

Mandar S. Chitnis, A glottal pitch extractor, M. Tech. Thesis, Department of Electrical Engineering, Indian Institute of Technology Bombay, 1998.

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Abstract – Detection and estimation of voice pitch, the fundamental frequency of vocal fold vibrations, finds wide use in speech analysis and recognition, diagnosis of voice disorders, and speech training aids for the hearing impaired. The aim of this project is to develop a low cost battery operated instrument using electroglottography, a non-invasive technique for measuring impedance variation across the thyroid cartilage of the larynx. This impedance variation provides information about the dynamics of the closure of the vocal folds, and can be used for obtaining the voice pitch.

A high frequency (300 kHz), low intensity (~3 mA) current is passed through the central discs (15 mm dia.) of a pair of plate electrodes held in contact with the skin on both sides of the thyroid cartilage. A guard around each of the discs is actively driven to the same potential as the central disc, in order to reduce the superficial component of the sensing current. The impedance variations, caused by varying contact area between the vocal folds, results in amplitude modulated voltage waveform across the central disc electrodes. This waveform is demodulated to get the impedance variation. A low cost microcontroller based signal acquisition, analysis, and LCD graphics display unit has been developed as a part of this instrument for displaying the impedance variation waveforms for diagnosis of speech disorders. A serial interface has been provided for interfacing the instrument to a computer for downloading the measurement results and to take a plot of the stored waveform on a plotter. A signal acquisition and analysis software has been developed on a notebook PC with a data acquisition card, for capturing the impedance variation waveform and plotting the pitch histogram.