Fall 2021

California State University, Northridge

Department of Electrical and Computer Engineering

Computer Assignment 5
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ECE 551
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1 Code.

```
clear
image = rgb2gray(imread("JohnLennon.jpg"));
[x,y,] = size(image);
image_vec = reshape(image,[x*y,1]);
image_u = unique(image_vec);
image_f = histc(image_vec,image_u);
image_p = [image_f/(x*y)];
dict = huffmandict(image_u,image_p);
image_c = huffmanenco(image_vec,dict);
image_vec_d = huffmandeco(image_c,dict);
image_d = reshape(image_vec_d,[x,y]);
imwrite(image_d,"image_d.jpg");
is_equal(image,image_d)
```

1 Results.

Original Image ***Decompressed Image***

Storage before compression = 1,200*857*8 = 8,277,200 bits
Storage after compression = 4,642,423 bits

2a/3 Code.

```
clear
image = int16(rgb2gray(imread("JohnLennon.jpg")));
[x,y,] = size(image);
image_diff = zeros(x,y);
image_diff = int16(image_diff);
j=2;
i=1;
prev=image(1,1)
right = 1;
image_diff(1,1) = image(1,1);
while i<x
   if right
      if j == y+1
         right = 0;
         j=j-1;
         i=i+1;
      else
         image_diff(i,j) = image(i,j) - prev;
         prev = image(i,j);
         j=j+1;
      end
   end
   if ~right
      if j == 0
         right = 1;
         i=i+1;
         j=j+1;
      else
         image_diff(i,j) = image(i,j) - prev;
         prev = image(i,j);
         j=j-1;
      end
   end
end
image_vec = reshape(image_diff,[x*y,1]);
image_u = unique(image_vec);
image_f = histc(image_vec,image_u);
image_p = [image_f/(x*y)];
dict = huffmandict(image_u,image_p);
image_c = huffmanenco(image_vec,dict);
image_vec_d = huffmandeco(image_c,dict);
```

```
image_d = reshape(image_vec_d,[x,y]);

image_diff_d = zeros(x,y);
image_diff_d = int16(image_diff);
j=2;
i=1;
prev=image(1,1)
right = 1;
image_diff_d(1,1) = image(1,1);
while i<x
   if right
      if j == y+1
         right = 0;
         j=j-1;
         i=i+1;
      else
         image_diff_d(i,j) = prev + image_d(i,j);
         prev = image_diff_d(i,j);
         j=j+1;
      end
   end
   if ~right
      if j == 0
         right = 1;
         i=i+1;
         j=j+1;
      else
         image_diff_d(i,j) = prev + image_d(i,j);
         prev = image_diff_d(i,j);
         j=j-1;
      end
   end
end
image_diff_d = uint8(image_diff_d);
imwrite(image_diff_d,"image_diff_d.jpg");
isequal(image,image_diff_d)
```

2a/3. Results

Original Image *Decoded Image (Difference and Huffman)*

Storage after Huffman-Difference compression 2,347,418 bits