DSP Project
Digital Hearing Aid

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Introduction

- Hearing deficiency can be due to less sensitive ears for some frequency and vica versa for some sounds
- To solve the problem, our system processes the audio and give an output based on the user preferences on the frequencies and tolerance levels.

Pseudo Code

Step 1 Input : Audio input taken from mic or any file

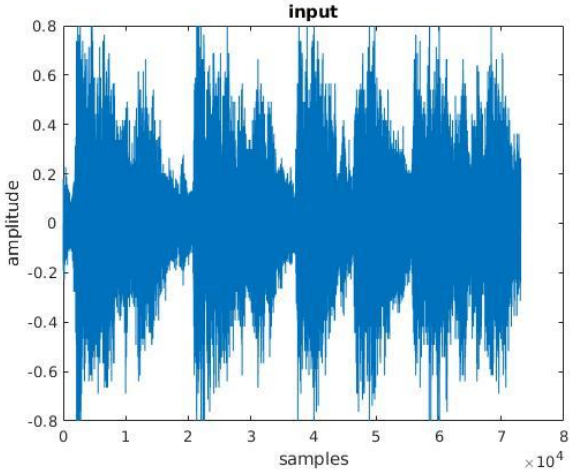
Step 2 Noise addition: To make a realistic solution, noise is added.We added AWGN noise

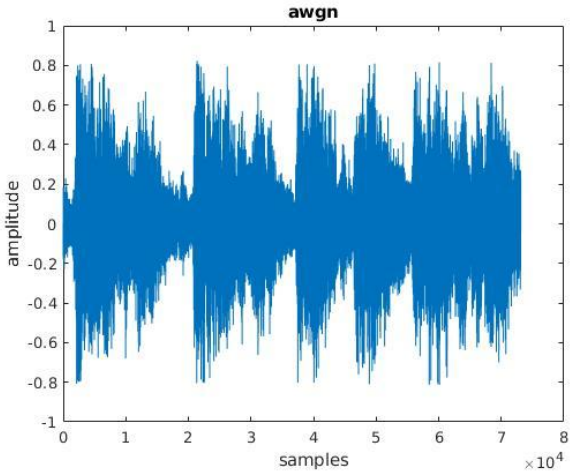
Step 3 Noise removal : Noise was removed using a low pass filter.

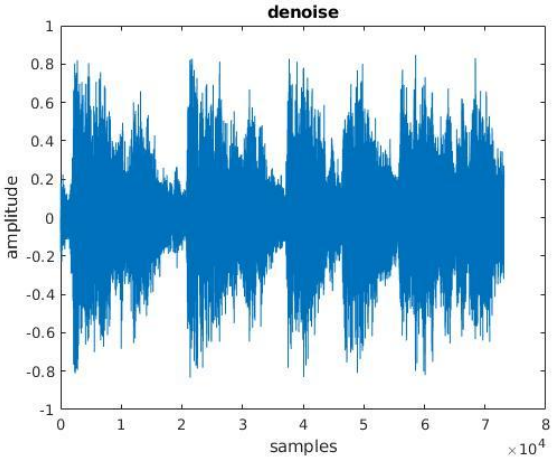
Step 4 Filtering using a bandpass filter to increase frequency at certain points according to the user.

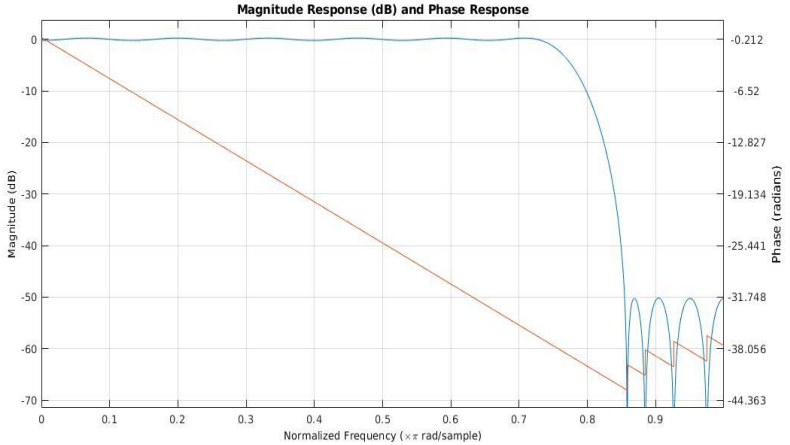
Step 5 Amplitude clipped above a threshold to reduce noise and control

