A Grey Wolf Optimizer for Identification of Liquid Slosh Behavior using Continuous-Time Hammerstein Model

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Abstract:
This paper presents the identification of liquid slosh plant using the Hammerstein model based on Grey Wolf Optimizer (GWO) method. A remote car that carrying a container of liquid is considered as the liquid slosh experimental rig. In contrast to other research works, this paper consider a piece-wise affine function in the nonlinear function of the Hammerstein model, which is more generalized function. Moreover, a continuous-time transfer function is utilized in the Hammerstein model, which is more suitable to represent a real system. The GWO method is used to tune both coefficients in the nonlinear function and transfer function of the Hammerstein model such that the error between the identified output and the real experimental output is minimized. The effectiveness of the proposed framework is assessed in terms of the convergence curve response, output response, and the stability of the identified model through the bode plot and pole zero map. The results show that the GWO based method is able to produce a Hammerstein model that yields identified output response close to the real experimental slosh output

Keywords: Slosh Behavior; Grey Wolf Optimizer; Hammerstein Model; System Identification; Experimental Validation.

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