EXPERINMENT 6

Aim : To study various types of noises and implementation of it.

❖ Exercises :

1. **Synthesize the image of a chess board. (use intensity 50 for dark block and 170 for bright block). Add gamma noise and exponential noise (both separately) and generate noisy image. Show and comment on histogram of the noisy images.**

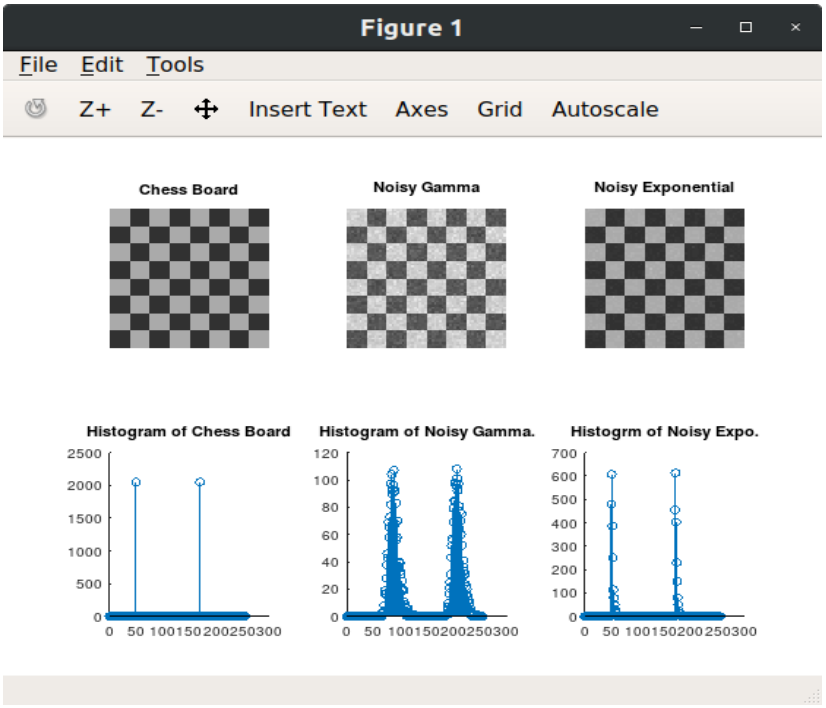
→ Solution :-

Code :

```
clear all
clc
close all

pkg load image

board = uint8(zeros(64,64));

block = 0;
blockm = 8,blockn = 8;
mr=1,nr=8;
mc=1,nc=8;
black = 50,white = 170;

for ib=1:8 %block row
  for jb=1:8 %block coloum
    if(mod(block,2)==0)
         board(mr:nr,mc:nc)= white;
    elseif(mod(block,2)==1)
        board(mr:nr,mc:nc)=black;
    endif
    mc = mc+blockm;
    nc = nc+blockn;
    block = block+1;
  endfor
  block = block-1;
  mc=1;
  nc=8;
  mr = mr+blockm;
  nr = nr+blockn;
endfor

```

```
33  img = board;
34  subplot(2,3,1)
35  imshow(img)
36  title("Chess Board");
37  subplot(2,3,4)
38  stem(0:255,imhist(img));
39  title("Histogram of Chess Board");
40
41  [M,N] = size(img);
42
43  a=0.5;
44  b=19;
45
46  %gamma noise
47
48  k=-1/a;
49  n=zeros(M,N);
50  for i=1:b
51    n=n+k*log(1-rand(M,N));
52  endfor
53
54  noisy = img+n;
55  subplot(2,3,2)
56  imshow(noisy);
57  title("Noisy Gamma");
58  subplot(2,3,5)
59  stem(0:255,imhist(noisy));
60  title("Histogram of Noisy Gamma.");
61
62  %exponential noise;
63  k=-1/a;
64  n=k*log(1-rand(M,N));
65
66  noisy = img+n;
67  subplot(2,3,3)
68  imshow(noisy);
69  title("Noisy Exponential");
70  subplot(2,3,6)
71  stem(0:255,imhist(noisy));
72  title("Histogrm of Noisy Expo.");
```

Output :



