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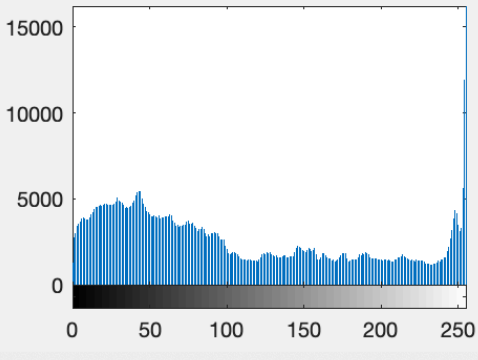
MACHINE VISION – DIGITAL ASSIGNMENT – 1

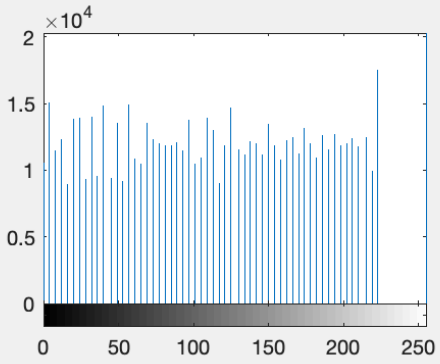
Image Enhancement Techniques:

Histogram Equalization:

```
image = imread('harry.png');
I= imread('harry.png');
figure
subplot(2,2,1)
imshow(I)
subplot(2,2,2)
imhist(I)
J = histeq(image);
figure
subplot(2,2,3)
imshow(J)
subplot(2,2,4)
imhist(J)
nscore=niqe(I)
nscore1=niqe(J)
```

Output:

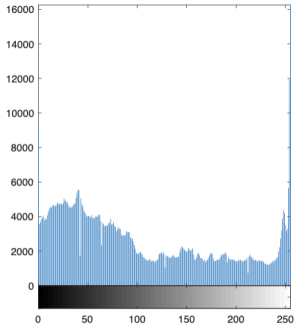


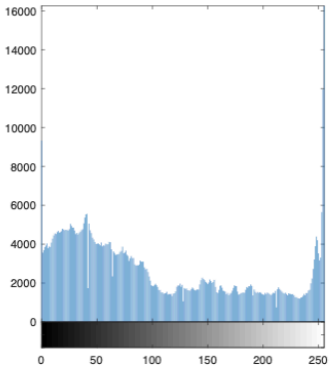



```
nscore =

    5.1336


nscore1 =

    3.7186
```

Contrast Stretching:

```
I = imread('harry.png');
figure
imshow(I)
J = imadjust(I,stretchlim(I),[]);
figure
imshow(J)
imhist(J)
nscore=niqe(I)
nscore1=niqe(J)
```


16000
14000
12000
10000
8000
6000
4000
2000
0
0
50
100
150
200
250


16000
14000
12000
10000
8000
6000
4000
2000
0
0
50
100
150
200
250

```
>> mv

nscore =

    5.1336


nscore1 =

    5.1083

>>
```

Gray Level Slicing:

```
clc;
clear all;
i=imread('harry.png');
j=double(i);
k=double(i);
[row,col]=size(j);
T1=100 %Lowest threshold value
T2=200 % Highest threshold value
for x=1:row
for y=1:col
if((j(x,y)>T1) && (j(x,y)<T2))
j(x,y)=i(x,y);
k(x,y)=255;
else
j(x,y)=0;
k(x,y)=0;
end
end
end
subplot(311), imshow(i), title('Original image')
subplot(312), imshow(uint8(j)), title('Graylevel
slicing with background')
subplot(313), imshow(uint8(k)), title('Graylevel
slicing without background')
nscore1=niqe(i)
```

```
nscore2=niqe(uint8(j))
nscore3=niqe(uint8(k))
```

Output:

Original image

Graylevel slicing with background

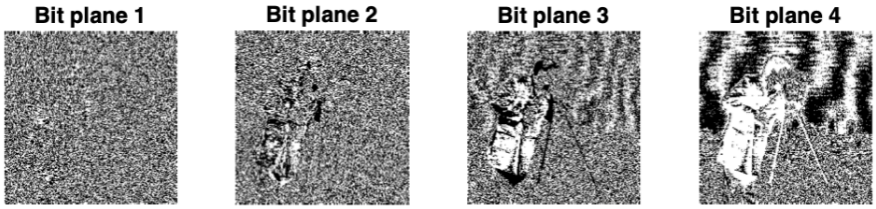
Graylevel slicing without background

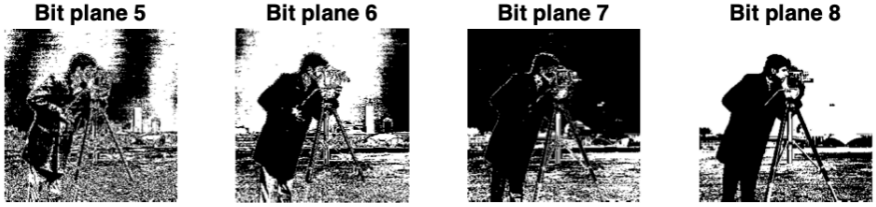
```
Command Window

nscore1 =

    5.1336


nscore2 =

    5.7842


nscore3 =

   12.0286

fx >>
```

