PEC University of Technology
CHANDIGARH

DIGITAL HEARING AID

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Audio Signal Processing

A MATLAB Program

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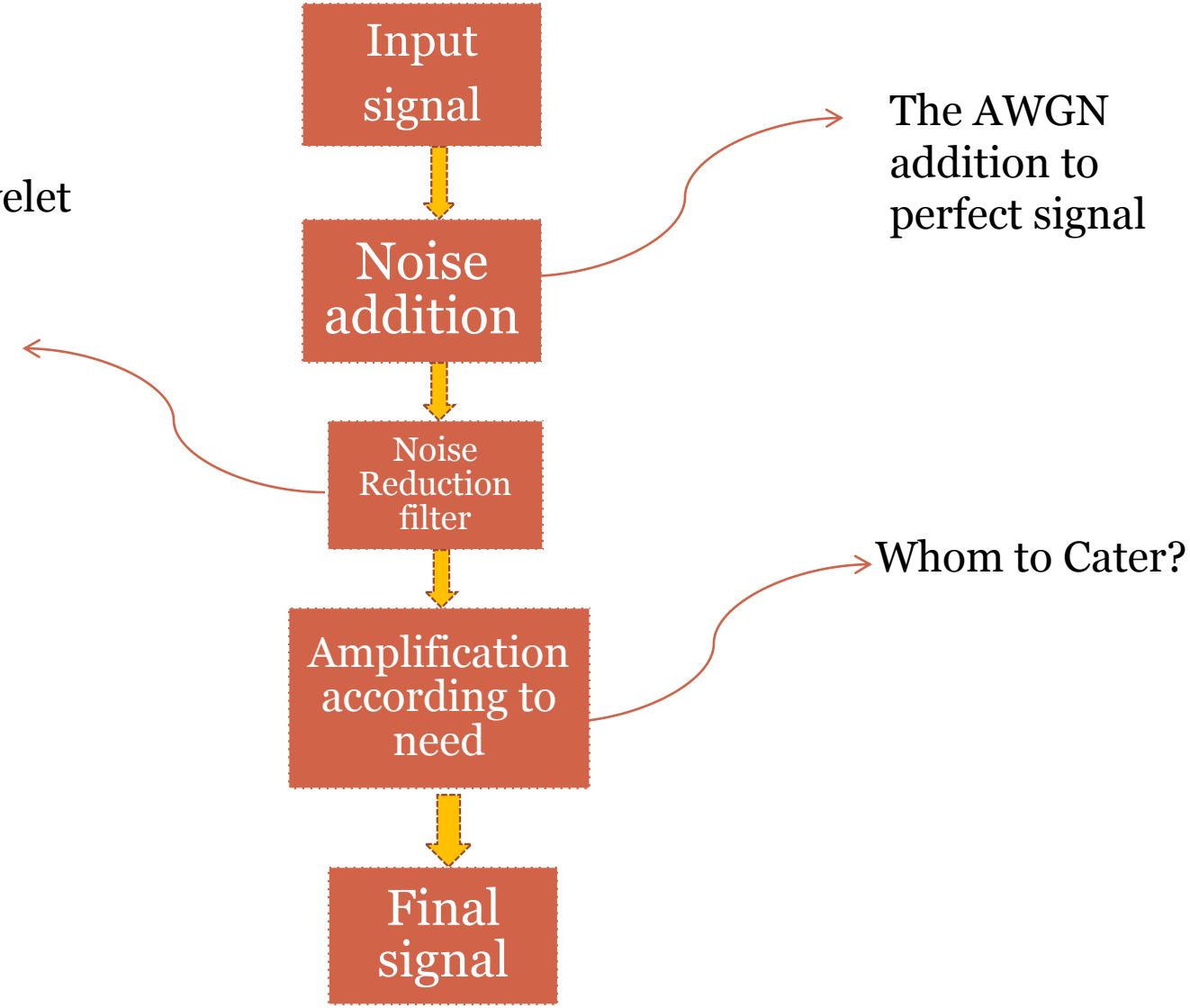
Need of Hearing Aid

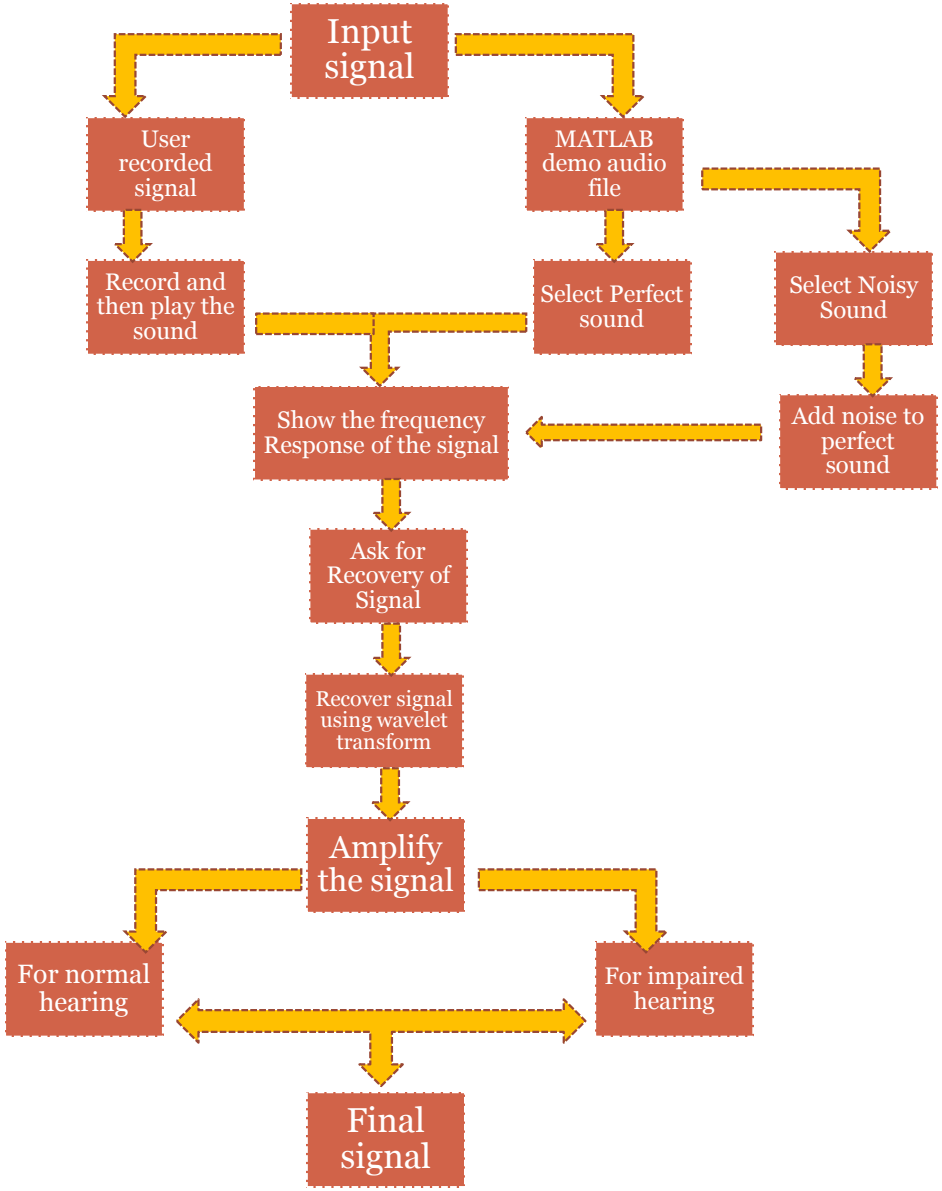
Classification of Hearing Loss	**Hearing level**
Normal hearing	-10 dB – 26 dB
mild hearing loss	27 dB - 40 dB
moderate hearing loss	40 dB - 70 dB
severe hearing loss	70 dB - 90 dB
profound hearing loss	greater than 90 dB

