V. V. Siva Rama Prasad, Speech processing for single channel sensory aid, M. Tech. Thesis, Department of Electrical Engineering, Indian Institute of Technology Bombay, 1996.

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Abstract – The aim of the project is to develop a speech processor for single channel sensory aid. This aid can be useful as a hearing aid to the deaf, who are suffering from sensori-neural hearing loss.

The speech processing scheme of this speech processor is based on frequency lowering principle. This scheme presents distinct cues about intonation and rhythm of the speech, and about the fricative sounds. This distinction has been achieved by separating the residual hearing frequency region of deaf, in two bands and providing the cues in these two bands. Only one of the two cues is presented at a time. This scheme processes the speech signal using two channels. Channel 1 estimates the pitch, voicing and generates a periodic or random waveform based on voiced or unvoiced speech, respectively. Channel 2 maps the high frequency components to the higher band of residual hearing region of the deaf. This scheme has been implemented in real-time using a Digital Signal Processor (DSP) card based on TMS320C25 DSP processor. Pitch is estimated by computing the short time autocorrelation. High frequency bursts are mapped using a pulse repetition rate mapping algorithm. An earlier implementation was tested and problems were solved by modifying the scheme as well as the implementation. This modified scheme has a reference to the formant energy for deciding whether to present either channel 2 output or channel 1 output. This modified implementation is tested thoroughly in modular and overall methods. Listening tests have been conducted using vowel-consonant-vowel syllables, on five normal hearing subjects. Results show that this scheme helps in providing cues about the features like voicing, manner, and place of articulation.