

Multirate Signal Processing

Seminar 3

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Homework assignment

To be presented on: 09.06. or 16.06.

1. Read in two different audio signals (from moodle)

- Speech signal
- Music signal

-> Downsample and upsample both signals with the factor $N=2$

2. For that purpose design a low pass filter using the window method

- Use window length of $L=16$
- Determine where the stopband should start

Homework assignment

3. Plot the frequency response of the

- Music/Speech signals
- Filter
- Downsampled and filtered music/speech signal (Show here the the entire spectrum from 0 to 2π ; Matlab: use `freqz(low_dwn,1,128, 'whole')`)
- Reconstructed music/speech signal

Homework assignment

4. Design a highpass filter out of the lowpass filter

- Repeat the downsampling, upsampling process with this filter
- Repeat Task 3 (plots)

5. Analyze and compare

- How does the spectrum of the signal change after filtering and downsampling?
- How does the reconstructed speech/music sounds in the case of the lowpass and highpass filter? What are the differences?