Jpeg Compression

Pictures, Images and Waves

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4th December 2013

JPEG Image Compression

- Joint Photographic Experts Group
- Lossy compression
  - Smaller file size
  - Maintain image quality
  - Human perception is limited

Compression

Lossy vs Lossless

- Simplest compression
  - `aaa,ttttt,pppp,hh,ssssss` - 20 "bits"
  - *becomes*
  - `3a5t4p2h6s` - 10 "bits"
  - Compression ratio of $\frac{20}{10} = 2$
- Many other methods
- JPEG specific to images

Mathematical Basis

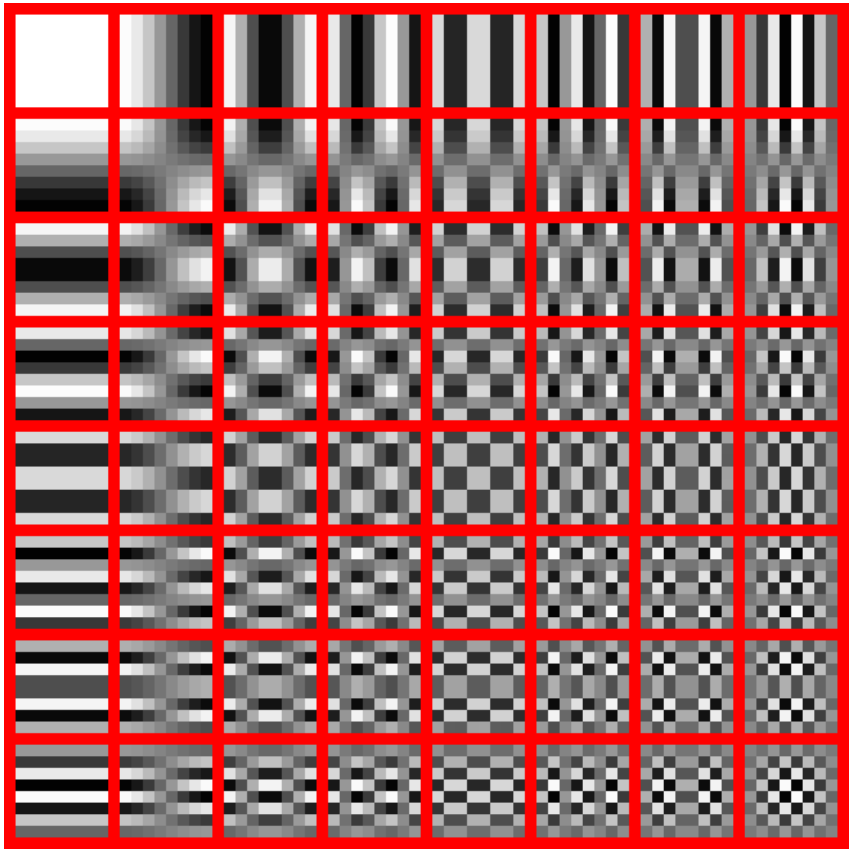
- Discrete Cosine Transform

$$D_m^M(u) = c_m \sqrt{\frac{2}{M}} \underbrace{\cos\overbrace{\left(\frac{\pi m(2u+1)}{2M}\right)}^{\text{Different coefficients}}}_{\text{Cosine Waves}} \qquad m = 0 \ldots M-1$$

$$G(m,n) = \sum_{u=0}^{M-1} \sum_{v=0}^{N-1} g(u,v) D_m^M(u) D_n^N(u)$$

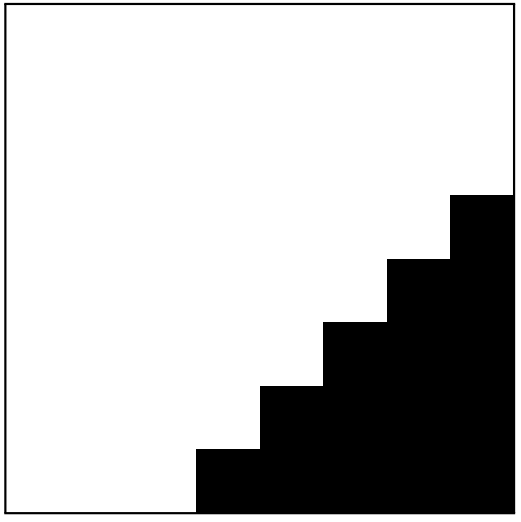
Conceptual Basis

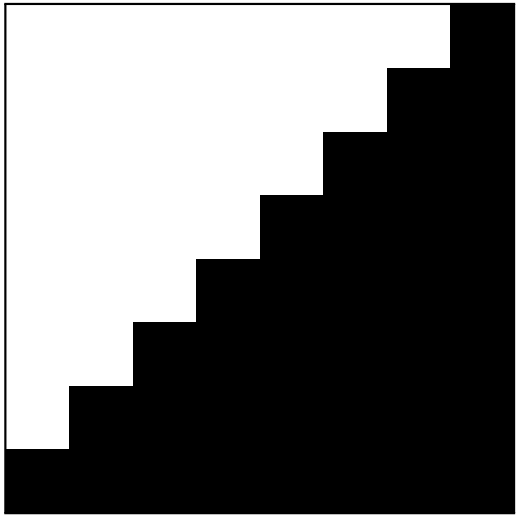
- Based on waves
- Split image into "waves"
  - Vertical
  - Horizontal
- Want to choose the waves that we remove so that they won't be missed.



Step by Step

- Decompose image into "waves"
- Arrange waves according to frequency
  - Highest frequency - top left
  - Lowest frequency - bottom right
- Erase bottom right corner
- Recompile image





Original Image

- 236 KB
- Uncompressed GIF image

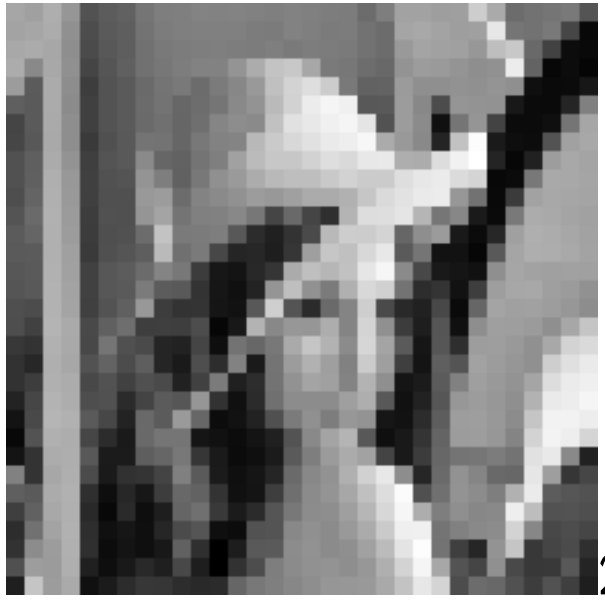
Results

A bit more information about this

41.4 KB

25.4 KB

36.9 KB



2.5 KB

Compressed Image

- 41.1 KB
- Compressed JPEG image