

EE2025 Independent Project (2019-20) Programming Assignment-2

Team Members :

Member1:

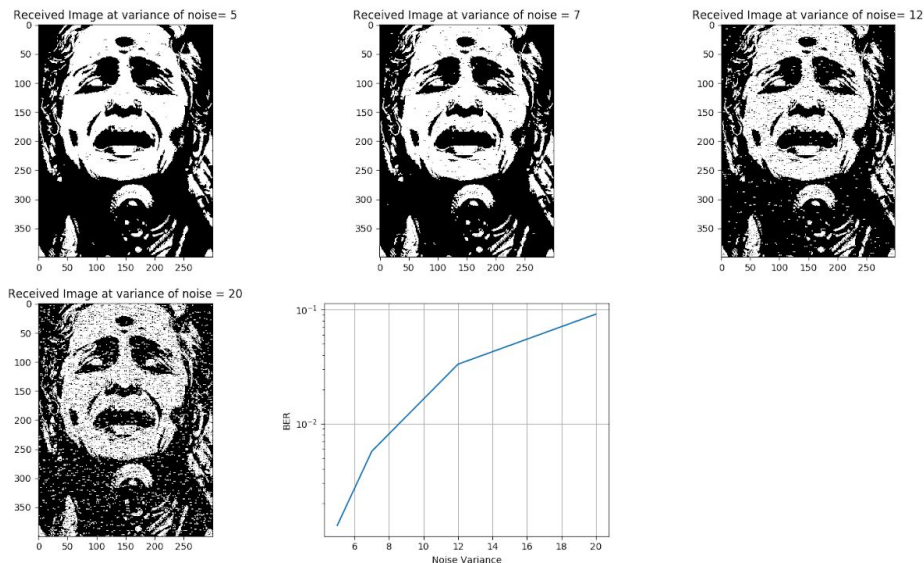
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Member2:

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Roll No. : EE18BTECH11022

PART 1 : First, We simulated the communication for the following values of the noise variance in the discrete-time model: $\sigma^2 = 20, 12, 7, 5$ and we got the following results :

Case1 : When a rate 1/2 linear code with $n = 8$ and $k = 4$ is used :



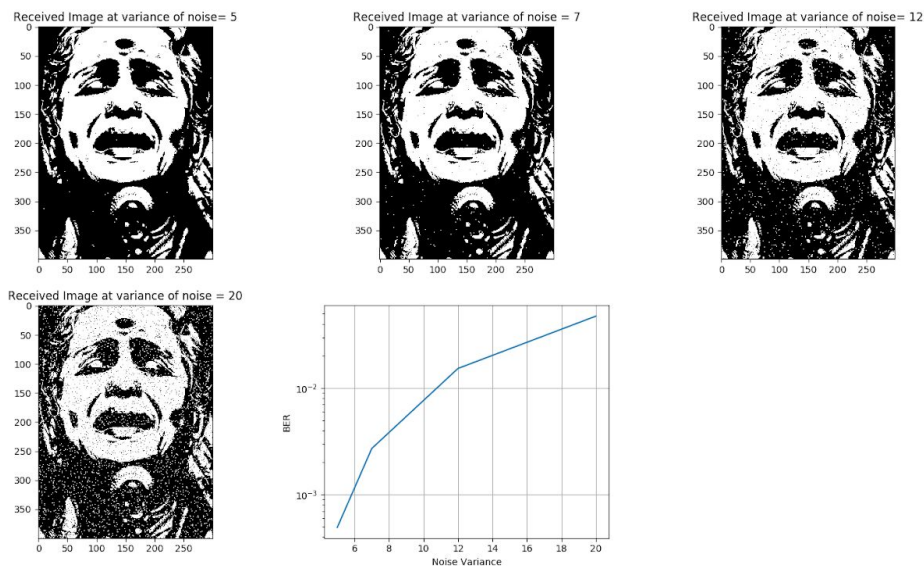
For more clarification , by running the code we will get the simulation results.

And the bit error rate(BER) values are :

```
Bit Error Rate at variance of noise = 5 is 0.0012833333333333334
Bit Error Rate at variance of noise= 7 is 0.0057166666666666667
Bit Error Rate at variance of noise = 12 is 0.0331
Bit Error Rate at variance of noise = 20 is 0.09089166666666666
```

The corresponding number of wrong pixels = ber . (120000) {Because the input image contains a total of 120000 pixels.}

Case2 : When a rate 1/3 repetition code is used :



For more clarification , by running the code we will get the simulation results.

