

# Digital Signal Processing

## Seminar 2

### Elimination of narrowband interference (sound of clarinet) in the human voice record

May 2022

#### 1.Introduction

The sound record '*1.danes\_je\_lep\_dan\_klarinet\_22050.wav*' is mix of human voice and clarinet. The clarinet part occupies much smaller part of the frequency spectrum than human voice. To make it possible we use narrow bandstop filter. The main goal of this seminar is to filter the sound of the clarinet as much as possible, while preserving the sound of the human voice.

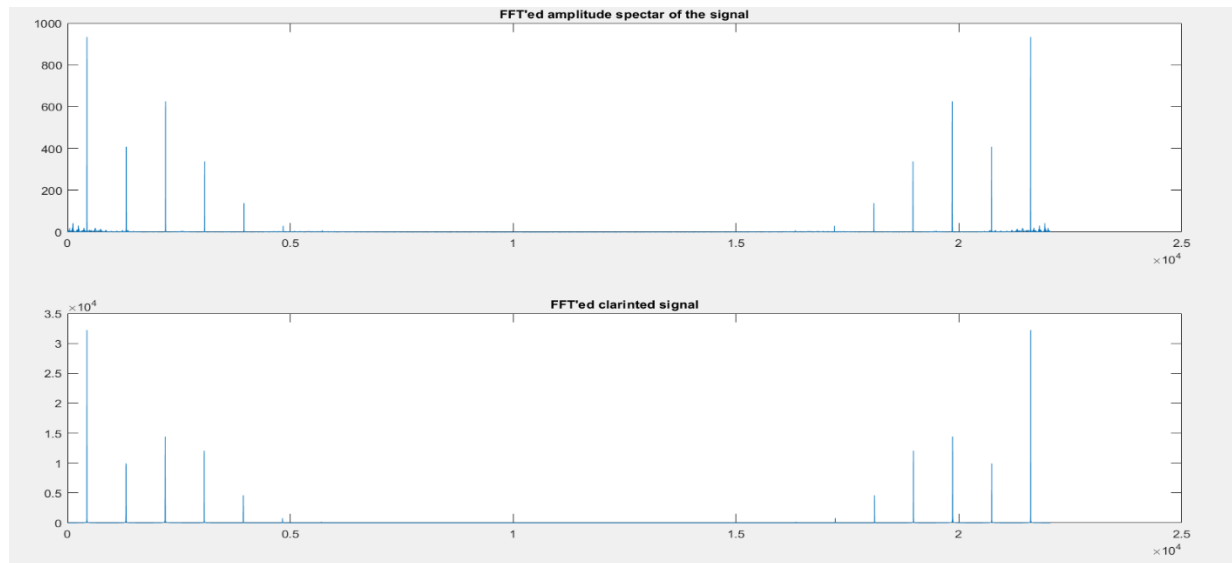
#### 2.Methods

We first make amplitude spectre of the Fourier transformed signal.

Than we know know the clarinet equation from the first seminar.

$$y(n)=\cos(\omega n) +0.375 \cos^*(3 \omega n) +0.581*\cos(5 \omega n)+0.382*\cos(7 \omega n)+ \\ 0.141*\cos(9 \omega n)+0.028*\cos(11 \omega n) +0.009*\cos(13 \omega n)$$

We make the Fourier transformed generated signal clarinet signal with  $F_b=438.5$ .



I used the function *bandstop* serially and eliminated the clarinet frequencies without interrupting human voice signal.

### 3.Results

Without headphones the voice is totally isolated but as soon as I put on headphones I listen some unfiltered clarinet sound.

The best results were made with  $\pm 25$  of the clarinet frequency if the number was lower, we could still hear the clarinet and, if the range was longer the human voice would sounded gibberish.

### 4.Discussion

I think there is better filter to use for isolating voice. But now in the music industry the voice and instruments are recorded separately so maybe there will not be necessary to create filter.