Abstract: PO-01

Tracking problem of 1D damped translational mechanical system for harmonic signals

H. M. A. K. Leelarathne* and W. P. T. Hansameenu

Department of Mathematics, University of Kelaniya, Sri Lanka
*anjaleeleelarathna@gmail.com

The translational mechanical systems play a major role in engineering systems such as automobile shock absorbing system, stock bridge damper, motion sensor etc. However, the damping influence of the translational mechanical systems is a major concern of system engineers. In this study, we consider a damped translational mechanical system and find control parameters, source term (force) and initial conditions, which are needed to track a harmonic signal. Let the governing equation of the damped translational mechanical system be

$$a(x)\,\ddot{x}\,(t) + b(x)\,\dot{x}(t) + c(x)\,x(t) = F(t), x(0) = \gamma, \dot{x}(0) = \delta.$$

We find the control parameters α(t), γ' and δ'. The harmonic signal will track the output of the system given by

$$a(x)\,\ddot{x}\,(t) + b(x)\,\dot{x}(t) + c(x)\,x(t) = F(t) + \alpha(t), x(0) = \gamma',\ \dot{x}(0) = \delta'.$$

The source term, α(t) gives information about the type and magnitude of the force needed to be added to the system to tracking the harmonic signal while avoiding the damping. Finally, we validate the results using numerical simulations using MATLAB.

Keywords: Translational mechanical system, Laplace transformation, Coupled systems, Linear ODEs