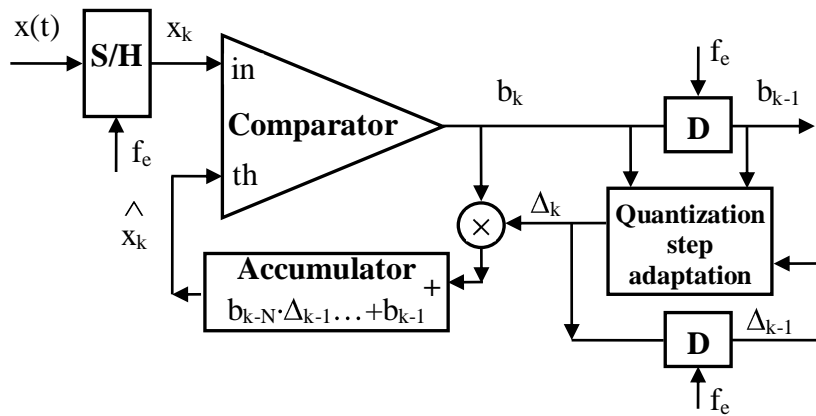


Currently transmitted bit: $\begin{cases} x_k \geq x_k \Rightarrow b_k = 1 \\ x_k < x_k \Rightarrow b_k = 0 \end{cases}$

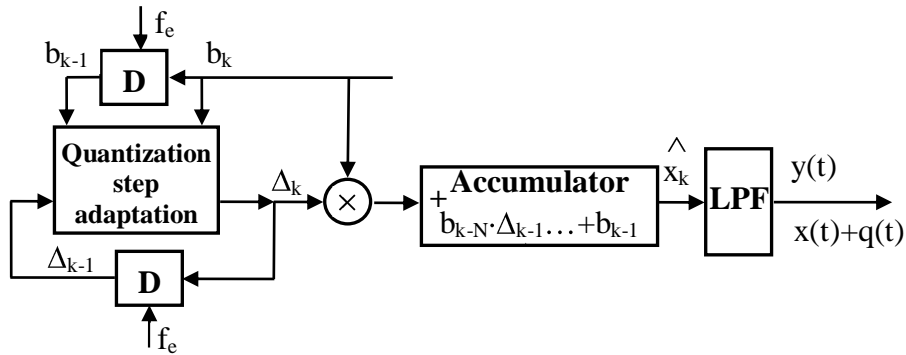
Predicted signal: $x_k = x_{k-1} + b_{k-1} \Delta_{k-1}$

Signal slope: $\begin{cases} \left| \frac{dx(t)}{dt} \right| = \Delta f_e \\ \left| \frac{dx(t)}{dt} \right| \approx K \sqrt{P} \end{cases}$ Quantization step: $\Delta_k = f_e \Delta_{k-1} b_k b_{k-1} \dots b_{k-N}$

SNR Delta modulation: $\begin{cases} P = \frac{\Delta^2 f_e^2}{K^2} \\ P_{zq-q} = \frac{\Delta^2}{12} \end{cases}; SNR_{delta} = \frac{P}{P_{zq-q}} = \frac{6 f_e^3}{K^2 f_m}$



Block schematic of the adaptive Delta modulator



Block schematic of the adaptive Delta demodulator

Song modulation:

$$\begin{cases} \Delta_k = \Delta_{k-1} + \Delta_e \text{ if } b_k = b_{k-1} \\ \Delta_k = \Delta_{k-1} - \Delta_e \text{ if } b_k \neq b_{k-1} \text{ or } \Delta_k = \Delta_{k-1} + \Delta_e \cdot \text{sgn } b_k \cdot b_{k-1} \\ \text{if } \Delta_k < \Delta_e \Rightarrow \Delta_k = \Delta_e \end{cases}$$

Jayant modulation:

$$\begin{cases} \Delta_k = \Delta_{k-1} \cdot p \text{ if } b_k = b_{k-1} \\ \Delta_k = \Delta_{k-1} / p \text{ if } b_k \neq b_{k-1} \end{cases} \text{ or } \Delta_k = \Delta_{k-1} \cdot p^{\text{sgn } b_k \cdot b_{k-1}}$$

Mean square error: $epm = \frac{\sum_{k=1}^M x_k - x_k^2}{M}$