Control Systems Design of the Nonlinear and Time Delay Systems

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Plant (Nonlinear Systems)

$$\dot{\boldsymbol{x}}(t)=\begin{bmatrix}0 & \alpha_1+\alpha_2+\dfrac{\sin a}{a}(\alpha_3+\alpha_4)\\ 1 & 0\end{bmatrix}\boldsymbol{x}(t)+\begin{bmatrix}1\\ 2(\alpha_1+\alpha_3)+(1+\cos a)(\alpha_2+\alpha_4)\end{bmatrix}u(t)+\begin{bmatrix}0\\ d(t)\end{bmatrix},$$

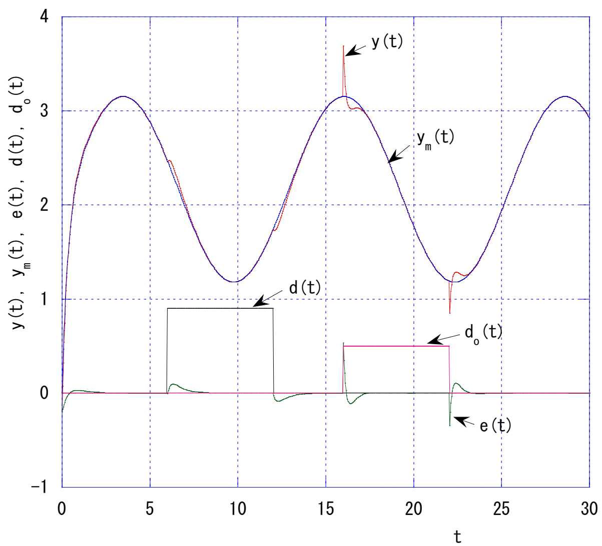
$$y(t)=\begin{bmatrix}3 & 1\end{bmatrix}\boldsymbol{x}(t)+d_o(t)$$

Reference Model

$$\dot{\boldsymbol{x}}_m(t)=\begin{bmatrix}0 & 1\\ -6 & -5\end{bmatrix}\boldsymbol{x}_m(t)+\begin{bmatrix}0\\ 1\end{bmatrix}r_m(t),$$

$$y_m(t)=\begin{bmatrix}2 & 1\end{bmatrix}\boldsymbol{x}_m(t),$$

$$r_m(t)=3\sin 0.5t+6.5$$



Content :

In production, transportation, society and environment fields utilized today's science and technology, the role of the systems-control engineering is important. In our laboratory, various design technique which guaranteed the stability of control systems for the nonlinear and time delay systems. Concrete contents are as follows.

1. The nonlinear controlled object is expressed by fuzzy modeling, and the control law which asymptotically agrees with the stable model followed by the output is constituted.
The condition as the whole control systems is stable is clarified, and responsibility and stability are confirmed in the numerical examples.
2. For the systems including the dely times, the model following type control law is constituted using operator vectors and state estimation, and the condition for becoming that the whole control systems is stabilized is deduced. Responsibility and stability are confirmed in the numerical examples.
3. The practical uses of above 1 and 2 control methods are attempted.

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