

Multimedia-Lecture-six

Data Compression



Data Compression Concept



Most of the real data is very redundant. Data Compression is basically defined as a technique that decreases the size of data.

It reduces the storage space and hence storage cost, also reduces time to retrieve and transmit data.

Data-compression techniques can be divided into two major families:

- Lossy Data Compression.
- Lossless Data Compression.

Lossy and Lossless Compression



Original Image



Lossless Compression



Original Lena
Image (12KB
size)



Lena Image, Compressed
(85% less information,
1.8KB)



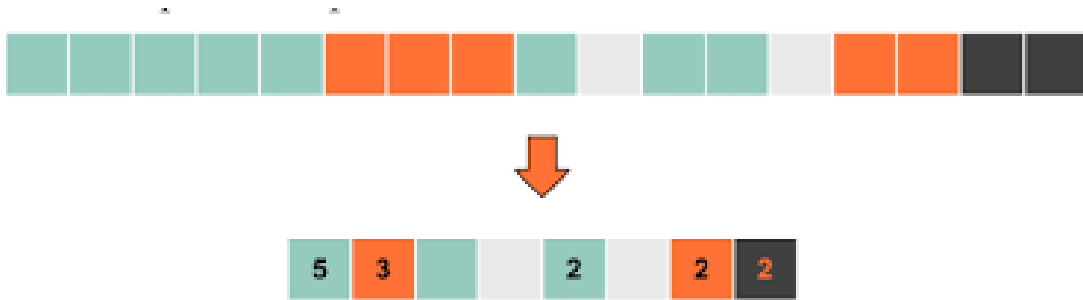
Lena Image, Highly
Compressed (96% less
information, 0.56KB)

Data Compression with MATLAB

- Compression Using RLE Method
- Image Compression Using RLE Method
- Image Compression with the DCT Method
- Entropy Function
- JPEG Algorithm

Encoding Data Using RLE Method

Run Length Encoding (RLE): is a simple compression algorithm used to compress sequences containing subsequent repetitions of the same character.



Example:

```
%% input data
x=[5, 5, 2, 1, 1, 1, 1, 3]
y=[];
c=1;
for i=1:length(x)-1
    if(x(i)==x(i+1))
        c=c+1;
    else
        y=[y,c,x(i),];
        c=1;
    end
end
y=[y,c,x(length(x))];
disp(y);
```

What is The
Output??

Image Compression Using RLE Method

Try the previous code for an black and white image blobs.png

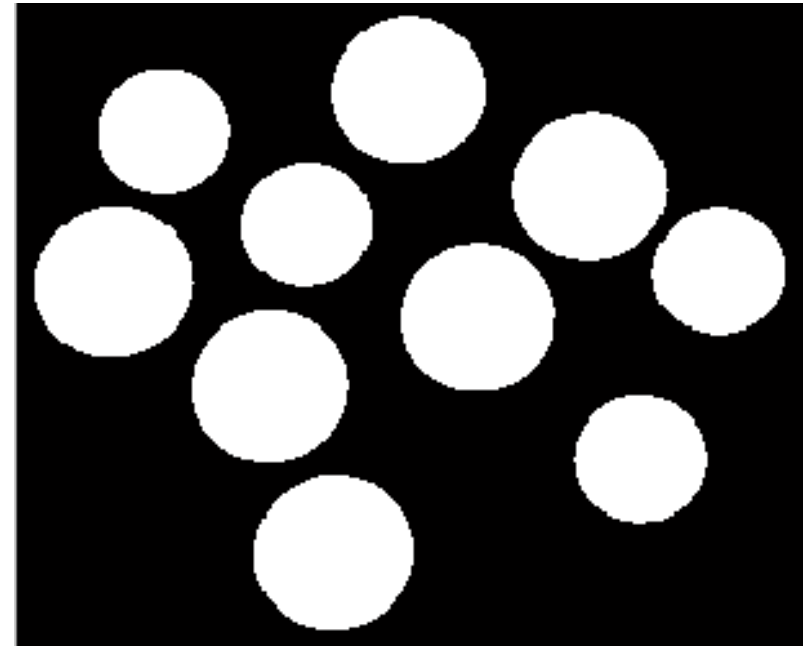
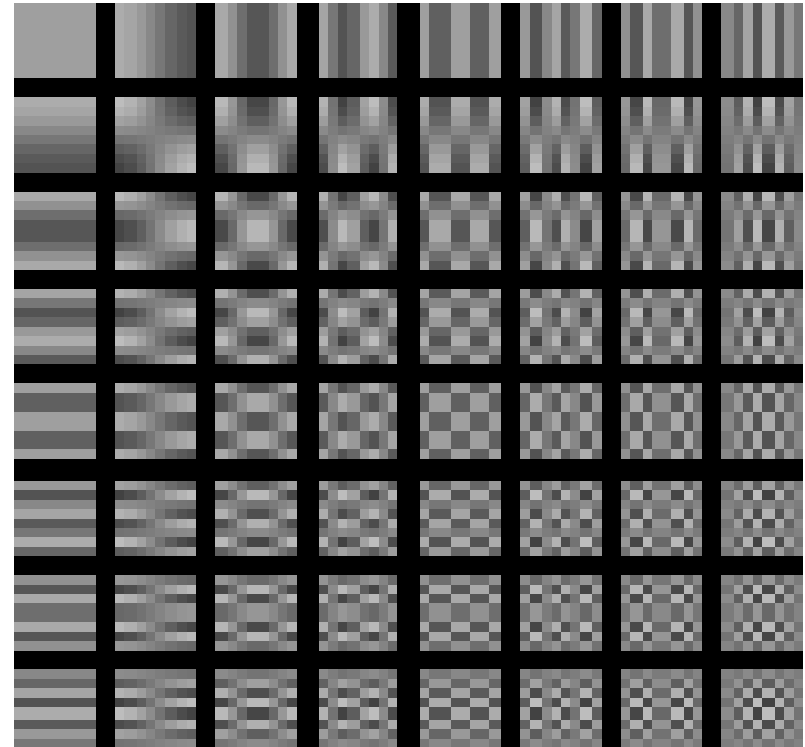