2. Take your gray scale photo and generate noisy photo with:

1) Gaussian noise with probability 0.4 using randn function

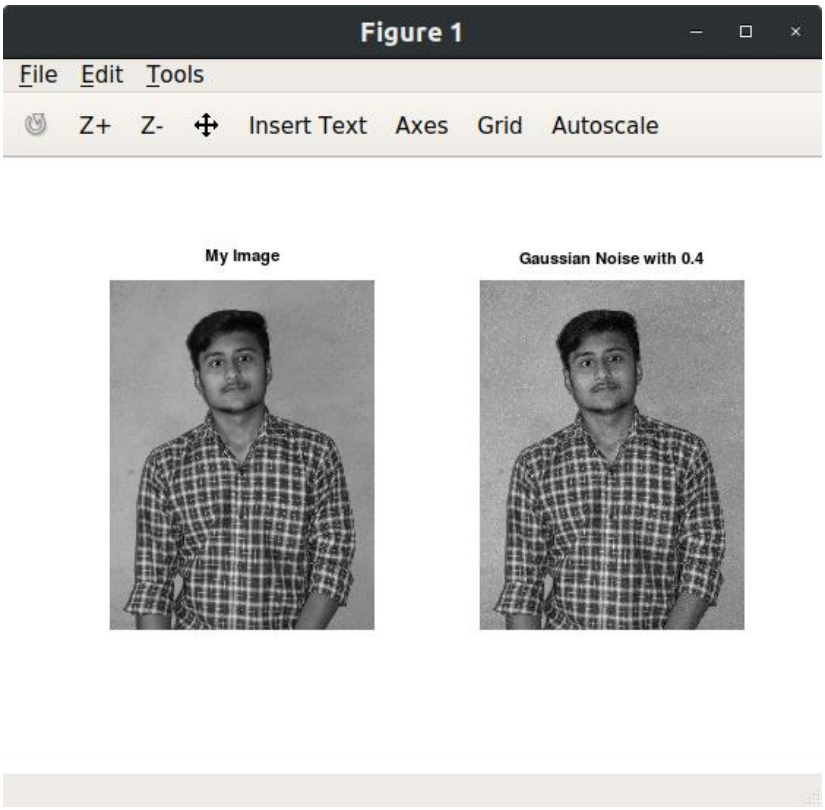
Code :

```
clear all
clc
close all

pkg load image
img = rgb2gray(imread('/home/nihar/Desktop/SEM 7/IP/Lab/Lab6/my.jpeg'));
subplot(1,2,1)
imshow(img);
title('My Image');
[M,N] = size(img);

sigma=10;
mean=5;
prob=0.4;
noisy = gaussian_noise_with_prob(img,sigma,mean,prob);
subplot(1,2,2)
imshow(noisy);
title('Gaussian Noise with 0.4');
```

Function for Gaussian Noise with Probability :

```
function noisy = gaussian_noise_with_prob(img,sigma,mean,prob)
  [M,N]=size(img);
  mask = rand(M,N)<prob;
  n = round(sigma*randn(M,N))+mean;
  n = n.*mask;
  noisy = img+n;
endfunction
```

Output :

