

ASAS Report

109136501 陳家麒

1. What's the definition of LP?

Linear prediction (LP) is a way use linear combination of previous values to predict next values. Linear prediction can separate two part, first is find LP coefficient and minimize $E(e[n])^2$.

$$e[n] = x[n] - \sum_{k=1}^P a_k x[n-k]$$

Where a_k is LP coefficient can use **Levinson-Durbin** to find.

Second part is reconstructing sounds:

$$x[n] = \sum_{k=1}^P a_k x[n-k] + e[n]$$

2. Under what assumptions did the authors think LP is particularly suitable for speech analysis?

Part of analysis method of analyzing speech is to analyze it after converting it into spectrum through fast Fourier transform, however these methods based on spectrum analysis can't effectively and accurately analyze. The author believes that to avoid this problem, it is necessary to model the voice wave rather than the frequency domain. Linear prediction can analyze voice waves at the time, so it is more suitable.

3. Application (1971~2021) of LP?

From studying the related literature on linear prediction from 1971 to 2021 we know that linear prediction can be used in speech recognition, re-forming the speech signals and automatic answerback services.

In recent research, some scholars have combined neural networks and linear prediction in the text-to-speech and compression application.

Reference

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2. Daniele Giacobello, Sparse Linear Prediction and Its Applications to Speech Processing
3. J Makhoul, Spectral analysis of speech by linear prediction
4. J.M. Valin, LPCNet: Improving neural speech synthesis through linear prediction
5. B.S. Atal, Effectiveness of linear prediction characteristics of the speech wave for automatic speaker identification and verification