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Contact: Prof. P. C. Pandey
Department of Electrical Engineering,
Indian Institute of Technology Bombay, Powai, Mumbai.
mailto: pcpandey@ee.iitb.ac.in

***Abstract* - Production of vowel–oral stop consonant–vowel utterances involves movement of articulators from the articulatory position of the initial vowel towards that of the oral stop closure, and then to that of the final vowel. As the closure segments have zero or low signal energy, linear predictive coding (LPC)-based estimation of vocal tract shape fails during stop closure. This paper reports a technique for estimation of place of articulation during stop closures by performing bivariate polynomial modeling on vocal tract area values during transition segments preceding and following the closure. The technique with second-degree polynomial modeling was found to be suitable for estimating the place of maximum constriction during stop closure segments of vowel–consonant–vowel utterances with bilabial, alveolar, and velar stops. The estimated places compared well with the actual constriction locations observed from the articulatory data. The technique may be useful for improving effectiveness of speech-training aids for production of stop consonants by providing visual feedback of the estimated place of articulation.**