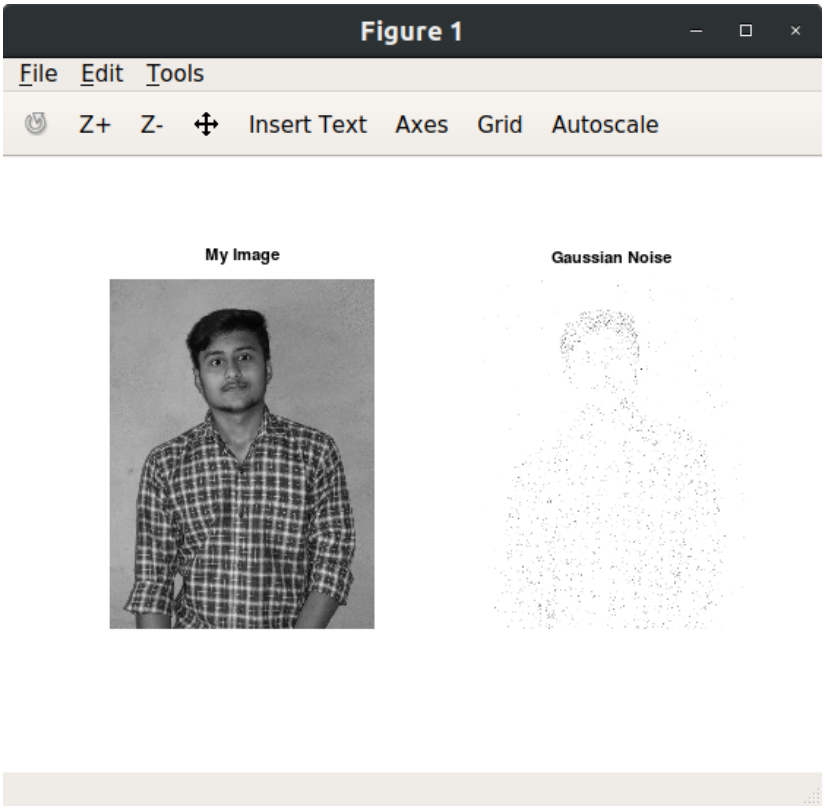


2) Gaussian noise with mean 2 and variance 0.06 using imnoise function.

Code :

```
clear all
clc
close all

pkg load image
img = rgb2gray(imread('/home/nihar/Desktop/SEM 7/IP/Lab/Lab6/my.jpeg'));
subplot(1,2,1)
imshow(img);
title('My Image');

variance=0.06;
mean=1;

noisy =  imnoise(img,'gaussian',mean,variance);
subplot(1,2,2)
imshow(noisy);
title("Gaussian Noise");
```

Output :



3) Salt and pepper noise with probability 0.2 using your user defined function.

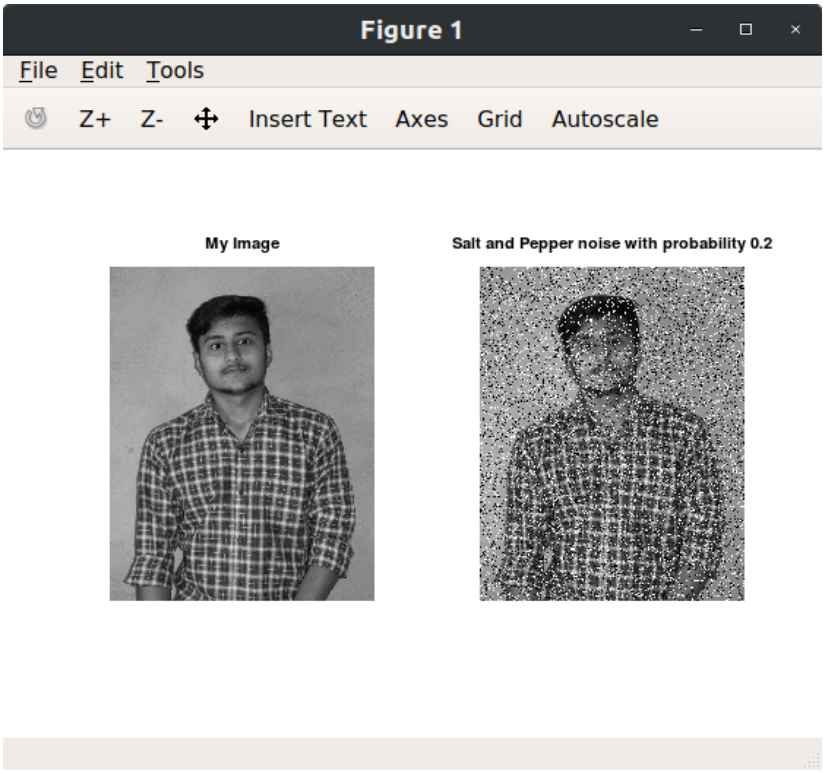
Code :

```
clc
clear all
close all

pkg load image
img = rgb2gray(imread('/home/nihar/Desktop/SEM 7/IP/Lab/Lab6/my.jpeg'));
subplot(1,2,1)
imshow(img);
title('My Image');

prob =  0.2;
noisy = salt_and_pepper_noise(img,prob);
subplot(1,2,2)
imshow(noisy);
title("Salt and Pepper noise with probability 0.2");
```

Function for Salt and Pepper Noise with Probability :

```
function noisy = salt_and_pepper_noise(img,prob)
  [M,N]=size(img);
  for i=1:(M*N*prob)
    p = round(1+(M-1)*rand());
    q = round(1+(N-1)*rand());
    if(round(rand()) == 0)
      img(p,q) = 255;
    else
      img(p,q) = 0;
    endif
  endfor
  noisy = img;
endfunction
```

Output :



4) Salt noise with probability 0.5 using your user defined function.