Table 1: Different degree of Hearing Loss

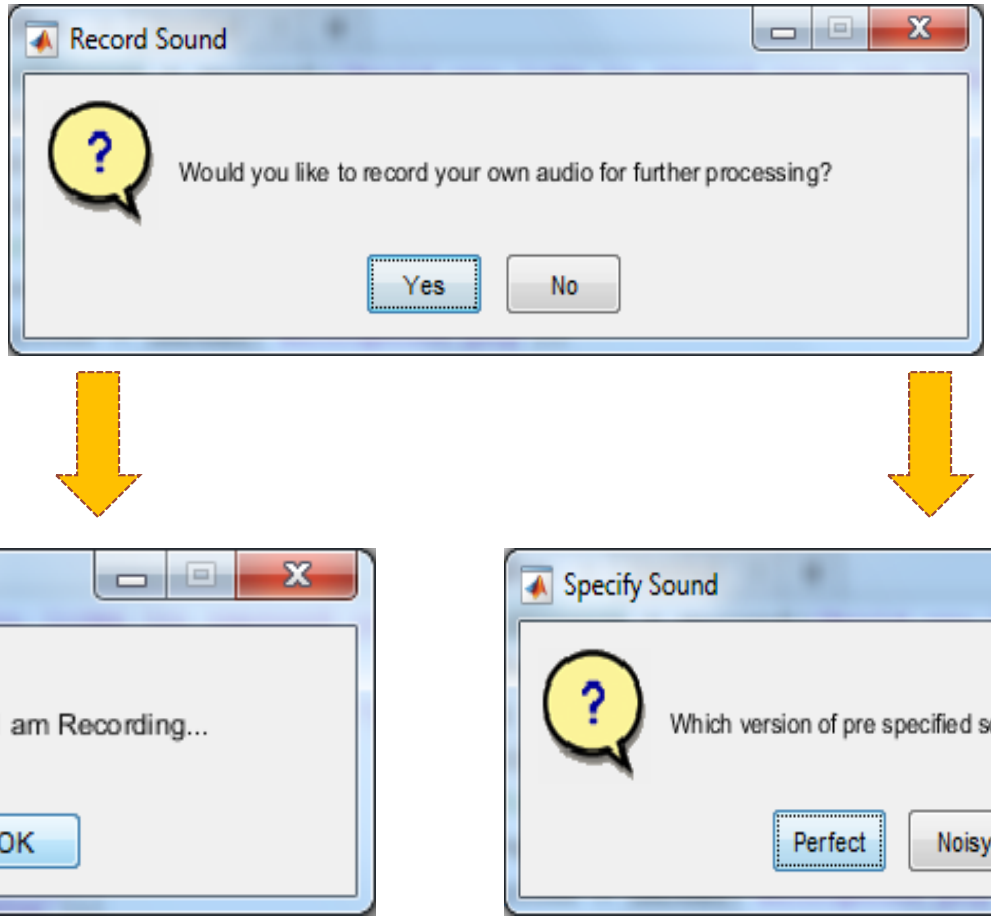
BLOCK DIAGRAM

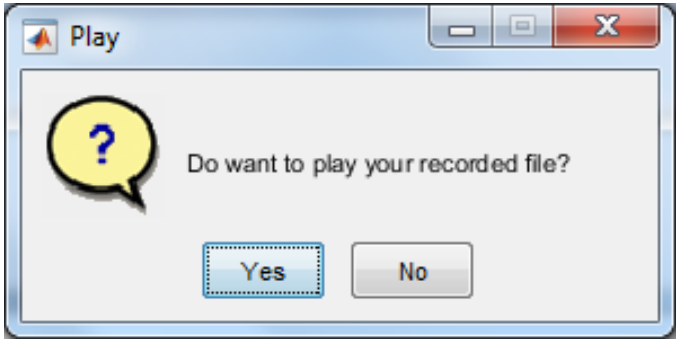


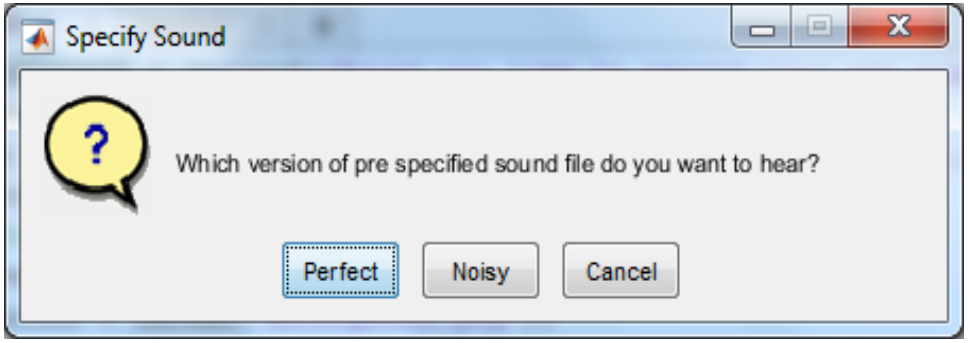
ALGORITHM

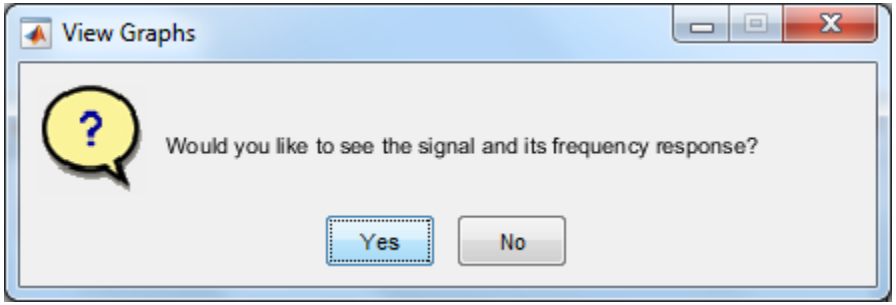

Input signal
User recorded signal
MATLAB demo audio file
Record and then play the sound
Select Perfect sound
Select Noisy Sound
Add noise to perfect sound
Show the frequency Response of the signal
Ask for Recovery of Signal
Recover signal using wavelet transform
Amplify the signal
For normal hearing
For impaired hearing
Final signal

