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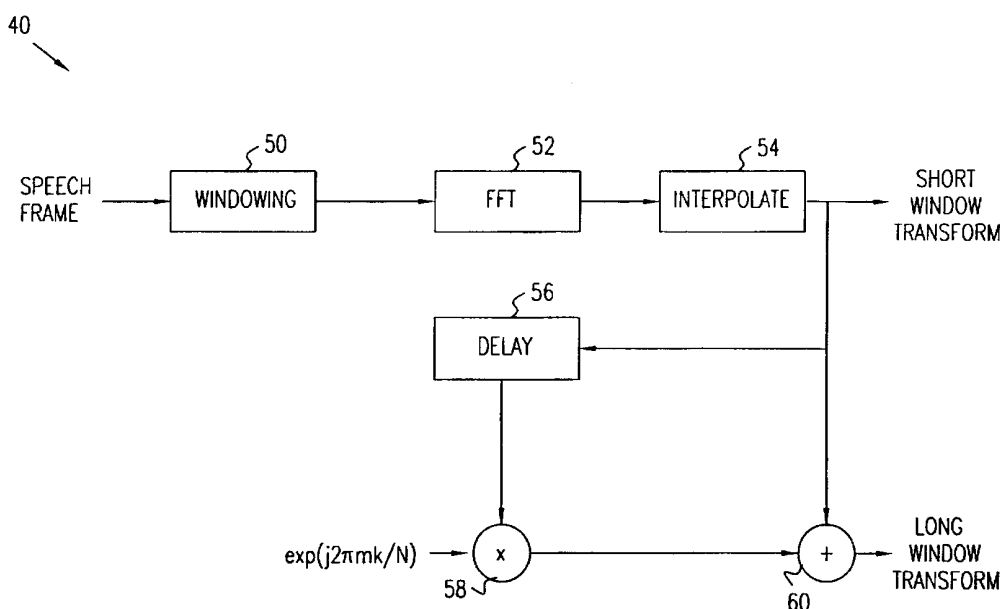
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(54) Title: FAST FREQUENCY-DOMAIN PITCH ESTIMATION



(57) Abstract: A method for estimating a pitch frequency of an audio signal includes computing a first transform of the signal to a frequency domain over a first time interval (42), and computing a second transform of the signal of the frequency domain over a second time interval (44), which contains the first time interval. A line spectrum of the signal is found, based on the first and second transforms, the spectrum including spectral lines having respective line amplitudes and line frequencies. A utility function (130) that is periodic in the frequencies of the lines in the spectrum is then computed. This function is indicative (158), for each candidate pitch frequency in a given pitch frequency range, of a compatibility of the spectrum with the candidate pitch frequency. The pitch frequency of the speech signal is estimated responsive to the utility function (176, 178).



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL01/00644

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G10L 11/04
US CL : 704/207

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 704/207, 203, 204

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
BRS, IEEE/IEL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,519,166 A (FURUHASHI et al.) 21 May 1996 (21.05.96), column 1-13.	1-56
Y	US 5,797,119 A (OZAWA) 18 August 1998 (18.08.98), entire document.	1-56
Y	US 5,870,704 A (LAROCHE) 09 February 1999 (09.02.99), columns 2-4.	2, 6, 9, 11, 13-18, 22, 24, 25, 28, 32, 35, 37, 39-44, 46, 50, 51
Y	MARTIN, P. Comparison of Pitch Detection by Cepstrum and Spectral Comb Analysis. IEEE. 1982, pages 180-183.	6, 9-18, 21-25, 32, 35, 36-44, 47-52, 55
Y	HESS, W. Pitch Determination of Speech Signals. New York: Springer-Verlag. 1983, sections 8.5.1-8.5.4.	8, 9, 12, 19, 20, 23, 24, 34, 35, 38, 45, 46, 49, 50
Y	LAROCHE, J. and DOLSON, M. Phase-Vocoder: About This Phasiness Business. 1997 IEEE ASSP Workshop on Applications of Signal Processing to Audio and Acoustics, 1997. 19-22 October 1997, entire document.	2, 4, 5, 28, 30, 31

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

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