



## Various Types of Parametric Methods of Power Spectral Density Estimation

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### Abstract

The basic problem of the single-channel speech enhancement methods lies in a rapid and precise method for estimating noise, on which the quality of enhancement method depends. The paper describes Types of Parametric Methods of Power Spectral Density Estimation in spectral domain. To reduce periodogram variance the proposed method use the procedure of Thresholding, the coefficients of a Periodogram, Then the smoothed estimate of power spectral density of noise is obtained using the inverse discrete Parametric Method.

**Keywords:** Speech Enhancement, Power Spectral Density, Periodogram, Parametric Method.

### 1- Introduction

Most of the speech enhancement methods use estimation of noise and interference characteristics. Thus the notion of power spectral density is introduced, which defines the density of total noise energy of a random signal in dependence on frequency. In statistical signal processing, the goal of spectral density estimation (SDE) is to estimate the spectral density of a random signal from a sequence of time samples of the signal. Intuitively speaking, the spectral density characterizes the frequency content of the signal. One purpose of estimating the spectral density is to detect any periodicities in the data, by observing peaks at the frequencies corresponding to these periodicities. SDE should be distinguished from the field of frequency estimation, which assumes that a signal is composed of a limited number of generating frequencies plus noise and seeks to find the location and intensity of the generated frequencies. SDE makes no assumption on the number of components and seeks to estimate the whole generating spectrum. Frequency domain speech enhancement systems typically consist of a spectral analysis/synthesis system, a spectral gain computation method, and a background noise power spectral density (PSD) estimation algorithm. While the former two are well understood [1]–[3] and easily implemented the noise estimator has frequently received less attention. The noise estimator is, however, a very important component of the overall system, especially if the algorithm should be capable of handling non-stationary noise. In fact the noise estimator has a major impact on the overall quality of the speech enhancement system. If the noise estimate is too low, unnatural residual noise will be perceived. If the estimate is too high, speech sounds will be muffled and intelligibility will be lost. The traditional SNR based voice activity detectors (VAD) are difficult to tune and their application to low SNR speech results often in clipped speech. Current research [4]–[6] aims therefore at incorporating soft-decision schemes which are also capable of updating the noise PSD during speech activity. Here Power Spectral Density (PSD) estimation is computed by using parametric and non-parametric methods. The reduction of noise ratio in PSD is considered as the parameter and it is estimated through crest factor. Finally the paper concludes with the need of best windowing method for PSD particularly in parametric techniques. Evaluation is handled both objectively and subjectively for Tamil speech datasets. In this paper, we present a novel noise estimation algorithm which is based



