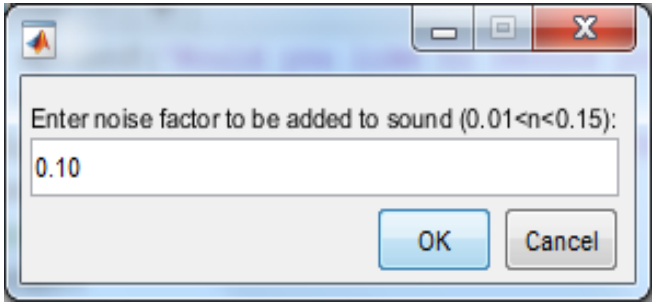
GUI and program flow



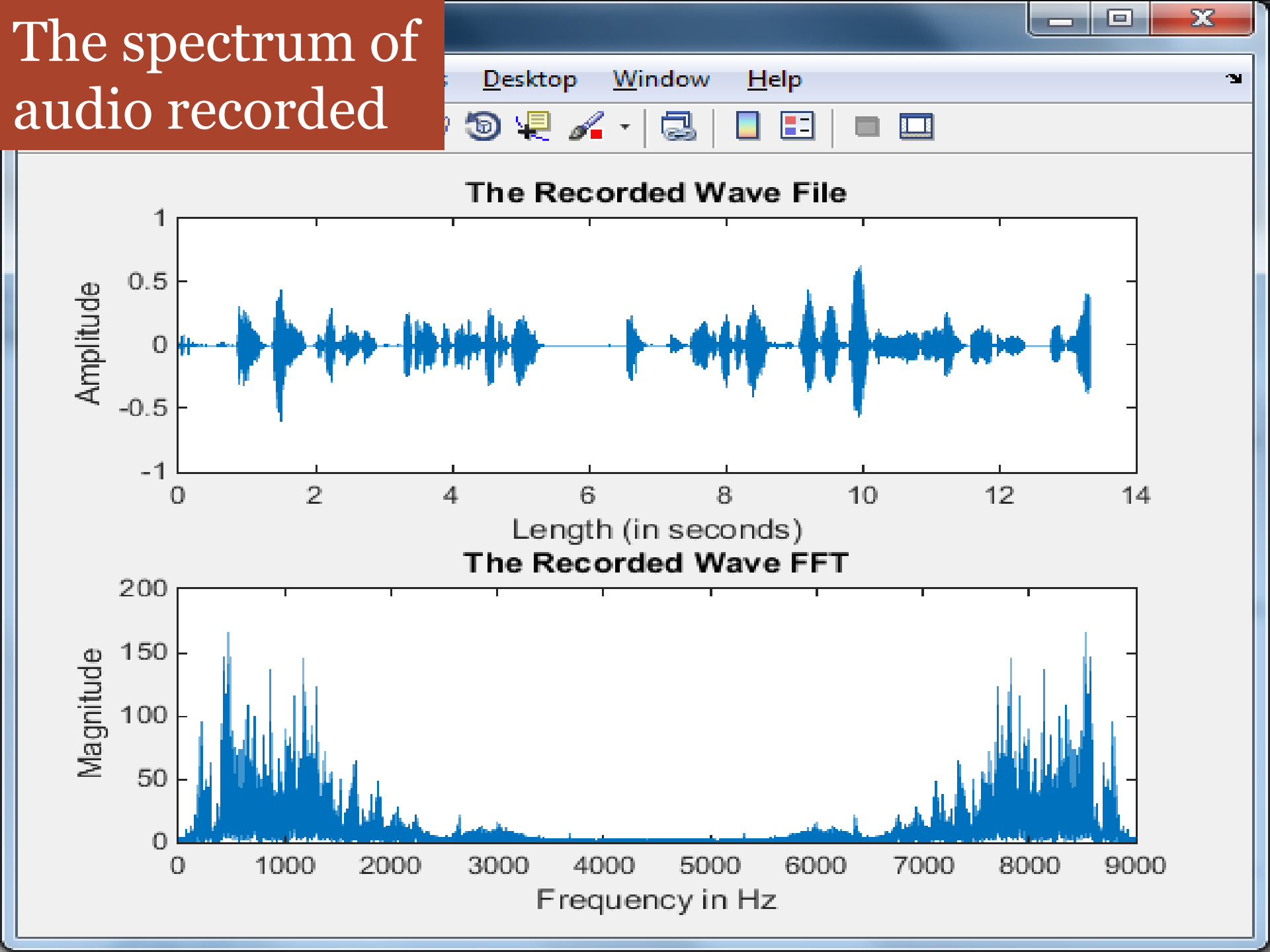

Play
Do want to play your recorded file?
Yes
No

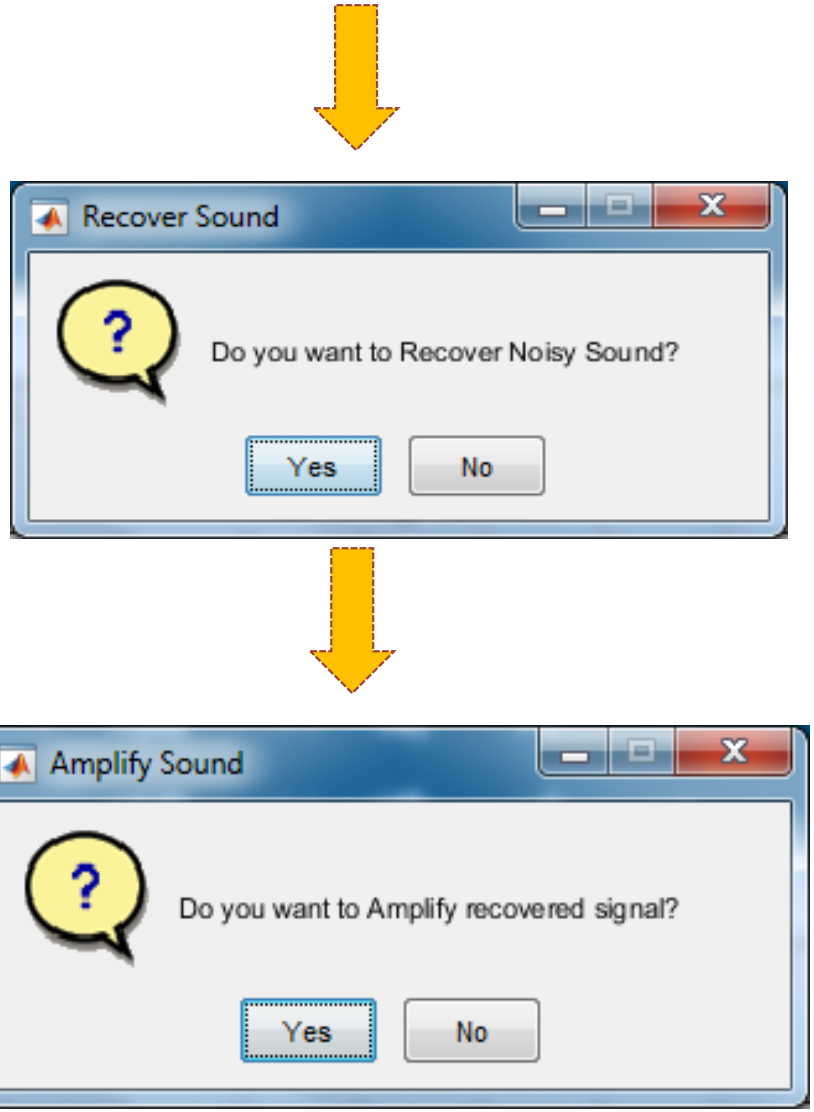

Specify Sound
Which version of pre specified sound file do you want to hear?
Perfect
Noisy
Cancel


