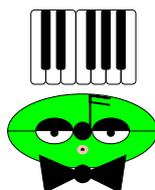# Whistle2Piano: Whistle to Piano conversion tool for Symbian 60

Dr. Dimitrios Ververidis (jimver04@gmail.com)
`dimitriosververidis.blogspot.com`

June 9, 2011

Abstract

A tool to convert human whistling sounds to piano notes by employing the spectrogram of the sound. Notes can be exported to Music xml format for further processing.

1 Installation

Install the Whistle2Piano.sis using the Nokia PC Suite or Nokia Ovi Suite. The Whistle2Piano is fully tested on Symbian 60 3rd edtion FP2.

2 User guide

Press "options" and "start" to start recording and recognizing notes in real time. Press exit to stop recording. Then, the following buttons that refer to the landscape orientation of the mobile phone such as in Figure 1 can be used:

- Left-right navigation buttons: Scroll signal;

- Up navigation button: Hear the signal that is displayed on the screen;

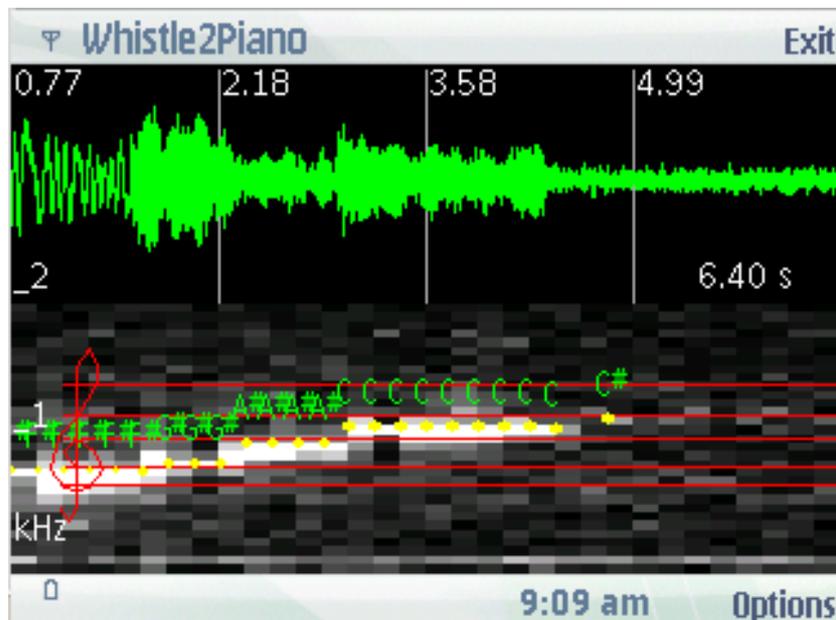- Down navigation button: Hear the notes of the displayed signal;

Figure 1: A screenshot of the software. The x-axis corresponds to seconds, the y-axis of the upper panel is the voltage of the input, the y-axis of the lower panel corresponds to kHz. 6.40 s is the total duration of the session in seconds. Notes are represented by yellow dots on the red stuff using the G2 clef.

- Button 1: Hear the synthesized signal (notes);

- Button 2: The actual signal can be heard;

- Button 3: Help.

The spectrogram can be viewed in two modes, namely the linear (default) or the logarithmic. The axes height balance between the waveform and the spectrogram can be adjusted with the `PanelsBalance` option from 10-100% where at 100% only the waveform is viewed.

3 Methodology

The sound of human whistling captured from either embedded microphone or handsfree is transformed into digital with `SamplingFrequency`=8000 samples per second and accuracy of 16 bit. The fast Fourier transform

(FFT) [1] is estimated on short-term frames of 128 samples. The coefficient of the FFT with the maximum energy :

$$\hat{n} = argmax_{n=1,2,\ldots,63}FFT(n) \tag{1}$$

defines the pitch frequency of the frame

$$F_P = \hat{n} * 4000/64. \tag{2}$$

The Kth piano note is given according to

$$K = 12\log_2(F_P/440) + 49 \tag{3}$$

The F_P on normal human whistling varies from 500 Hz to 2 kHz. Thus K varies from 52 to 75. In ABC notation 52 and 75 correspond to C5 and B6, respectively. Notes can be exported to music xml format and can be further processed using Musescore software [2]. The notes are exported to one octave less that the actual one so that they fit to the center of the staff.

References

[1] J. W. Cooley and J. W. Tukey. An algorithm for the machine calculation of complex Fourier series. *Math. Comput*, 19(90):297–301, 1965.

[2] Musescore. Free music composition & notation software, 2011. `http://musescore.org`.