CPE592 – Multimedia Network Security

Gregory Byrne Homework 1

For part 1 of the assignment we had to write a program to hide our first and last name inside of an image using the least significant bit (LSB) steganography technique. The pixels we modified with our name data also had to be right next to each other and coded with a stego key. For my implementation of this technique I used the stego key of "513" which coded the pixels in the top left corner of the stego image on the 2nd column of pixels going downward. This position was chosen to easily see the difference between encoding bits using least significant bit (LSB) steganography and most significant bit (MSB) steganography. Using LSB steganography I encoded the pixels in the picture of lena1.bmp with my name data "Gregory Byrne" as seen in figure 1 below.

Figure 1. Stego LSB Lena1

As you can see in the figure there seems to be no distortion of the image using the LSB technique on a grayscale photo. Using the program I wrote and the stego key "513" I was able to recover my name from this image using the programs I wrote in Matlab. Next I encoded my name in a color picture called mandril_color.bmp to see how LSB works on a color image. Below in figure 2 is the stego image with my name data encoded in its pixels.

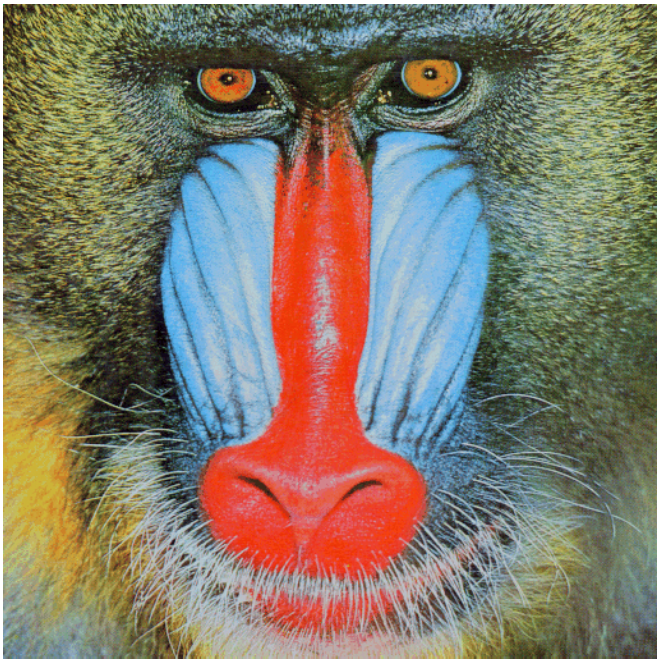

Figure 2. Stego LSB Mandril_color

As you can see in the figure there seems to be no distortion of the image using the LSB technique on a color photo as well. Using the program I wrote and the stego key “513” I was able to recover my name from this color image using the programs I wrote in Matlab.

For part 2 of the assignment we had to do the same task of encoding our name data within an image but this time we had to use most significant bit (MSB) steganography. After modifying my previous LSB steganography Matlab program to now utilize MSB steganography it generated the following results. As seen below in figure 3 lena1 now has some discolored out of place pixels in the top left corner of the image.

Figure 3. Stego MSB Lena1

Though it is hard to see since its close to the border of the image the pixels are out of place and very noticeable. In this grayscale image the encoding of the data on the MSB of the pixels turns them green and red which can be detected by the eye. The name data was retrieved from the image with no issue using the Matlab program. Having seen how the MSB steganography effected this image next I looked at the effect of this technique on a color image. Below in figure 4 is the stego MSB of Mandril_color.

Figure 4. Stego MSB Mandril_color

Though it is hard to see since its close to the border of the image the pixels are out of place and very noticeable. In this color image the encoding of the data on the MSB of the pixels turns them red while the other pixels around them are black and yellow. MSB steganography is a lot easier to detect with the eye than LSB steganography. This is because when encoding data with LSB you are only changing the last least import bit of the pixel value. So instead of a pixel being its original value the stego pixel will be one color value off which is not easily detectable when compared to MSB steganography. With MSB you are now encoding data using the pixels most significant bit value. So if the stego pixel is changed the value can be 128 more or less than color value of what the original image pixel had for that value at that location. This leads to very easy to detect distortion of the image and thus a less desirable technique for steganography when compared to LSB.