View Graphs
Would you like to see the signal and its frequency response?
Yes
No

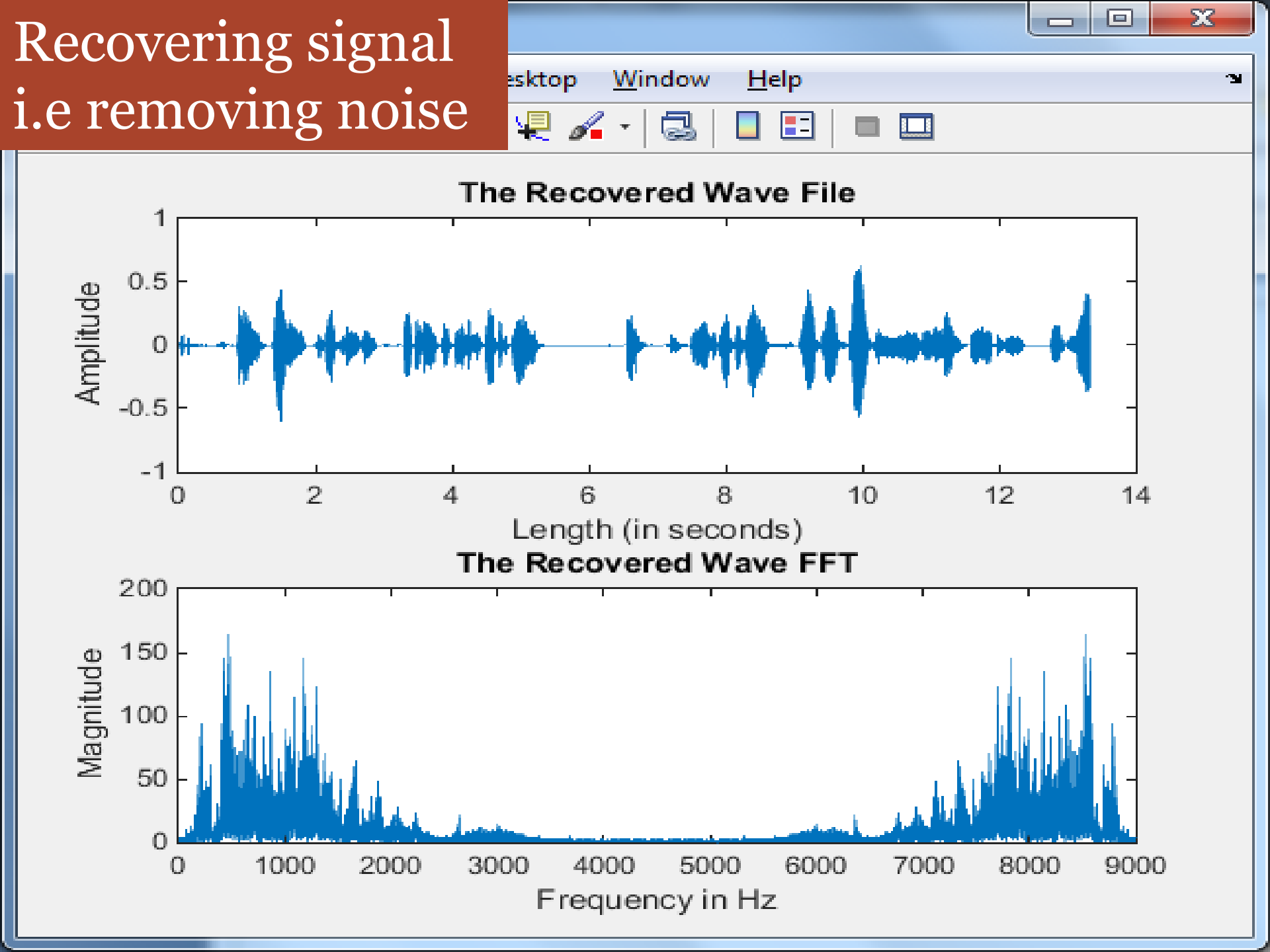

Enter noise factor to be added to sound (0.01<n<0.15):
0.10
OK
Cancel

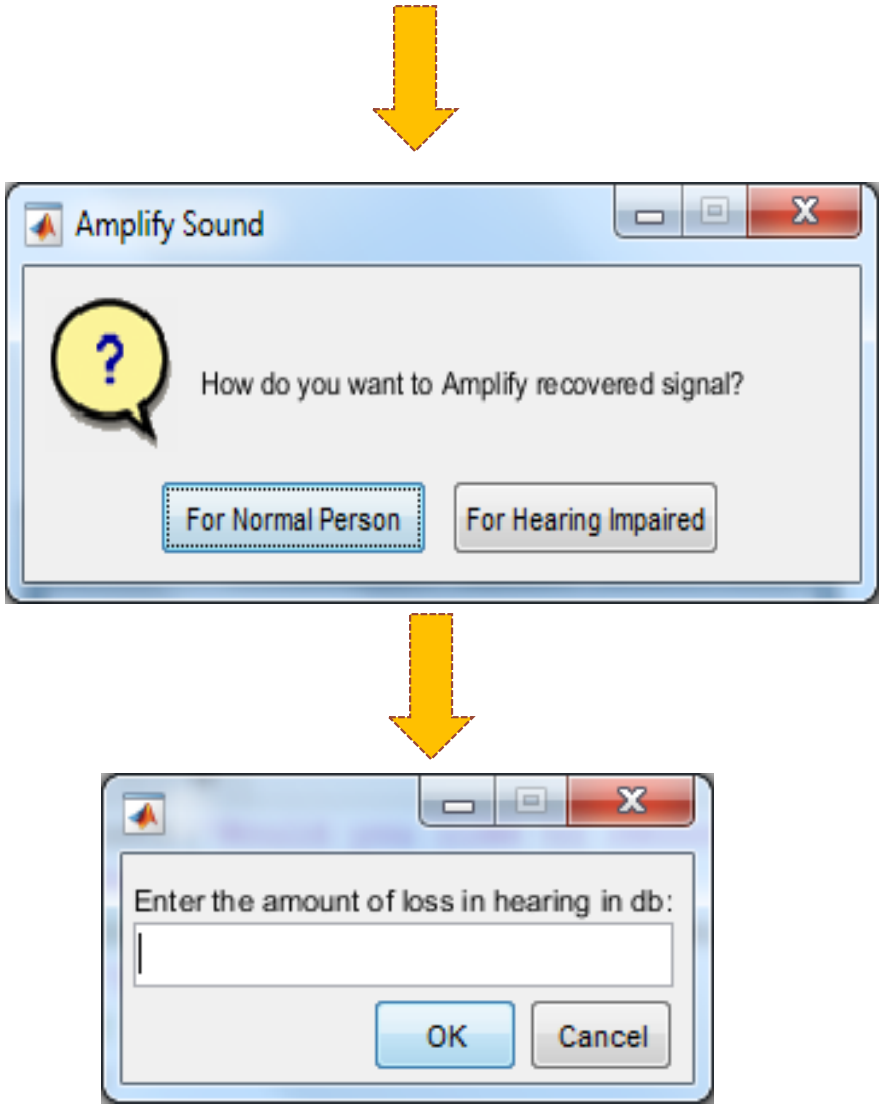