And the bit error rate(BER) values are :

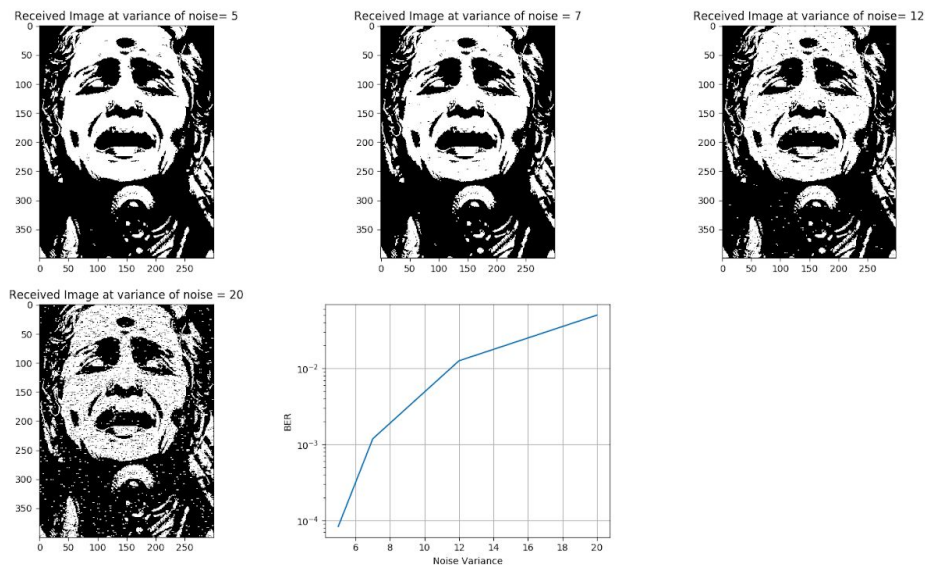
```

Bit Error Rate at variance of noise = 5 is 0.00049166666666666666
Bit Error Rate at variance of noise= 7 is 0.00270833333333333334
Bit Error Rate at variance of noise = 12 is 0.015283333333333333
Bit Error Rate at variance of noise = 20 is 0.047391666666666665

```

The corresponding number of wrong pixels = ber . (120000) {Because the input image contains a total of 120000 pixels.}

Case3 : When a rate 1/3 linear code with $n = 12$ and $k = 4$ is used :



For more clarification , by running the code we will get the simulation results.

And the bit error rate(BER) values are :

```

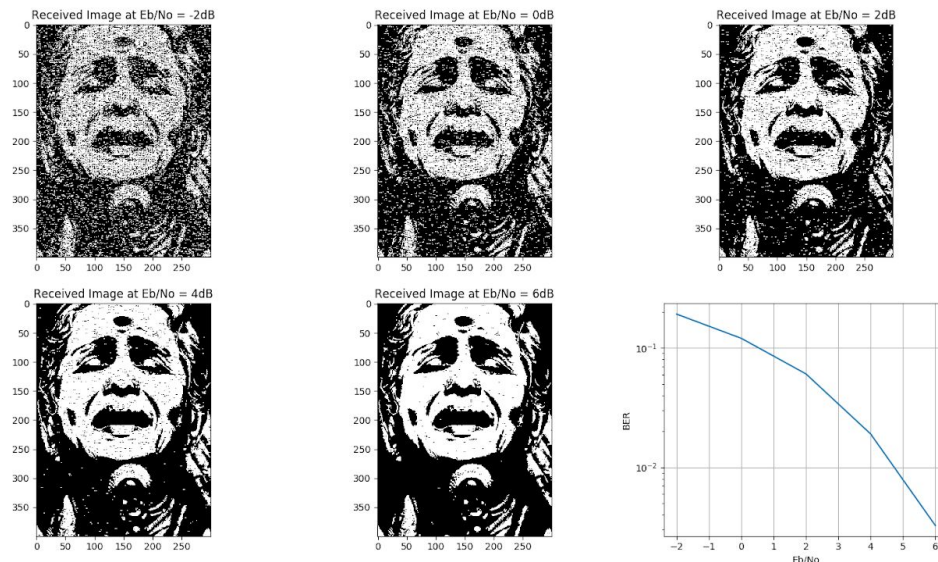
Bit Error Rate at variance of noise = 5 is 8.333333333333333e-05
Bit Error Rate at variance of noise= 7 is 0.0011833333333333333
Bit Error Rate at variance of noise = 12 is 0.012558333333333333
Bit Error Rate at variance of noise = 20 is 0.05005

```

The corresponding number of wrong pixels = $\text{ber} \cdot (120000)$ {Because the input image contains a total of 120000 pixels.}

PART 2 : After that, We simulated the communication for 5 values of E_b/N_o : -2, 0, 2, 4, 6 dB. Since E_b is the energy per message bit, the corresponding noise variance depends on the rate of the code. And we got the following results :

Case1 : When a rate 1/2 linear code with $n = 8$ and $k = 4$ is used :



For more clarification , by running the code we will get the simulation results.

