Reference
$$r(t) = r_1(t) + r_2(t) + r_3(t)$$

Least Squares identification method

$$\hat{\theta}(k) = \hat{\theta}(k-1) + \mathbf{P}(k)\phi(k)\epsilon(k)$$

$$\mathbf{P}(k) = \frac{1}{\gamma} \left[\mathbf{P}(k-1) - \frac{\mathbf{P}(k-1)\phi(k)\phi(k)^T\mathbf{P}(k-1)}{\gamma + \phi^T(k)\mathbf{P}(k-1)\phi(k)} \right]$$

$$e(k) = z(k) - \phi^T(k)\hat{\theta}(k-1)$$

 $\begin{aligned} \mathbf{P}(0) &= \mathbf{P}_0 = \mathbf{P}_0^\mathsf{T} > 0, \, \mathbf{P}_0 = \rho \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}, \, z = y(k) - y(k-1), \, \boldsymbol{\phi} = \begin{bmatrix} e(k-1) + e(k-2) \\ y(k-1) - y(k-2) \end{bmatrix}, \, \boldsymbol{\theta} = \begin{bmatrix} \theta_1 \\ \theta_2 \end{bmatrix}, \\ \hat{\alpha_0} &= -\frac{\ln \hat{\theta_2}}{T_S}, \, \hat{\alpha_1} = \frac{2\hat{\theta_1}\hat{\alpha_0}}{T_S(1-\hat{\theta_2})K_I}, \, \text{and} \, T_S \, \text{is sampling time.} \end{aligned}$