The spectrum of audio recorded



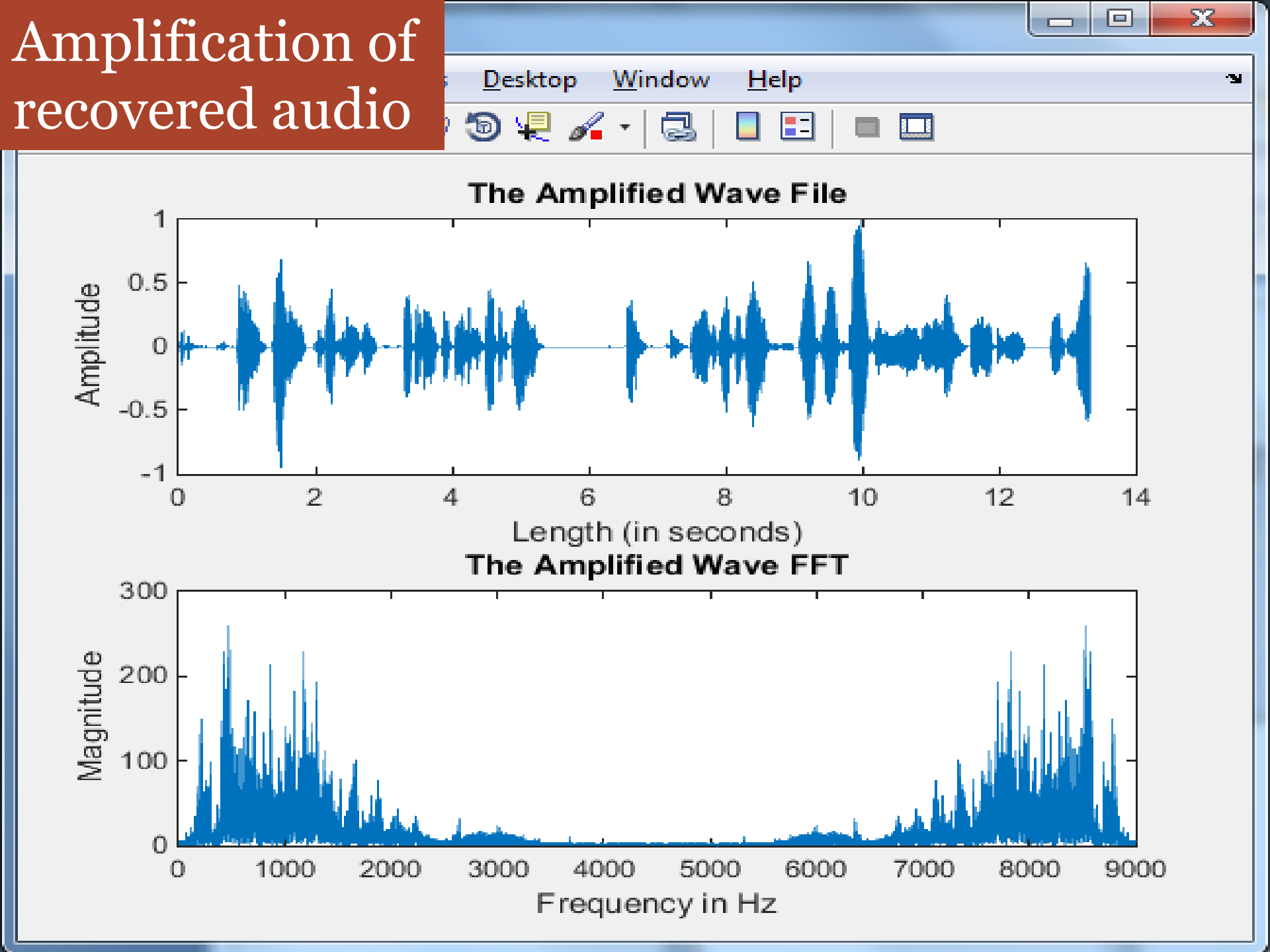

Recover Sound
Do you want to Recover Noisy Sound?
Yes
No
Amplify Sound
Do you want to Amplify recovered signal?
Yes
No

