PES UNIVERSITY

DEPARTMENT OF ELECTRONICS AND COMMMUNICATION ENGINEERING

DIGITAL IMAGE PROCESSING -2

A/H/P COMPONENT-1

Submitted By:

SHAKTHA SHETTY

PES1UG20EC336

SECTION – F

QUESTION 1:

%load an image of ur choice (grayscale image)
% using huffman encoding technique , encode the image for transmission
%achieve compression

Loaded image : 'cameraman.tif'
Image:

CODE:

```
clear all
clc
A=imread('cameraman.tif');
figure
imshow(A)
A1=double(A(:))
[p,symbols]=hist(A1,unique(A1));
p=p/sum(p)


[dict,avglen] = huffmandict(symbols,p)
comp = huffmanenco(A1,dict)
```

OUTPUT:

A1 = 65536×1

```
156
160
156
160
156
155
156
159
158
155
  ⋮
```

p = 1×247

```
0.0001    0.0065    0.0225    0.0192    0.0179    0.0222    0.0233 ...
```

dict = 247×2 cell

	1	2
1	7	*1×14 double*
2	8	[1,0,1,0,0,1,1]
3	9	[1,1,1,1,0]
4	10	[0,0,1,1,0,1]
5	11	[0,1,0,1,0,0]
6	12	[1,1,1,1,1]
7	13	[1,1,0,1,1]
8	14	[1,0,1,0,1]
9	15	[0,0,0,1,1,1]

avglen = 7.0448

comp = 461689×1

```
0
1
0
0
0
1
1
1
0
0
  ⋮
```

INFERENCE :

Huffman Coding is generally useful to compress the data in which there are frequently occurring characters. We can observe that the most frequent character gets the smallest code and the least frequent character gets the largest code .

QUESTION 2:

%2
%load cameraman and lena images
%perfoem morphological dilation , erosion , opening and closing operations
%comment on the result

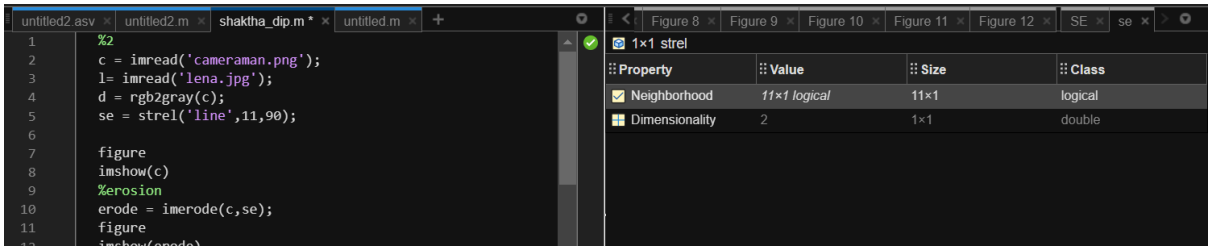
Loaded image(input):

'cameraman.png'

'lena.jpg' (used as it is, With coloured Image)

STRUCTURING ELEMENT: strel Creates a linear structuring element that is symmetric with respect to the neighborhood center, with approximate length len and angle deg.

Properties of structuring element:



THIS IS THE LINE FOR STRUCTURING ELEMENT : se = strel('line',11,90);

Different structuring element can be used.

CODE:

```
%2
c = imread('cameraman.png');
l= imread('lena.jpg');
d = rgb2gray(c);
se = strel('line',11,90);

figure
imshow(c)
%erosion
erode = imerode(c,se);
figure
imshow(erode)

%dilation
dilate = imdilate(c,se);
figure
imshow(dilate)

%opening
open = imopen(c,se);
figure
imshow(open)

%closing
close = imclose(c,se);
figure
imshow(close)

figure
imshow(l)

%erosion
erode2 = imerode(l,se);
figure
imshow(erode2)
```

```
%dilation
dilate2 = imdilate(l,se);
figure
imshow(dilate2)

%opening
open2 = imopen(l,se);
figure
imshow(open2)

%closing
close2 = imclose(l,se);
figure
imshow(close2)
```

OUTPUT:

Figure 1 × Figure 2 × Figure 3 × Figure 4 × Figure 5 × Figure 6 × F

Figure 4 × Figure 5 × Figure 6 × Figure 7 × Figure 8 × Figure 9 × F

Figure 4 × Figure 5 × Figure 6 × Figure 7 × Figure 8 × Figure 9 × F

Figure 4 × Figure 5 × Figure 6 × Figure 7 × Figure 8 × Figure 9 × F

Figure 5 × Figure 6 × Figure 7 × Figure 8 × Figure 9 × Figure 10 ×

INFERENCE:

Here, we have used a line structuring element.

Erosion is the counter-process of dilation. If dilation enlarges an image then erosion shrinks the image. The way the image is shrunk is determined by the structuring element.

Erosion,erodes away the boundaries of foreground object (Always try to keep foreground in white)

Dilation increases the white region in the image or size of foreground object increases. Normally, in cases like noise removal, erosion is followed by dilation

Opening is just another name of erosion followed by dilation. It is useful in removing noise which can be clearly seen in the output Image.

Closing is reverse of Opening, Dilation followed by Erosion. It is useful in closing small holes inside the foreground objects, or small black points on the object.