**MATLAB CODE:**

**%Reading data**

[audio\_in1,audio\_freq\_sampl]=audioread('./audio\_signal.wav');

**%Allowing input from only one channel**

audio\_in=audio\_in1(:,1);

**%Plotting all samples**

plot(audio\_in);

title('Input Audio');

**%shortening length of audio to nearest power of two**

Length\_audio=pow2(nextpow2(length(audio\_in))-1);

**%length\_audio/Running\_Time\_of\_music=audio\_freq\_sampl**

df=audio\_freq\_sampl/Length\_audio;

**%Plotting for better visualization including shifting of audio**

frequency\_audio=-audio\_freq\_sampl/2:df:audio\_freq\_sampl/2-df;

figure

FFT\_audio\_in=fftshift(fft(audio\_in,Length\_audio));%/length(fft(audio\_in));

plot(frequency\_audio,abs(FFT\_audio\_in));

title('FFT of Input Audio');

xlabel('Frequency(Hz)');

ylabel('Amplitude');

**%playing the audio**

sound(audio\_in,audio\_freq\_sampl);

**%defining new frequency range and plotting for sepearting frquencies**

frequency\_audio1=0:df:audio\_freq\_sampl-df;

**%plot(frequency\_audio1,abs(fft(audio\_in,Length\_audio)));**

plot(frequency\_audio1,(abs(fft(audio\_in,Length\_audio))))

Approximately frequency/df=23.75\*frequency datapoints in fourier transform. We will use that in the following.

**%separating voices:frequency(2-500) range://Guitar**

hv=fft(audio\_in,Length\_audio);

hv(1:46,1)=0;

hv(11875:(Length\_audio-11875),1)=0;

hv((Length\_audio-46):(Length\_audio),1)=0;

guitar=real(ifft(hv));

**%plot(frequency\_audio1,abs(hv))**

sound(guitar,audio\_freq\_sampl);

plot(guitar)

title('Guitar Component');

audiowrite('guitar.wav',guitar,audio\_freq\_sampl);

**%separating voices:5000 to 6000-frequency range://drum**

hv=fft(audio\_in,Length\_audio);

hv(1:118750,1)=0;

hv(142500:Length\_audio-142500,1)=0;

hv(Length\_audio-118750:Length\_audio,1)=0;

drums=real(ifft(hv));

**%plot(frequency\_audio1,abs(hv))**

sound(drums,audio\_freq\_sampl);

plot(drums)

title('Drum Component');

audiowrite('drums.wav',drums,audio\_freq\_sampl);

**%Separation of 1500-2500 frequency range//HUMAN VOICE**

hv=fft(audio\_in,Length\_audio);

hv(1:35625,1)=0;

hv(59375:(Length\_audio-59375),1)=0;

hv((Length\_audio-35625):Length\_audio,1)=0;

human=real(ifft(hv));

**%plot(frequency\_audio1,abs(hv));**

sound(human,audio\_freq\_sampl);

plot(human)

title('Human Voice Component');

audiowrite('human.wav',human,audio\_freq\_sampl);

**%Reconstruction of audio signal**

Reconst = human+guitar+drums;

sound(Reconst,audio\_freq\_sampl);

plot(Reconst)

title('Reconstructed Audio');

audiowrite('reconstructed\_signal.wav',Reconst,audio\_freq\_sampl);