Recovering signal i.e removing noise



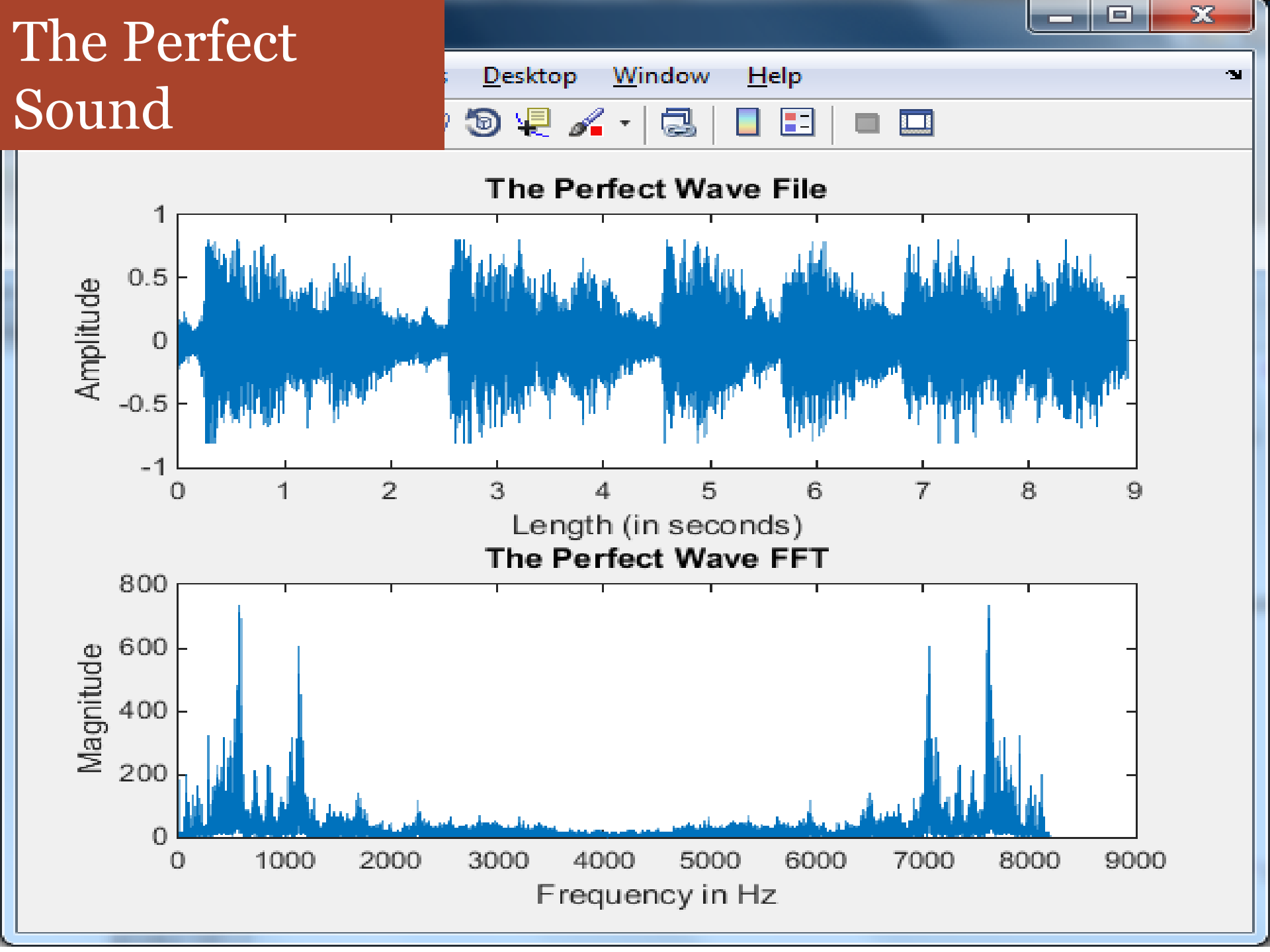

Amplify Sound
How do you want to Amplify recovered signal?
For Normal Person
For Hearing Impaired
Enter the amount of loss in hearing in db:
OK
Cancel

