2. *FFT* medium spectrum (Documentation – see 01)

2.1. Presentation

In addition to the instant spectrum, the medium spectrum introduces as an analysis instrument the possibility to compute the average of spectrums based on a number of analysis windows. It is useful when an analysis of spectral components is intended that concerns a bigger time interval without using analysis windows with large numbers of samples. As in the case of instant spectrum, algorithm FFT reduces the dimension of the analysis window to a power of 2.

The user has to specify the position of the first, respectively, the last sample on which the analysis window will focus as well as the displacement pitch. Supposing that the sampling frequency of wav file is 22050 Hz and a spectral analysis is intended that covers a segment of 100 ms (22050 * 0.1 = 2205 samples) with a window of 512 values, then the total number of windows considered is 2205-511 if the *displacement pitch* is a sample. The bigger the pitch, the fewer the windows considered. The displacement pitch equal to ¼ or ½ of the window is recommended. For example if you choose a 512-sample window, the displacement pitch may be 256 or 128.

It is also recommended that in order not to distort the spectral results a weighting window should be used (other than the rectangular one), as in the case of instant FFT application (see appropriate documentation).

2.2. Way of operating

The tool was conceived under the form of an executable called *fft_med.exe*. This has to be enclosed in the same folder with the sound files (wav) to be analysed.

The user selects the following parameters:

- Name of file (it may be selected from the wav file list in the folder)

After inputting the sound file name, the information in the header is checked and pieces of information such as sampling frequency, number of channels, number of bits per sample, and the total number of samples are displayed. Only mono-channel sound files are accepted.

- Number of processed samples – dimension of analysis window (for example *512*)

The minimum value must be 4 and the maximum one is given by the total number of samples (or the dimension of memory unit assigned to the vector keeping the read data in the file)

- The place within wav file of the first, respectively, the last sample on which the analysis window will focus. They must not exceed the imposed limits (inferior limit = N/2 = 256; superior limit = total number of samples - N/2)
- Displacement pitch (a non-null positive integer whose value depends on the places previously assigned to the first and, respectively, the last window considered when determining the medium spectrum)
- Select the type of window (implicitly = 0, the rectangular window)
- Select the way in which data will be saved (as complex numbers or in modulus)

The application is effective for files with both 16-bit and 24-bit samples.

Citation and Copyright

Marius Zbancioc, Horia-Nicolai Teodorescu: "Average FFT" Application. Tools for the Archive of Romanian Spoken Language – Romanian Sounds
http://www.etc.tuiasi.ro/sibm/romanian_spoken_language/ro/instrumente.htm.

In the absence of a proper citation, we reserve the right to apply to justice. In order to use the program in commercial applications, one needs the written, contractual permission of the authors. Contact us on the address below and provide us with the description of your application and the way you intend to use the program. In the absence of a written permission, we reserve the right to apply to justice.

Authors: H.-N. Teodorescu and M. Zbancioc