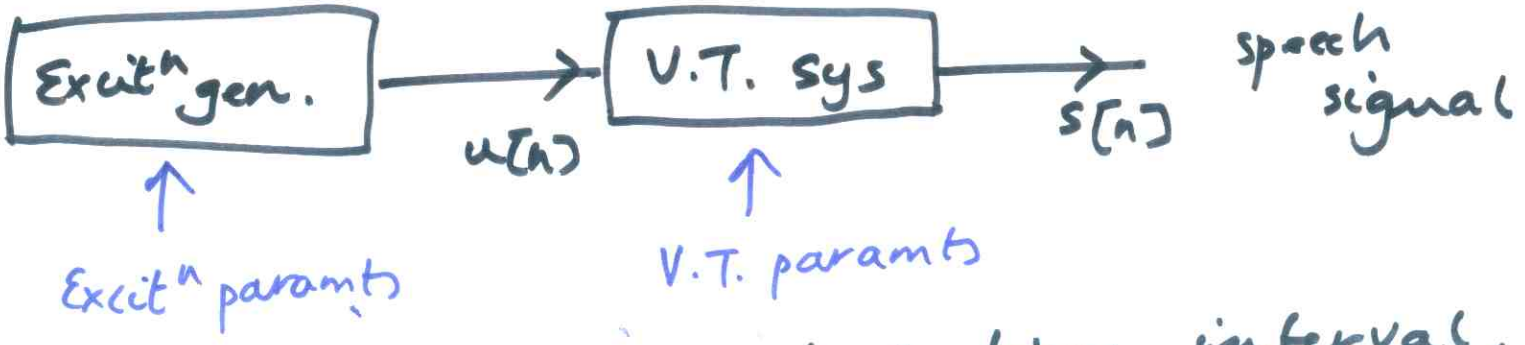
# Linear Predictive Analysis

"Model - based"



$A_i \cos(\omega_i t + \phi_i)$

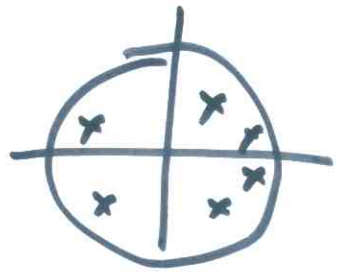
Consider our speech production model :




We have seen that over a short-time interval,

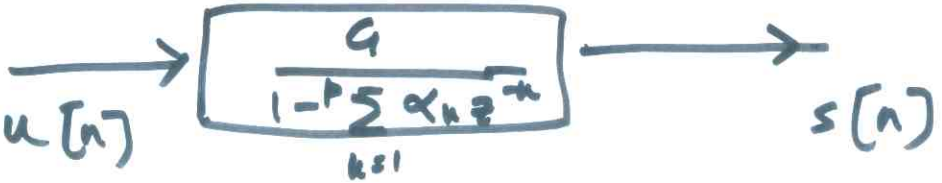
$$H(z) = S(z)/U(z)$$

$$H(z) = \frac{G}{1 - \sum_{k=1}^{p} \alpha_k z^{-k}}$$ "p" . . . (1)



$$H(z) = \frac{S(z)}{U(z)} =$$

$$\Rightarrow \quad s[n] = \sum_{k=1}^{p} \alpha_k s[n-k] + G \cdot u[n] \quad . \; . \; . \; (2)$$



A "linear predictor" with coeffs $\{a_k\}$ is defined as a system whose o/p is

$$\hat{s}[n] = \sum_{k=1}^{p} a_k \, s[n-k] \quad \ldots (3)$$



LP analysis is then about finding the predictor coeffs $\{a_k\}$ that are "optimal" for the given $s[n]$.

Define : error $e[n] = s[n] - \hat{s}[n]$

Optimiz$^n$ criterion =>

find $\{a_k\}$ that minimizes $E = \sum_{n=-\infty}^{\infty} e^2[n]$

M.S.E.