**Assignment 2**

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**Q1**

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**Q2**

1. Done in Hard Copy
2. Mentioned the Expression in the Hard Copy and used that final obtained expression for finding the resulting matrix both full and same without using conv2.

**NOTE:-There are 2 file for this question one names Q2.m (it contain the script) and the other one is F.m (it contain the F function)**

**F.m:-**

function value= F( x,y )

if(x==0 && y==0)

value=1;

elseif(x==1&&y==0)

value=2;

elseif(x==2 && y==0)

value=3;

elseif(x==0 && y==-1)

value=4;

elseif(x==1 && y==-1)

value=5;

elseif(x== 2&& y==-1)

value=6;

elseif(x== 0&& y==-2)

value=7;

elseif(x==1 && y==-2)

value=8;

elseif(x== 2&& y==-2)

value=9;

else

value=0;

end

end

**Q2.m**

N1=zeros(5,5);

x=-1;

y=1;

for i=1:5

for k=1:5

N1(i,k)=5\*F(x,y)+6\*F(x-1,y)+4\*F(x+1,y)+2\*F(x,y-1)+F(x+1,y-1)+3\*F(x-1,y-1)+7\*F(x+1,y+1)+8\*F(x,y+1)+9\*F(x-1,y+1);

x=x+1;

end

x=-1;

y=y-1;

end

disp('Without using conv2: ')

disp('Full');

disp(N1);

disp('Same');

N2=N1(2:4,2:4);

disp(N2);

disp('Using conv2: ')

f=[1 2 3;4 5 6;7 8 9];

w=[1 2 3;4 5 6;7 8 9];

disp('full');

M1=conv2(f,w,'full');

disp(M1);

disp('Same');

M2=conv2(f,w,'same');

disp(M2);

1. Compared the result using conv2 command for both same and full and the resulting matrix is exactly same hence verified.

**NOTE:-The comparison is also done in Q2.m file**

**Q3**

**NOTE: The code is in Matching.m file**

**Matching.m:-**

I=imread('cameraman.tif');

I=double(I);

pr=zeros(256,1);

for j=0:255

pr(j+1)=nnz(I==j);

end

for j=1:256

pr(j)=pr(j)/65536;

end

prk=zeros(256,1);

sum=0;

for i=1:256

sum=0;

for j=1:i

sum=sum+pr(j);

end

prk(i)=sum\*255;

end

prk=round(prk);

Z=imread('Fig0417(a)(barbara).tif');

Z=double(Z);

zs=zeros(256,1);

for j=0:255

zs(j+1)=nnz(Z==j);

end

for j=1:256

zs(j)=zs(j)/227532;

end

zsk=zeros(256,1);

sum=0;

for i=1:256

sum=0;

for j=1:i

sum=sum+zs(j);

end

zsk(i)=sum\*255;

end

zsk=round(zsk);

M=zeros(256,1);

min=9999;

index=-1;

for i=1:256

min=9999;

index=-1;

for j=1:256

if min > abs(prk(i)-zsk(j))

min=prk(i)-zsk(j);

index=j;

end

end

M(i)=index;

end

for i=1:256

for j=1:256

I(i,j)=M(I(i,j)+1);

end

end

I=uint8(I);

Preview=imread('cameraman.tif');

Reference=imread('Fig0417(a)(barbara).tif');

imshow(Preview),figure,imhist(Preview),figure,imshow(Reference),figure,imhist(Reference),figure,imshow(I),figure,imhist(I);

**RESULT:**



Original Image



Histogram of Original Image



Reference Image



Histogram of Reference Image



Histogram Matching Image



Matching Histogram

**OBSERVATION:**

As we can see the difference in the histogram of the original image and the histogram after performing histogram matching with the reference image, in the original image the frequency of some so the pixel values were two high as seen from the peak in the histogram but after performing histogram matching, most of the pixel values are at the same height and the pixel values that have very low frequency there frequency is also raised. And we can also notice the difference between the histogram of the original image and the reference image ,in the reference image most of the pixel values are at the same height as compared to original image where we can easily notice some peaks forming.

**Q4**

**NOTE:-**

1. **I have performed blurring using 3x3 box kernel, sharpening using Laplacian mask of 3x3 (only horizontal and vertical) and unsharp mask on cameraman.tif**
2. **Code for 3x3 box kernel is in Blurfilter.m file**
3. **Code for sharpening using Laplacian mask of 3x3 is in Sharpfilter.m file**
4. **Code for unsharp mask is in Unsharpmask.m file**
5. **Code for verifying the output of all three is in VerifyFilter.m file**

**Blurfilter.m:**

I=imread('cameraman.tif');

J=[I;zeros(1,256)];

J=[zeros(1,256);J];

Z=zeros(258,1);

J=[Z J Z];

J=double(J);

R=zeros(256,256);

for i=2:256

for j=2:256

R(i-1,j-1)=(J(i,j)+J(i-1,j)+J(i+1,j)+J(i,j+1)+J(i-1,j+1)+J(i+1,j+1)+J(i,j-1)+J(i+1,j-1)+J(i-1,j-1))/9;

end

end

R=uint8(R);

imshow(I),figure(),imshow(R);

**Result:**



Blur Image

**OBSERVATION:**

The 3X3 Box kernel is an average mask which when placed on an pixel ,I assign the average value of its neighbor(3X3) including its value too ,so all the pixel values in the image are affected, due to this averaging mask we lose the sharp edges in the image which make the image sharp ,so the image seems to be blur.

**Sharpfilter.m:**

I=imread('cameraman.tif');

J=[I;zeros(1,256)];

J=[zeros(1,256);J];

Z=zeros(258,1);

J=[Z J Z];

J=double(J);

R=zeros(256,256);

for i=2:256

for j=2:256

R(i-1,j-1)=J(i+1,j)+J(i-1,j)+J(i,j+1)+J(i,j-1)-4\*J(i,j);

end

end

R=uint8(R);

Out=I-R;

imshow(I),figure,imshow(R),figure,imshow(Out);

**Result:**



Masked Image



Sharper Image

**OBSERVATION:**

**Unsharpmask.m:**

I=imread('cameraman.tif');

J=[I;zeros(1,256)];

J=[zeros(1,256);J];

Z=zeros(258,1);

J=[Z J Z];

J=double(J);

R=zeros(256,256);

for i=2:256

for j=2:256

R(i-1,j-1)=(J(i,j)+J(i-1,j)+J(i+1,j)+J(i,j+1)+J(i-1,j+1)+J(i+1,j+1)+J(i,j-1)+J(i+1,j-1)+J(i-1,j-1))/9;

end

end

I=double(I);

U=I-R;

G=I+U;

G=uint8(G);

I=uint8(I);

imshow(I),figure(),imshow(G);

**Result:**



Unsharp Masked Image

**OBSERVATION:**

**VerifyFilter.m**

I=imread('cameraman.tif');

H = fspecial('laplacian');

MotionBlur = imfilter(I,H,'replicate');

Out1=I-MotionBlur;

H = fspecial('average');

MotionBlur = imfilter(I,H,'replicate');

Out2=MotionBlur;

H = fspecial('average');

MotionBlur = imfilter(I,H,'replicate');

imshow(MotionBlur);

G=I-MotionBlur;

Out3=I+G;

imshow(Out2),figure,imshow(Out1),figure,imshow(Out3);

**Result:**



Blur Image



Sharp Image



Unsharp Masked Image

**OBSERVATION:**

**Q5**

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