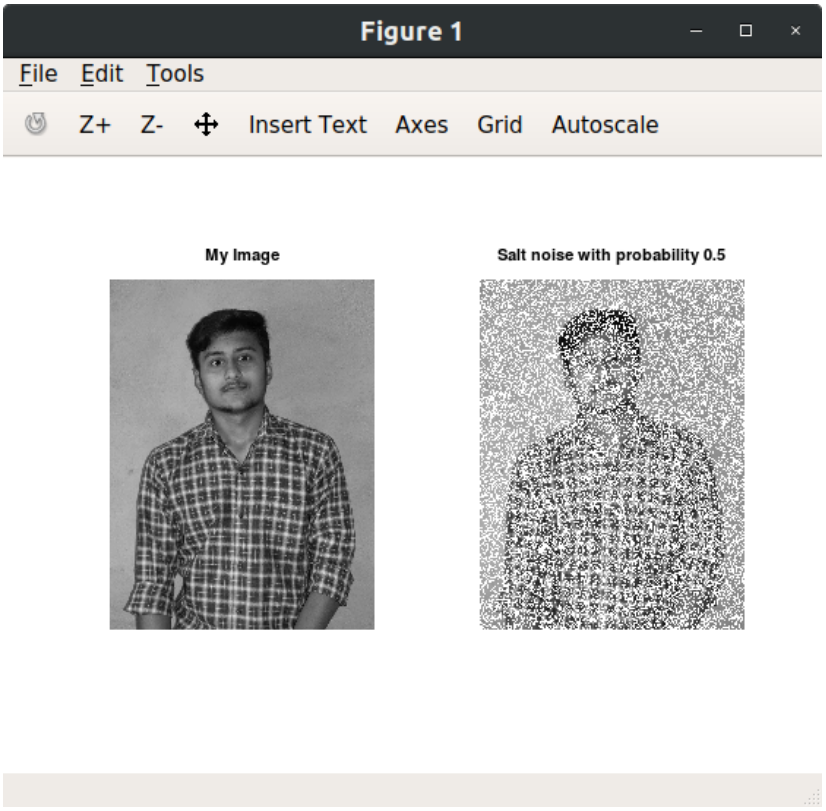
Code :

```
clc
clear all
close all

pkg load image
img = rgb2gray(imread('/home/nihar/Desktop/SEM 7/IP/Lab/Lab6/my.jpeg'));
subplot(1,2,1)
imshow(img);
title('My Image');

prob =  0.5;
noisy = salt_noise(img,prob);
subplot(1,2,2)
imshow(noisy);
title("Salt noise with probability 0.5");
```

Function for Salt Noise with Probability :

```
function noisy = salt_noise(img,prob)
  [M,N]=size(img);
  for i=1:(M*N*prob)
    p = round(1+(M-1)*rand());
    q = round(1+(N-1)*rand());
    img(p,q) = 255;
  endfor
  noisy = img;
endfunction
```

Output :



5) Pepper noise with probability 0.3 using your user defined function.

