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

$$f(t) = r_1(t) + r_2(t)$$

$$f(t) = r_1(t) + r_2(t$$

Plant

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