

## EMARO Signal Processing – Assignment 1 subjects (rev. 2008-10-21)

### 1. On-line spectral analyzer

Create an application displaying on-line spectral analysis of a sound signal. The application should compute and display the power of spectrum and total signal power in the form of a continuous curve as well as bars representing energies of different spectral bands. The width of bands should be configurable.

### 2. FFT Graphical Equalizer

Create an application allowing to interactively attenuate or suppress different spectral bands of a sound signal. Level of manipulation is controlled by a set of sliders. Filtering should be performed in the frequency space. Consider methods of reduction of the aliasing effect.

### 3. Filter-based Graphical Equalizer

Create an application allowing to interactively attenuate or suppress different spectral bands of a sound signal. Level of manipulation is controlled by a set of sliders. Filtering should be performed with a set of several band-pass filters (in time domain).

### 4. Frequency-domain filter designer

Create a simple application allowing to interactively design filters by specifying (drawing) a curve of the filter frequency response. Present results both in frequency and in time domain. Consider methods of reduction of the aliasing effect.

### 5. Correlation-based DFT and FFT transformations

Create your own implementation of correlation-based DFT and FFT transformations and compare results of both methods in terms of efficiency and output.

### 6. Linear equations DFT and correlation-based DFT transform

Compare two basic methods of computation of the DFT: the one founded on solving a set of linear equations for time domain signal synthesis using IDFT formulas, and the other founded on computing correlations between

sinusoidal signals and the original signal. Create your own implementations and compare results of both methods in terms of efficiency and output.

#### 7. AM “radio” transmitter and receiver

Design a simple application performing modulation and demodulation of an amplitude modulated signal. Analyze behavior of a spectrum of the modulated and demodulated signal.

#### 8. FM “radio” transmitter and receiver

Design a simple application performing modulation and demodulation of frequency modulated signal. Analyze behavior of a spectrum of the modulated and demodulated signal.