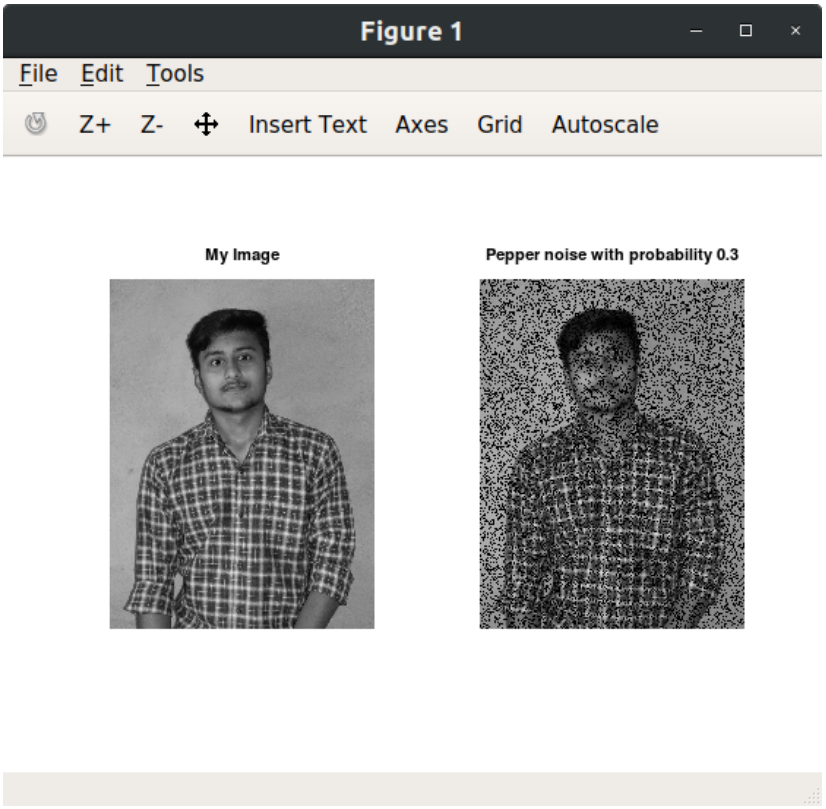
Code :

```
clc
clear all
close all

pkg load image
img = rgb2gray(imread('/home/nihar/Desktop/SEM 7/IP/Lab/Lab6/my.jpeg'));
subplot(1,2,1)
imshow(img);
title('My Image');

prob =  0.3;
noisy = pepper_noise(img,prob);
subplot(1,2,2)
imshow(noisy);
title("Pepper noise with probability 0.3");
```

Function for Pepper Noise with Probability :

```
function noisy = pepper_noise(img,prob)
  [M,N]=size(img);
  for i=1:(M*N*prob)
    p = round(1+(M-1)*rand());
    q = round(1+(N-1)*rand());
    img(p,q) = 0;
  endfor
  noisy = img;
endfunction
```

Output :



6) Uniform noise with probability 1 and a=10 , b=20.

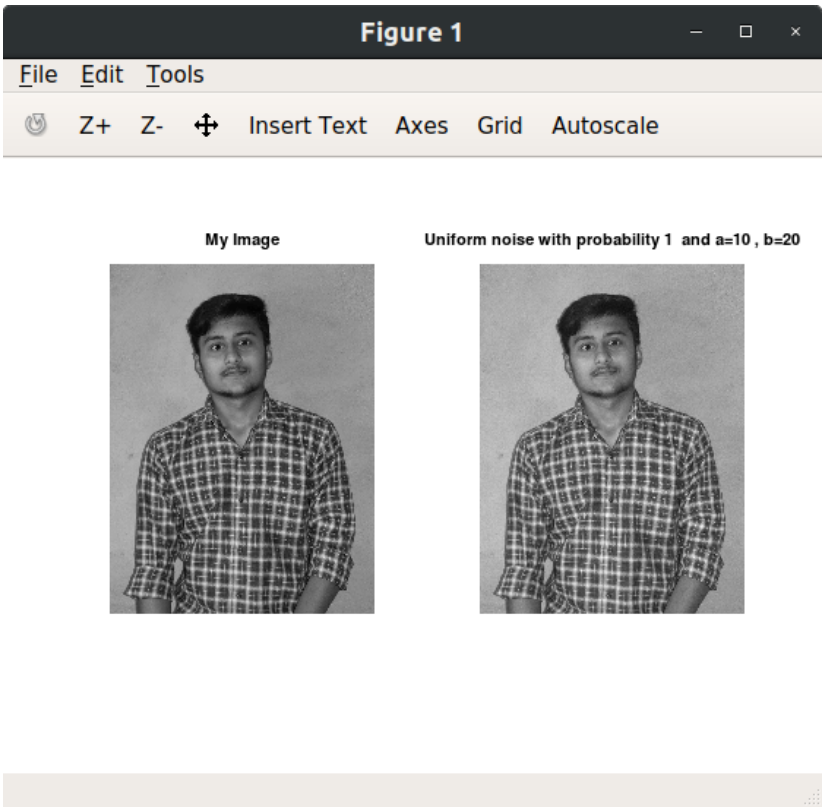
Code :

```
clc;
clear all;
close all;

pkg load image
img = rgb2gray(imread('/home/nihar/Desktop/SEM 7/IP/Lab/Lab6/my.jpeg'));
subplot(1,2,1)
imshow(img);
title('My Image');

a=10;
b=20;
noise = uniform_noise(img,a,b);
subplot(1,2,2)
imshow(noisy);
title("Uniform noise with probability 1  and a=10 , b=20");
```

