Yogesh A. Bhagwat, Real-time vocal tract shape and pitch estimation, M. Tech. Thesis, Department of Electrical Engineering, Indian Institute of Technology Bombay, 1994.

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Abstract – One of the ways of training profoundly deaf children to acquire proper articulatory features of speech, is by providing a visual or tactile feedback of vocal tract shape, pitch, and energy level. A training aid giving such feedback should have capability of real-time estimation and display of these parameters with a provision for slow motion display.

In this project various algorithms for estimation of vocal tract area function and pitch were examined for their suitability for real-time implementation. After selection of suitable algorithms, the same were implemented for real-time operation and tested for accuracy.

The hardware setup consists of a PC/AT with a TMS320C25 based DSP board. The speech signal is input through a microphone, amplifier, and filter to A/D converter input of the DSP board. The speech processing for the parameter estimation is performed on the DSP board and the results are displayed on the PC monitor. Each analysis segment is of 25.6 ms duration. The vocal tract shape is displayed for the current segment and a time history of pitch and energy for the previous 25 frames is displayed. A target vocal tract shape can also be defined in real time. In addition to the real-time operation, the system offers a facility for slow motion review of the analysis results.