Electrical Engineering Department
Faculty of Engineering
Alexandria University

Lecturer: Dr. Mohamed Moselhy	Lecturer: Dr. Mona Lotfy
Course: Signals & Systems	Academic year: 2020 - 2021

In this project, you will implement a very simple communication systems as shown in the following figure. Here you try to send a sound file over a communication channel & then try to receiver it.

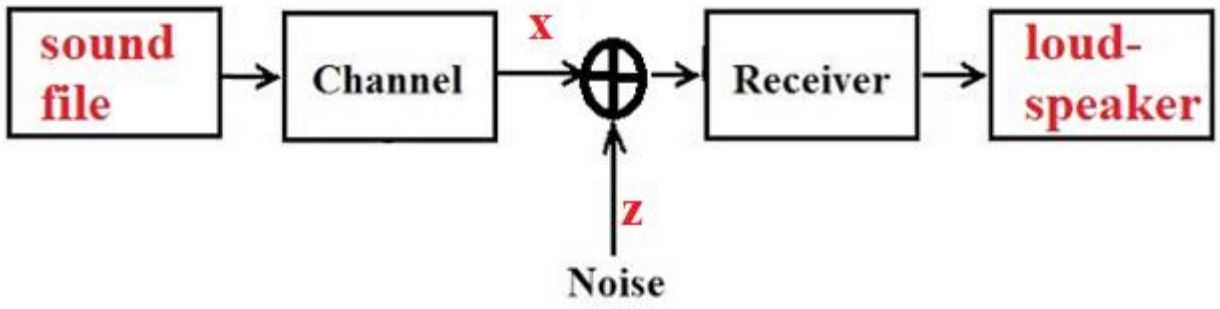

Figure 1Block diagram of a communication system

1. Transmitter

At the first stage, which is called the transmitter. You will enter your sound file and prepare it for the transmission over the channel.

Requirement:

- Play your sound file through Matlab
- Plot your sound file in time domain and the frequency domain

2. Channel

The channel has the following impulse response. At this stage, you will need to pass your sound message over the channel

You have 4 options for the channel impulse response.

```
1. Delta function
2. exp(-2pi*5000t)
3. exp(-2pi*1000t)
4. The channel has the following impulse response
```

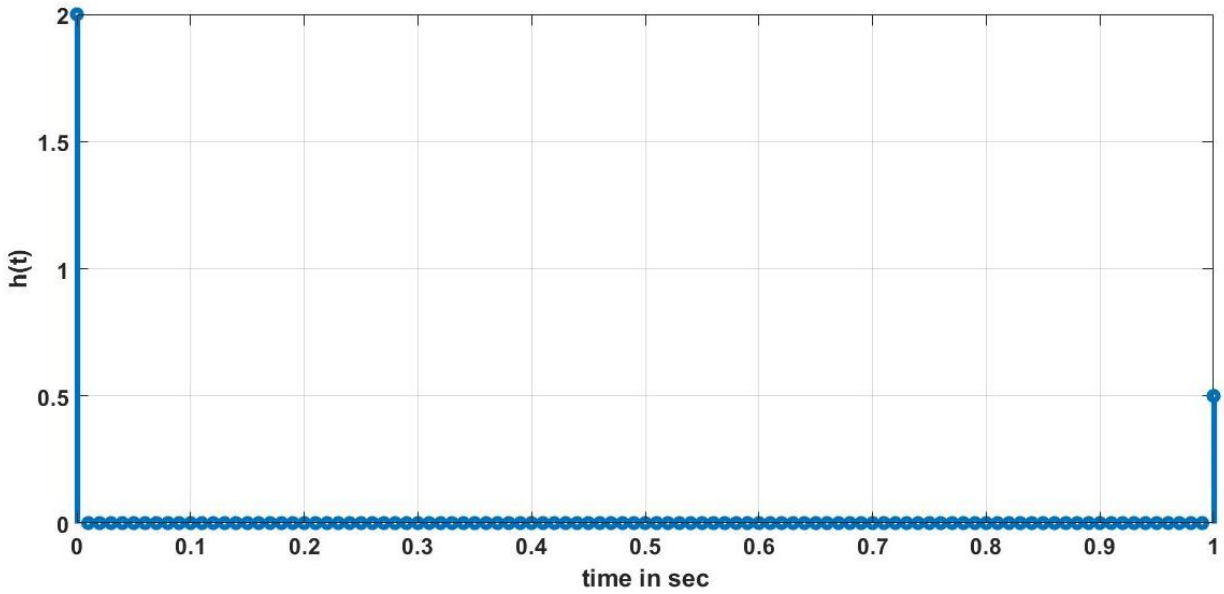

Figure 2 channel impulse response

Try the four different impulse responses for the channel and compare the effect of the first three ones on the sound signal.

3. **Noise**

   The program should have the ability to add noise (simply random signal) to the output of the channel

   The random signal generation is done as following

   ```
   Z(t) =sigma*randn(1,length(x))
   Where x is a vector represents the output of the channel
   ```

   The user should enter the value of the sigma at this stage

   The output will be a Gaussian distributed noise with zero mean and standard deviation of sigma

Requirement:

- Play your sound file after adding noise
- Plot your sound file in time domain and the frequency domain

4. **Receiver**

In order to limit the effect of the noise,

1. You will construct an ideal low pass filter which has a cut off of 3400 KHz. The frequency response of the filter as shown in figure.
2. pass the noisy sound over the ideal filter

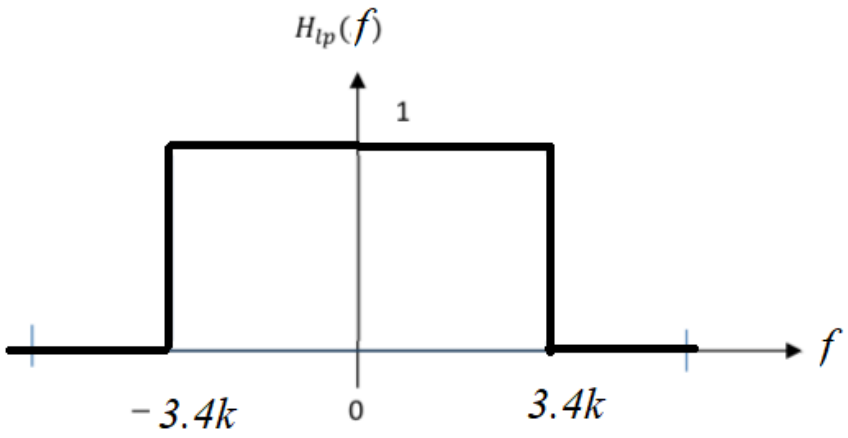

Figure 3 frequency response of Ideal LPF

Requirement:

- Play the sound file after the filter
- Plot the output sound file in time domain and the frequency domain

Submission regulations (Read carefully):

1. You should solve **in a group** of (4) students.
2. Each group should submit a softcopy report including screenshots for the output of the code.

3. Copied codes will take **zero**

   Any group may be asked to explain any step in the program and his/her report the discussion