequency information, I eliminate low DCT values in the transformed image because they correspond to small changes in the image. By increasing the threshold for which values I remove, I can heavily compress the image. The original image is 943 kB, while my compressed image is 158 kB, so the compression ratio is approximately 6!

Original image

Compressed Image