

Supplement to Chapter 3 of *The Science of Digital Media* – Digital Image Processing

Worksheet – Digital Imaging > JPEG Compression¹

Before completing this worksheet, you should view the on-line interactive tutorial “JPEG Compression.” This tutorial can be accessed at the website for *The Science of Digital Media*.

1. Suppose you have a detailed picture that you took on a digital camera. You import the picture into Photoshop, then attempt to save it. Should you save it as a GIF file or a JPEG file? Why?
2. Explain what is meant by the term “chrominance downsampling” with YUV color. Why is it used in the JPEG compression algorithm? Include the specifics of 4:2:0 chrominance downsampling.
3. Suppose you have an eight by eight block of pixels that you are going to compress using the JPEG method. They are currently represented as 24-bit RGB color, with eight bits per color component. Below, calculate the number of bytes necessary to store this image data in the RGB model *and* in the YUV model with 4:2:0 chrominance downsampling. Then calculate the compression rate.
4. Briefly explain how the Discrete Cosine Transform is used in the JPEG compression algorithm. Why are the color components tiled into 8×8 blocks before the transform is performed? Does it actually compress the data?
5. On the sample quantization matrix below, label the area that generally contains the *smallest* integer value and the *largest* integer value, then explain why it is organized in that manner

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