And the bit error rate(BER) values are :

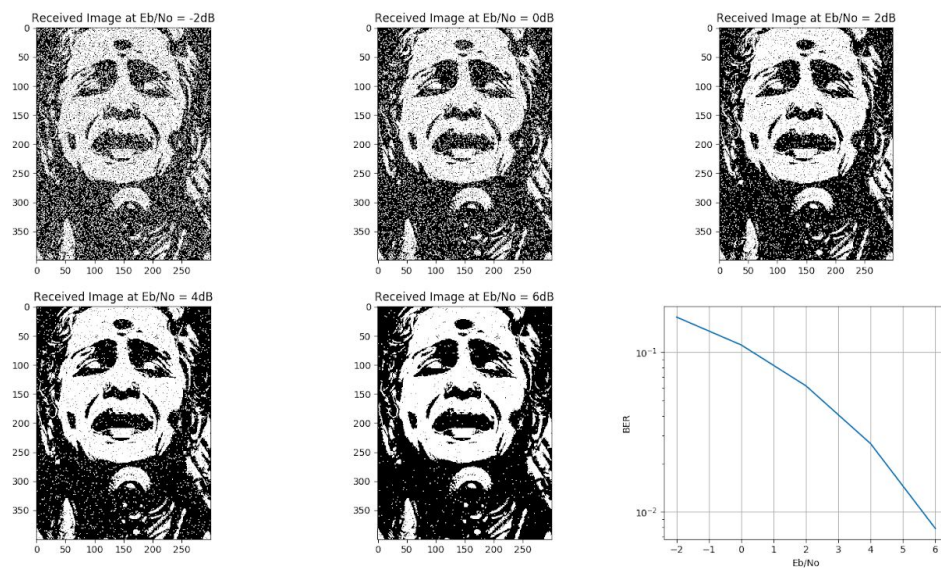
```

Bit Error Rate at Eb/No = -2 is 0.19159166666666666
Bit Error Rate at Eb/No = 0 is 0.12013333333333333
Bit Error Rate at Eb/No = 2 is 0.06051666666666667
Bit Error Rate at Eb/No = 4 is 0.019016666666666668
Bit Error Rate at Eb/No = 6 is 0.0032583333333333333

```

The corresponding number of wrong pixels = ber . (120000) {Because the input image contains a total of 120000 pixels.}

Case2 : When a rate 1/3 repetition code is used :



For more clarification , by running the code we will get the simulation results.

And the bit error rate(BER) values are :

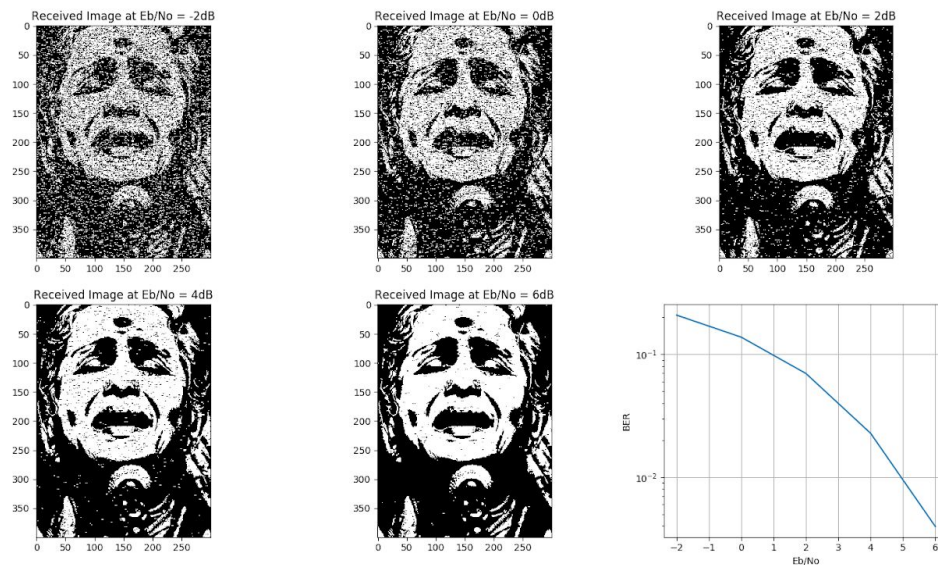

```

Bit Error Rate at Eb/No = -2 is 0.16583333333333333
Bit Error Rate at Eb/No = 0 is 0.11094166666666666
Bit Error Rate at Eb/No = 2 is 0.06155
Bit Error Rate at Eb/No = 4 is 0.026733333333333335
Bit Error Rate at Eb/No = 6 is 0.007875

```

The corresponding number of wrong pixels = ber . (120000) {Because the input image contains a total of 120000 pixels.}

Case3 : When a rate 1/3 linear code with $n = 12$ and $k = 4$ is used :



For more clarification , by running the code we will get the simulation results.

And the bit error rate(BER) values are :

```

Bit Error Rate at Eb/No = -2 is 0.208
Bit Error Rate at Eb/No = 0 is 0.13758333333333334
Bit Error Rate at Eb/No = 2 is 0.0697
Bit Error Rate at Eb/No = 4 is 0.022741666666666667
Bit Error Rate at Eb/No = 6 is 0.003975

```

The corresponding number of wrong pixels = $\text{ber} \cdot (120000)$ {Because the input image contains a total of 120000 pixels.}