Function for Uniform Noise with Probability :

```
function noisy = uniform_noise(img,a,b)
  [M,N] = size(img);
  n = uint8(round(a .+ (b-a).*rand(M,N)));
  noisy = img+n;
endfunction
```

Output :

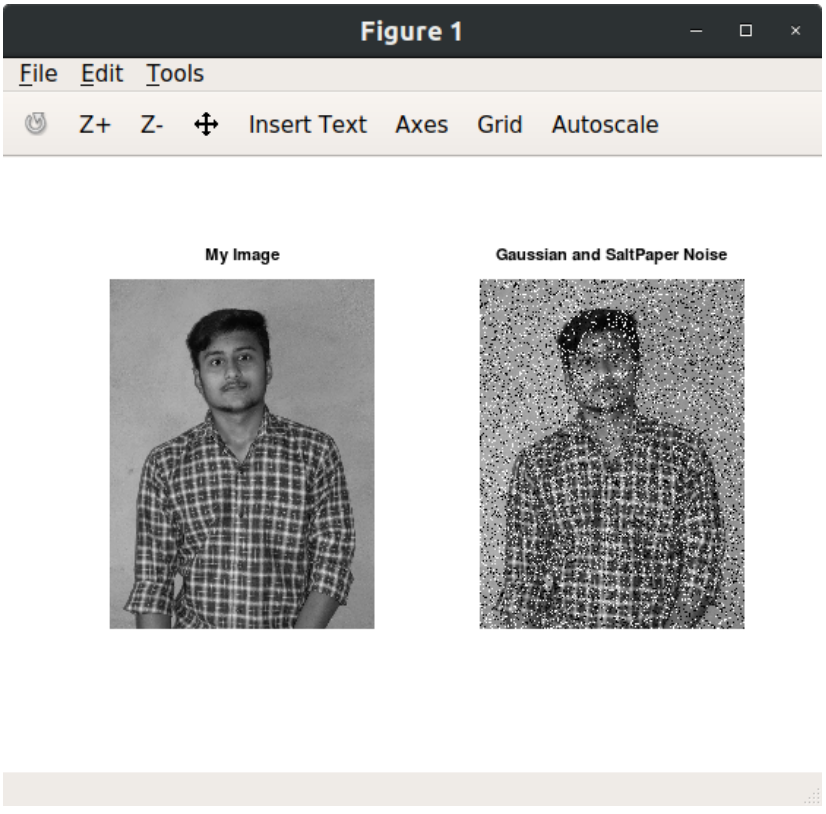


7) Gaussian plus salt and pepper noise.

Code :

```
clc
clear all
close all

pkg load image
img = rgb2gray(imread('/home/nihar/Desktop/SEM 7/IP/Lab/Lab6/my.jpeg'));
subplot(1,2,1)
imshow(img);
title('My Image');

prob=0.2;
noisy = salt_and_pepper_noise(img,prob);
variance=0.2;
mean=0;
noisy = gaussian_noise(noisy,variance,mean);
subplot(1,2,2)
imshow(noisy);
title("Gaussian and SaltPaper Noise");
```

Output :

