INT 13146
Homework 2

1. Obtain the images "lena.bin" and "peppers.bin" from the dataset Each imagehas 256 × 256 pixels and each pixel has 8 bits.
   (a) Read and display the images.
   (b) Define a new 256 ×256 image **J** as follows: the left half of **J**, *i.e.*, the first 128 columns, should be equal to the left half of the *Lena* image. The right half of **J**, *i.e.*, the 129^{th} column through the 256^{th} column, should be equal to the right half of the *Peppers* image.
   (c) Define a new 256 × 256 image **K** by swapping the left and right halves of **J**.
   (d) **Be sure to turn in:** A listing of your code and printouts of the original images, image **J**, and image **K**.

2. Use Python for this problem.
   (a) Type `help imread` and `help imwrite` at the Python prompt to read the online help for these commands.
   (b) Obtain the image "lenagray.jpg" from the dataset. It is the same imagethat you used in the first problem, but the file is in JPEG format this time.
   (c) Use the `imread` function to read in the image. Let's call this image $\mathbf{J}_1$.
   (d) Make a new image $\mathbf{J}_2$ that is the photographic negative of $\mathbf{J}_1$. To do this, set $\mathbf{J}_2 = 255 - \mathbf{J}_1$. Display the new image $\mathbf{J}_2$ and use the `imwrite` command to write it out as a JPEG file.
   (e) **Be sure to turn in:** A listing of your code and printouts of the original and modified images.

3. Use Python for this problem.
   (a) Obtain the **color** image "lena512color.jpg" from the dataset. It is the same image that you used in the first two problems, except this time it is in color (each pixel has 24 bits) and the size is 512 512 pixels. If you read the image into a Python array `J1`, then `J1(:,:,1)` is the Red band, `J1(:,:,2)` is the Green band, and `J1(:,:,3)` is the Blue band. In each band, each pixel has 8 bits, just like the image in the first problem.
   (b) Use `imread` to read in the image and then display it. Let's call this image $\mathbf{J}_1$.
   (c) Make a new color image $\mathbf{J}_2$ by swapping the color bands of $\mathbf{J}_1$ as follows. First, just set $\mathbf{J}_2 = \mathbf{J}_1$ to initialize the new image with the right size. Then make the Red band of $\mathbf{J}_2$ equal to the Blue band of $\mathbf{J}_1$, make the Green band of $\mathbf{J}_2$ equal to the Red band of $\mathbf{J}_1$, and make the Blue band of $\mathbf{J}_2$ equal to the Green band of $\mathbf{J}_1$.
   For example, to set the Red band of $\mathbf{J}_2$ equal to the Blue band of $\mathbf{J}_1$, you can type `J2(:,:,1) = J1(:,:,3);`.
   (d) Display the new image and use `imwrite` to write it out to a JPEG file.
   (e) **Be sure to turn in:** A listing of your code and printouts of the original and modified images.

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