Amplification of recovered audio

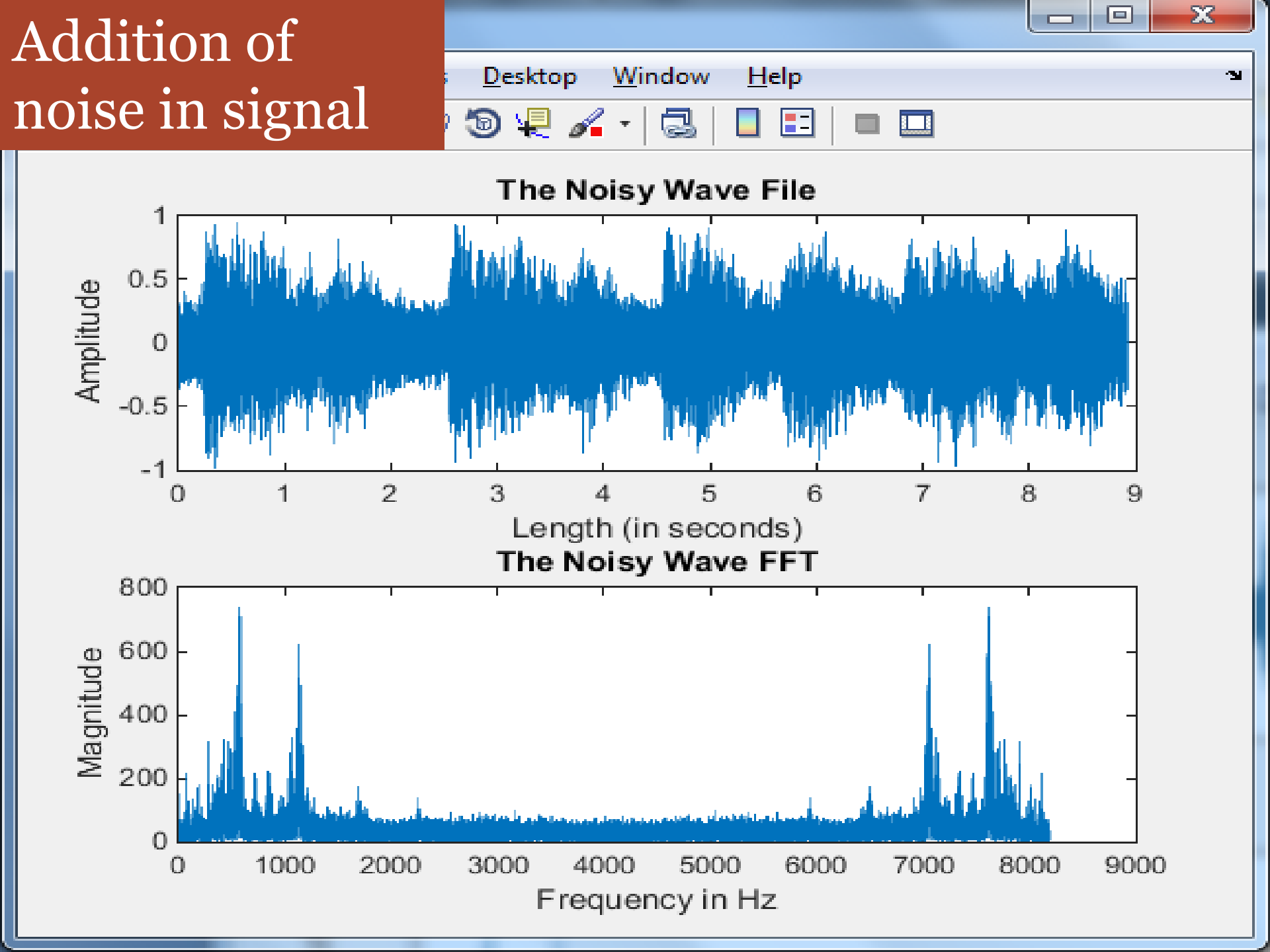


RESPONSES FOR SAMPLE FILE OF MATLAB

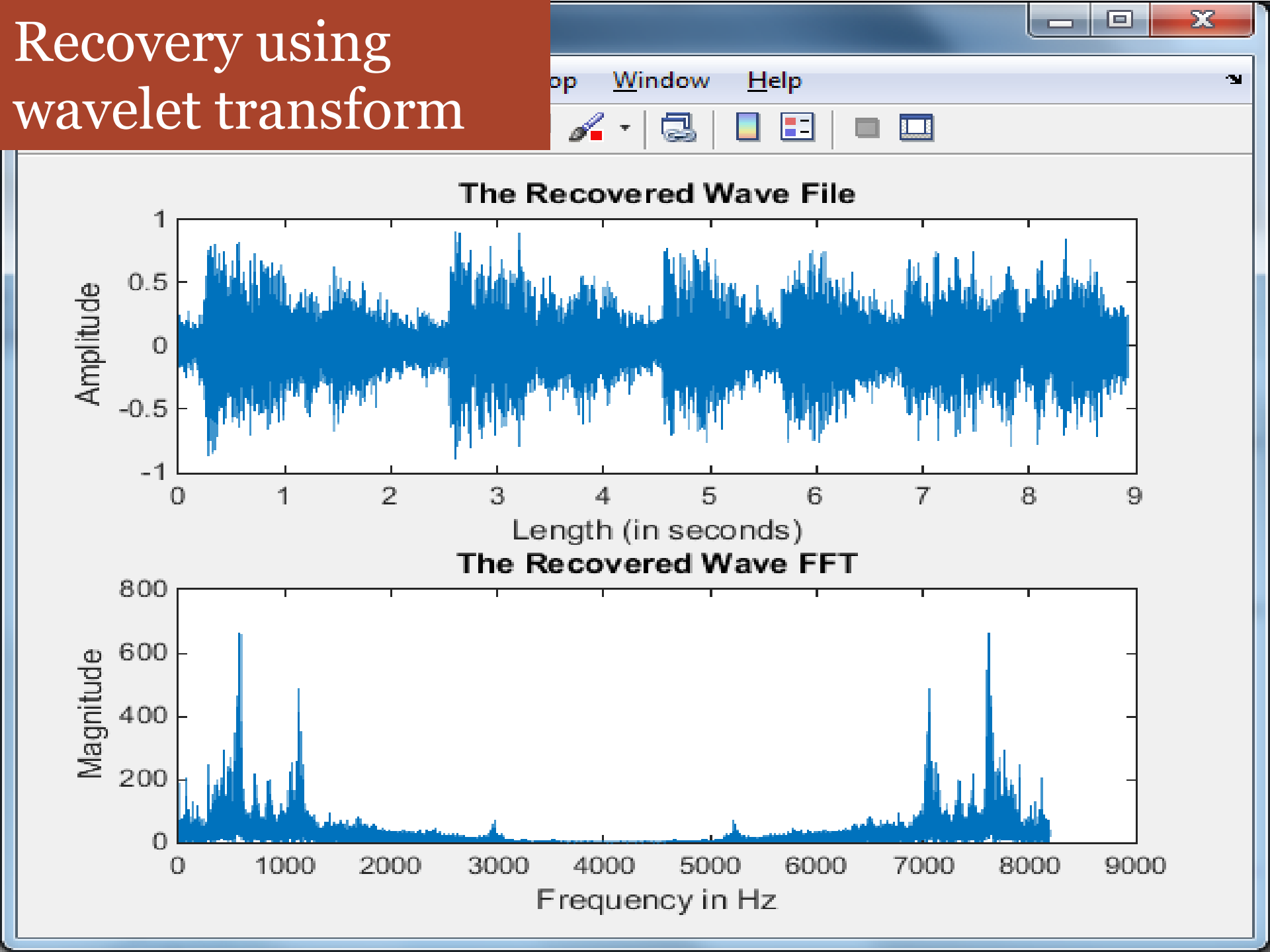
The Perfect Sound