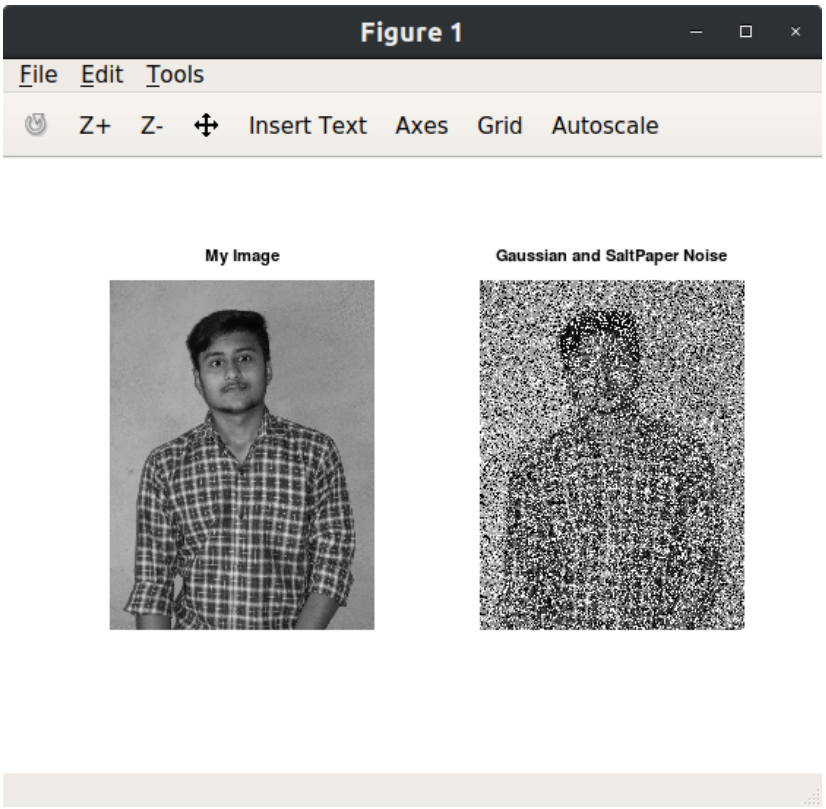


8) Salt noise with probability 0.3 and pepper noise with probability 0.2 .

Code :

```
clc
clear all
close all

pkg load image
img = rgb2gray(imread('/home/nihar/Desktop/SEM 7/IP/Lab/Lab6/my.jpeg'));
subplot(1,2,1)
imshow(img);
title('My Image');

prob =  0.3;
noisy = salt_noise(img,prob);

prob =  0.2;
noisy = pepper_noise(noisy,prob);
subplot(1,2,2)
imshow(noisy);
title("Gaussian and SaltPaper Noise");
```

Output :

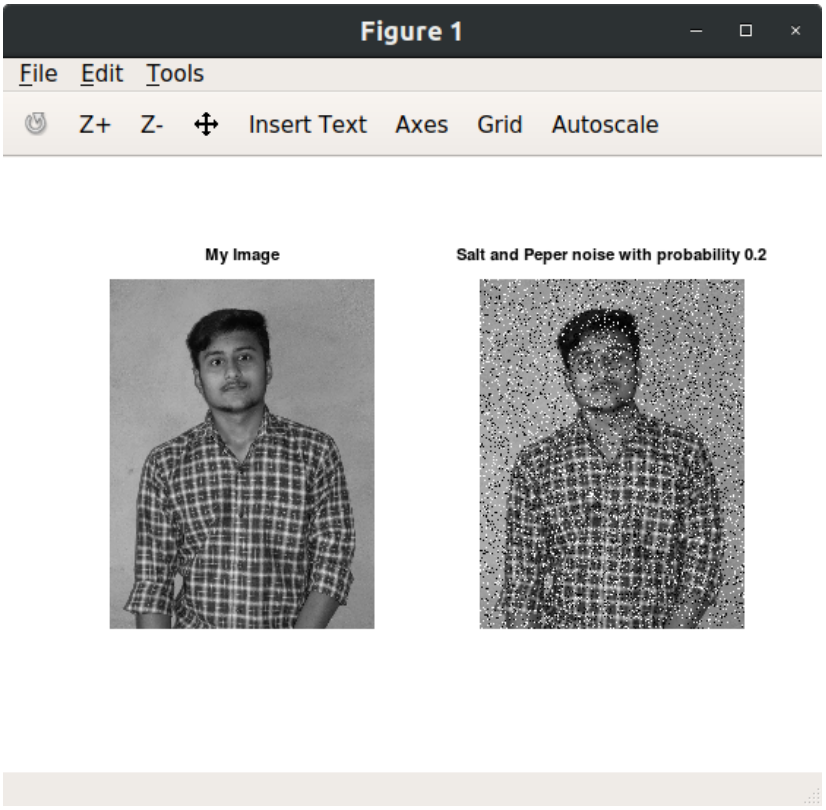


9) Salt and pepper noise with random probability of salt and pepper noise.