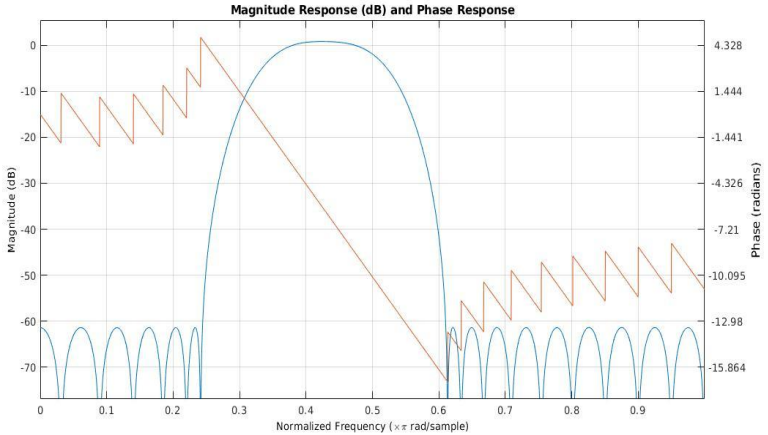
Results

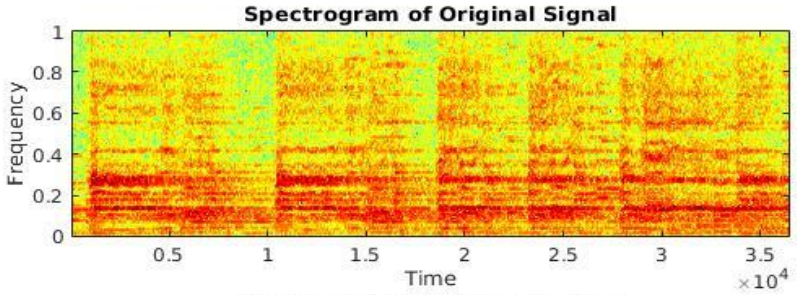

input
amplitude
samples
×10^4

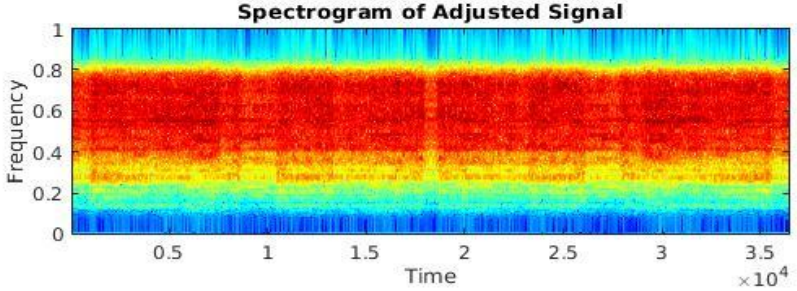

awgn
amplitude
samples
×10^4


denoise
amplitude
samples
×10^4


Magnitude Response (dB) and Phase Response
Magnitude (dB)
Phase (radians)
Normalized Frequency (×π rad/sample)
0
-10
-20
-30
-40
-50
-60
-70
-0.212
-6.52
-12.827
-19.134
-25.441
-31.748
-38.056
-44.363
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9


Magnitude Response (dB) and Phase Response
Magnitude (dB)
Phase (radians)
Normalized Frequency (×π rad/sample)
0
-10
-20
-30
-40
-50
-60
-70
4.328
1.444
-1.441
-4.326
-7.21
-10.095
-12.98
-15.864
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9


Spectrogram of Original Signal
Frequency
Time
×10^4
1
0.8
0.6
0.4
0.2
0
0.5
1
1.5
2
2.5
3
3.5


Spectrogram of Adjusted Signal
Frequency
Time
×10^4
1
0.8
0.6
0.4
0.2
0
0.5
1
1.5
2
2.5
3
3.5

References

1. http://www.bvicam.ac.in/news/NRSC%202007/pdfs/papers/st_121.pdf

2. http://www.ijcis.info/vol2n1/23-26s.pdf

3. https://pdfs.semanticscholar.org/220d/f46c99002c63b044f2f9eaf9811855223784.pdf