Bit Plane Slicing:

```
clc
clear all
close all
warning off;
A=imread('cameraman.tif');
A=double(A);
B=bitget(A,1); subplot(2,4,1);imshow((B));title('Bit
plane 1');
B=bitget(A,2); subplot(2,4,2);imshow(B);title('Bit
plane 2');
B=bitget(A,3); subplot(2,4,3);imshow(B);title('Bit
plane 3');
B=bitget(A,4); subplot(2,4,4);imshow(B);title('Bit
plane 4');
B=bitget(A,5); subplot(2,4,5);imshow(B);title('Bit
plane 5');
B=bitget(A,6); subplot(2,4,6);imshow(B);title('Bit
plane 6');
B=bitget(A,7); subplot(2,4,7);imshow(B);title('Bit
plane 7');
B=bitget(A,8);subplot(2,4,8);imshow(B);title('Bit
plane 8');
```

Output:

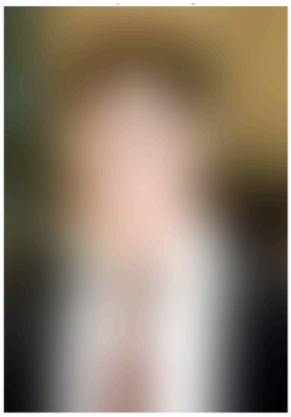




Sharpening the image:

```
x=imread('harry.png');
figure;
imshow(x);
I = imgaussfilt(x,40);
figure();
imshow(I);
I_sharpen=imsharpen(x,'amount',3);
figure;
imshow(I_sharpen);
nscore1=niqe(x);
nscore2=niqe(I);
nscore3=niqe(I_sharpen);
```

Output:



Command Window

```
nscore1 =

    5.1336


nscore2 =

    9.1180


nscore3 =

    4.9331
```

Quality of the image:

```
clc
A = imread('harry.png');
Anoise = imnoise(A,'Gaussian',0,0.05);
Ablur = imgaussfilt(A,2);
score = piqe(A);
score_noise = niqe(Anoise);
score_blur = niqe(Ablur);
figure
montage({A,Anoise,Ablur},'Size',[1 3])
title({['Original Image: NIQE score = ',
num2str(score),'    |    Noisy Image: NIQE score =
', num2str(score_noise),'    ' '|    Blurred
Image: NIQE score = ', num2str(score_blur)]},
'FontSize',12)
```

Output:

Image Inversion :

```
i = imread('harry.png');
gs = rgb2gray(i);
nscore=niqe(gs);
fprintf("Image score for Grayscale image: %0.2f.\n", nscore)
bw = imbinarize(gs);
InvertedBW = imcomplement(bw);
subplot(1, 2, 1)
imshow(bw)
title('Black and white Image');
subplot(1, 2, 2)
imshow(InvertedBW)
title('Inverted B&W image');
```

Black and white Image

Inverted B&W image

```
>> mv
Image score for Grayscale image: 5.13.
>>
```

Metrics used to measure enhancement of Image :

- niqeModel - Naturalness Image Quality Evaluator (NIQE) model -used to calculate the Naturalness Image Quality Evaluator (NIQE) perceptual quality score of an image. A smaller score indicates better perceptual quality.

S.no	Image	Score
1	Original image	5.1336
2	Histogram equalised image	3.7186
3	Smoothened image	9.1180
4	Sharpened image	4.9331
5	Contrast stretched image	5.1083
6	Grayscale image with background	5.7842
7	Grayscale image without background	12.0286
8	Grayscale	5.13
9	Blurred image	5.0835
10	Noisy image	16.9091

The image enhancement methods with least scores :

- Histogram equalisation
- Sharpened

Changes Suggested:

- Changed from different images to same images and applied the techniques.

- Quality of image is found.
- Smoothened the image before sharpening it.
- Used gaussian noise for the image.

Result :

The NIQE scores are calculated for images. Hence different image enhancement techniques are applied for the image and best and worst image enhancement methods are found.