Code :

```
clc
clear all
close all

pkg load image
img = rgb2gray(imread('/home/nihar/Desktop/SEM 7/IP/Lab/Lab6/my.jpeg'));
subplot(1,2,1)
imshow(img);
title('My Image');

prob =  rand();
noisy = salt_and_pepper_noise(img,prob);
subplot(1,2,2)
imshow(noisy);
title("Salt and Peper noise with probability 0.2");
```

Output :



3. Get information about imnoise and generate various noisy images.

Code :

```
clear all
close all
clc

pkg load image
img = rgb2gray(imread('/home/nihar/Desktop/SEM 7/IP/Lab/Lab6/my.jpeg'));
subplot(2,3,1)
imshow(image);
title('My Image');

mean=0;
variance=0.01;
gaussianNoisy = imnoise(image,"gaussian",mean,variance);
subplot(2,3,2)
imshow(gaussianNoisy);
title('Gaussian Noise');

poissionNoisy=imnoise(image,"poisson");
subplot(2,3,3)
imshow(poissionNoisy);
title('Poission Noise');

density=0.05;
saltpaperNoisy = imnoise(image,"salt & pepper",density);
subplot(2,3,4)
imshow(saltpaperNoisy);
title('Salt & Pepper Noise');

speckleNoisy=imnoise(image,"speckle",variance);
subplot(2,3,5)
imshow(speckleNoisy);
title('Speckle Noise');
```

Output :

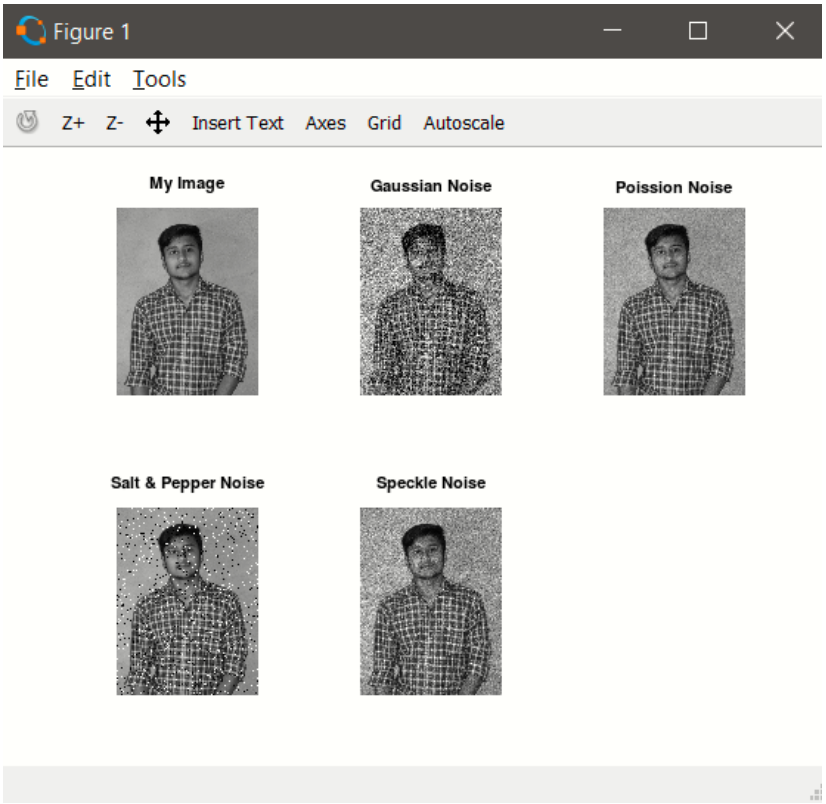


Figure 1
File Edit Tools
Z+ Z- Insert Text Axes Grid Autoscale
My Image
Gaussian Noise
Poission Noise
Salt & Pepper Noise
Speckle Noise