# 2.3 Adaptive DPCM (ADPCM)

ADPCM : Adaptive Prediction in DPCM

Adaptive Quantization

## Adaptive Quantization

Quantization level $\Delta$ varies with local signal level

$\Delta[n] = a\hat{\sigma}_{\mathbf{x}}[n]$

$\hat{\sigma}_{\mathbf{x}}[n]$ : locally estimated standard deviation of x[n]

- **Two Approaches for adaptive quantization**

- AQF : Adaptive Quantization with Forward Estimation

  unquantized input samples used to estimate $\hat{\sigma}_{\mathbf{x}}[n]$

  problems : 1. buffer and delay

  2. additional side information for $\hat{\sigma}_{\mathbf{x}}[n]$

- AQB : Adaptive Quantization with Backward Estimation

  quantizer output samples used to estimate $\hat{\sigma}_{\mathbf{x}}[n]$

  problems in AQF avoided

*See Fig. 3.29 , p. 231 of Haykin*

# Adaptive Prediction

$$\tilde{x}[n] = \sum_{k=1}^{P} \hat{w}_k[n] x[n-k]$$

$\hat{w}_k[n]$ obtained with $\hat{r}_k[n]$ estimated locally

- **Two Approaches for adaptive prediction**
  - APF : Adaptive Prediction with forward estimation
  - APB : Adaptive Prediction with backward estimation

similar problems as in APF avoided in APB

*See Fig. 3.30 , p. 231 of Haykin*

# Speech Coding Standard

ADPCM accepted as world standard giving 32 kbps for speech signals

*Ref : 3.7 , 3.9 , 3.10 , 3.13, 3.14, 3.15 of Haykin*