Image Compression Using DCT Method

Discrete Cosine Transform(DCT):

The discrete cosine transform (DCT) represents an image as a sum of sinusoids of varying magnitudes and frequencies. The `dct2` function computes the two-dimensional discrete cosine transform (DCT) of an image.



```

I = imread('cameraman.png');
I = im2double(I);
%Compute the two-dimensional DCT of 8-by-8 blocks in the image
T = dctmtx(8);
dct = @(block_struct) T * block_struct.data * T';
B = blockproc(I,[8 8],dct);
mask = [1  1  1  1  0  0  0  0
        1  1  0  0  0  0  0  0
        1  0  0  0  0  0  0  0
        0  0  0  0  0  0  0  0
        0  0  0  0  0  0  0  0
        0  0  0  0  0  0  0  0
        0  0  0  0  0  0  0  0];
B2 = blockproc(B,[8 8],@(block_struct) mask .*
block_struct.data);
invdct = @(block_struct) T' * block_struct.data * T;
I2 = blockproc(B2,[8 8],invdct);
imshow(I)
figure
imshow(I2)

```



Compression Image

Try to compute compression ratio:
Uncompressed Size / Compressed Size.

Entropy Function

The definition of entropy is aimed at identifying often-occurring symbols as short codeword.

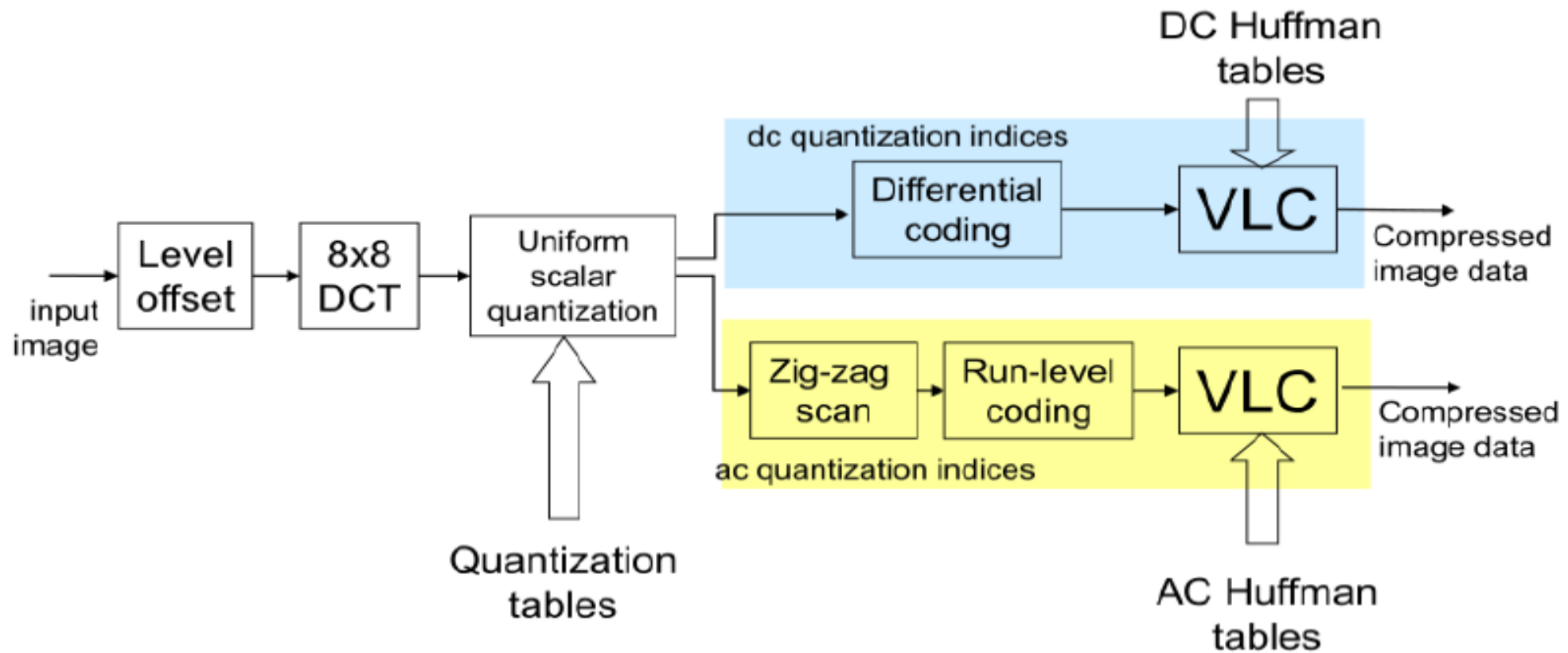
For example, E occurs frequently in English, so we would give it a shorter code than Q.

$$\eta = H(s) = \sum_{i=0}^n p_i \log_2 \frac{1}{p_i} = -\sum_{i=0}^n p_i \log p_i$$

P_i : is the probability that symbol S_i in S will occur.

$\log_2\left(\frac{1}{p_i}\right)$ Indicates the amount of information contained in characters.

JPEG Algorithm



That's All