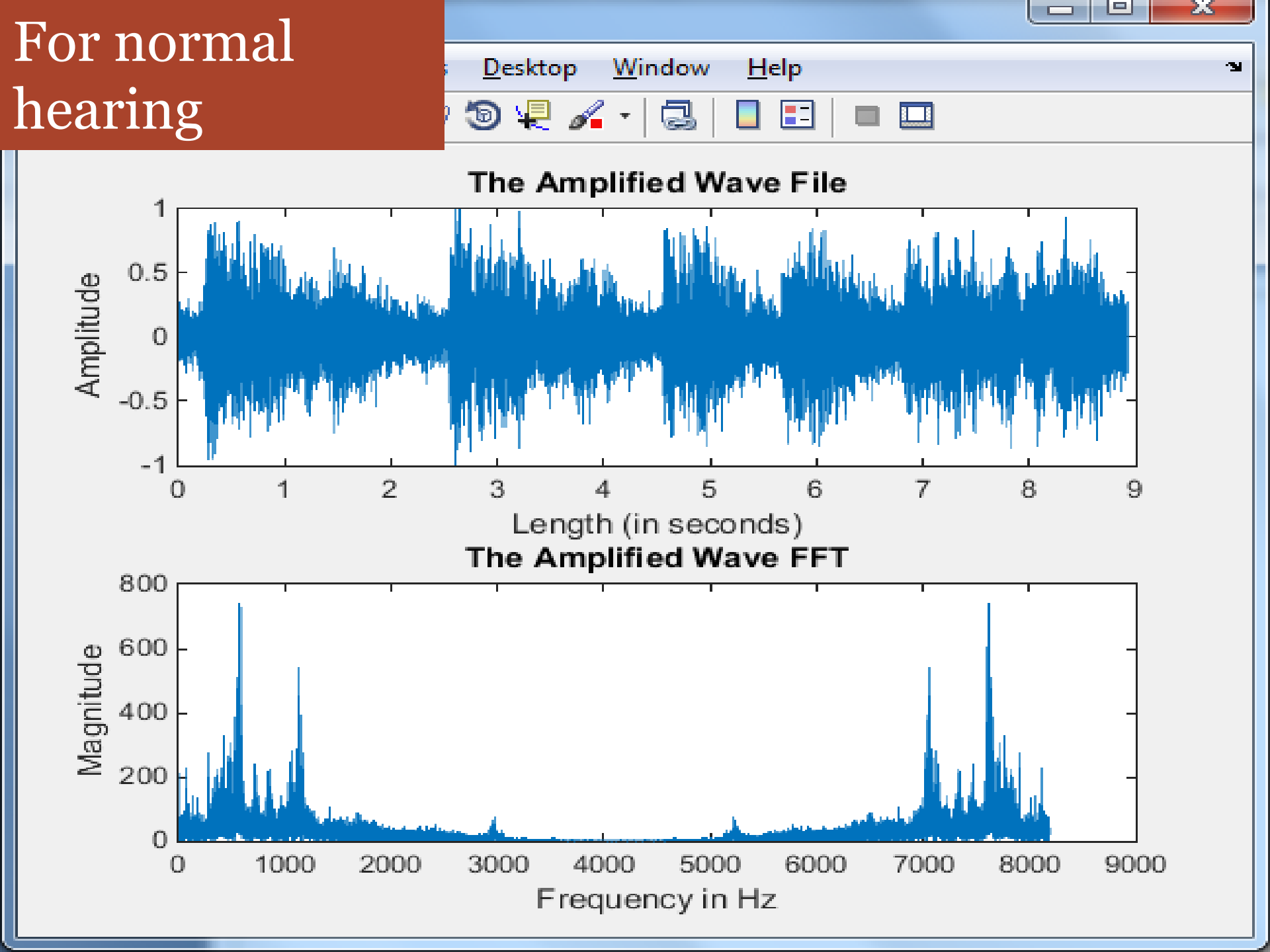
Addition of noise in signal



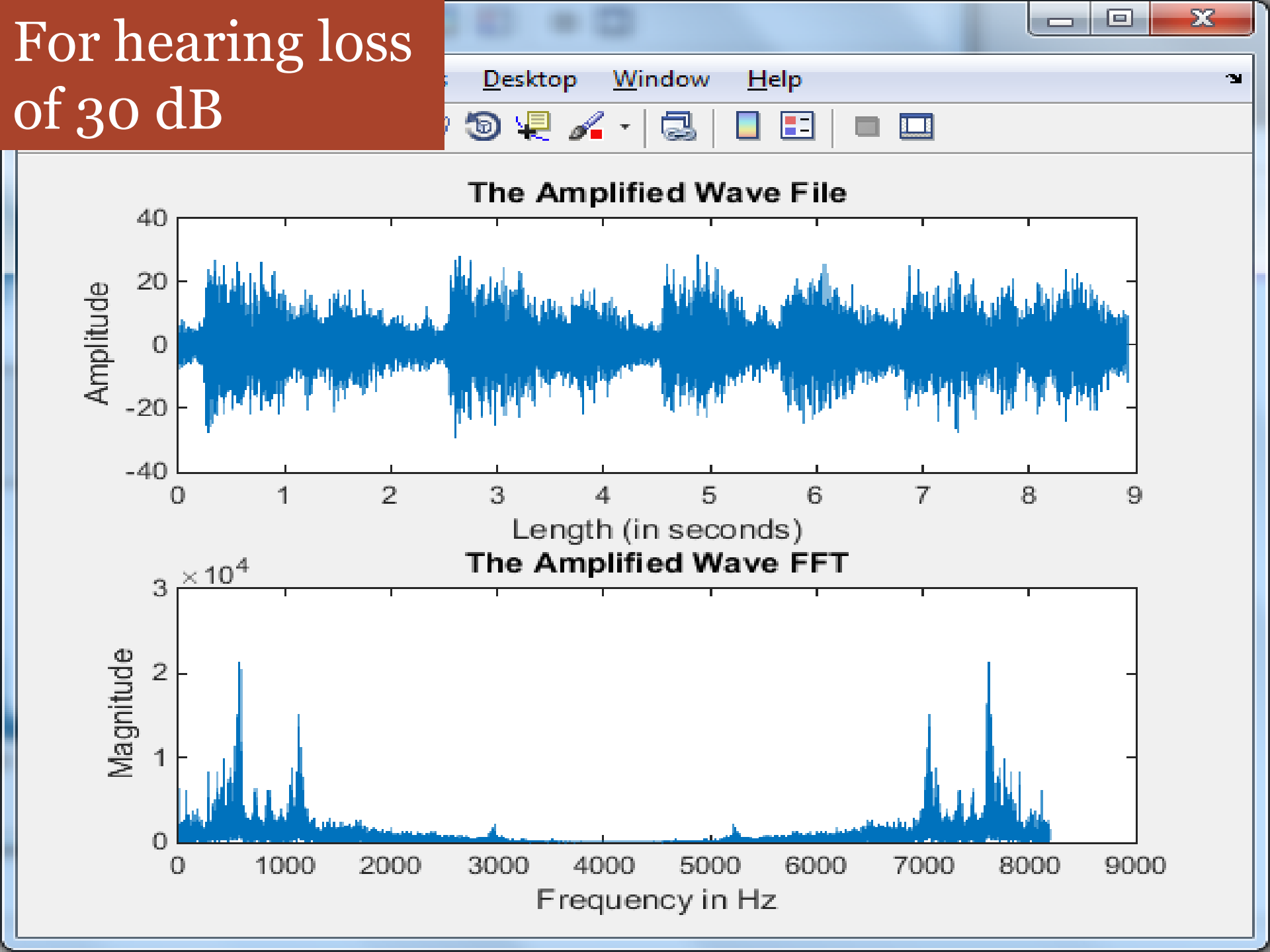
Recovery using wavelet transform



For normal hearing



For hearing loss of 30 dB



Thank You!