Vikash Sethia, Lip shape estimation from speech waveform, M. Tech. Thesis, Department of Electrical Engineering, Indian Institute of Technology Bombay, 2004.

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Abstract **-** Display of lip shape can be employed for providing visual information to improve speech reception by the hearing impaired persons during telephonic conversation. The objective of this project is to investigate estimation of lip-shape parameters from speech waveform without the knowledge of speech content. Estimation of lip-shape parameters is carried out from the spectral moments of the pitch synchronously computed speech spectra using bivariate least squares approximation, and 2D and 3D Delaunay triangulation methods. Lip-shape parameters extracted from these methods are first analyzed for the training sounds. Segments of vowels /a/, /e/, /i/, /o/ and /u/ are used as the training sounds. The spectral moments of the training sounds are then used as the reference data for synthesizing lip shapes for other segments like vowel-vowel and vowel-semivowel-vowel syllables. Analysis results have been consistent for speech signal with SNR greater than 20 dB. Also, lip-shape parameters estimated using 3D Delaunay triangulation method have smooth contour than those using the other two methods.