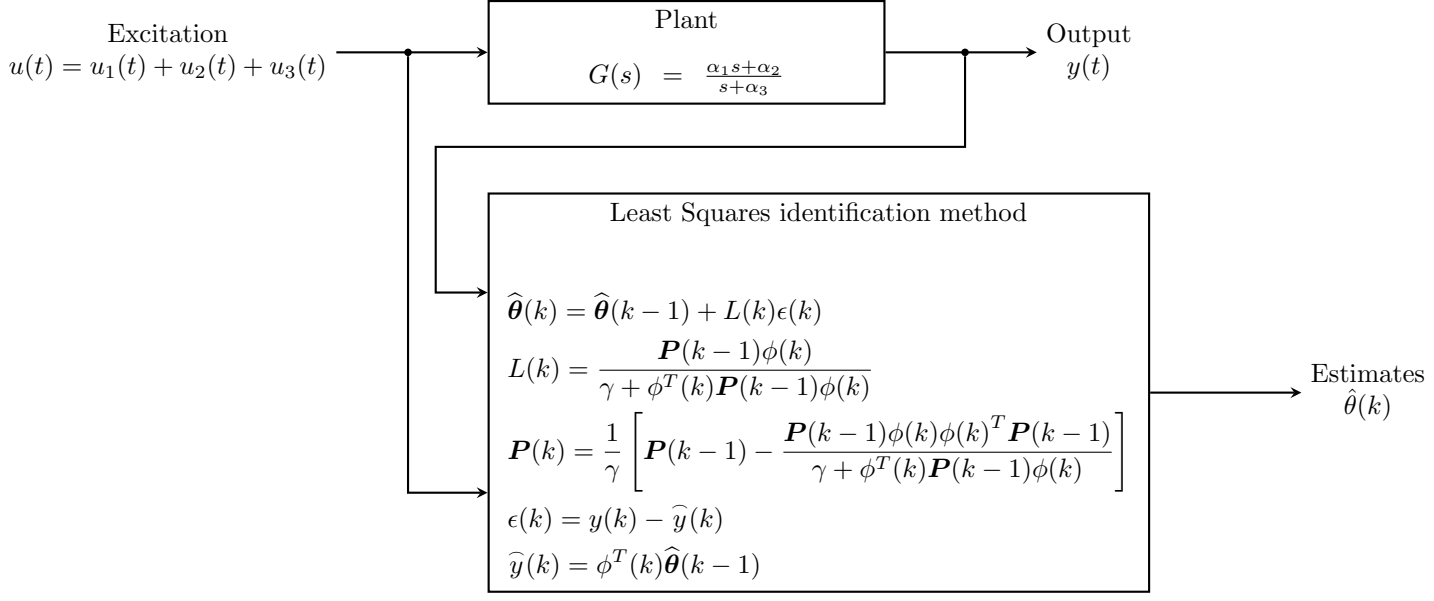


$\boldsymbol{P}(0) = \boldsymbol{P_0} = \boldsymbol{P_0}^\intercal > 0$, $\boldsymbol{P_0} = \rho \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$, $\boldsymbol{\phi} = \begin{bmatrix} u(k) & u(k-1) & y(k-1) \end{bmatrix}^\intercal$,

$\boldsymbol{\theta} = \begin{bmatrix} \theta_1 & \theta_2 & \theta_3 \end{bmatrix}^\intercal$, $\hat{\boldsymbol{\theta}} = \begin{bmatrix} \hat{\theta}_1 & \hat{\theta}_2 & \hat{\theta}_3 \end{bmatrix}^\intercal$,

$\hat{\alpha}_1(k) = \hat{\theta}_1(k)$, $\hat{\alpha}_2(k) = \hat{\alpha}_3(k)\left[\frac{\hat{\theta}_2(k) + \hat{\theta}_1(k)\hat{\theta}_3(k)}{1 - \hat{\theta}_3(k)} + \hat{\theta}_1(k)\right]$, $\hat{\alpha}_3(k) = -\frac{\ln(\hat{\theta}_{3*}(k))}{T_s}$,

$\hat{\theta}_{3*}(k) = \begin{cases} \hat{\theta}_3(k) & \text{if} \quad \hat{\theta}_3(k) > 0.01 \\ 0.01 & \text{if} \quad \hat{\theta}_{3*}(k) \leq 0.01 \end{cases}$ and $T_S$ is sampling time.