

# Identification of Liquid Slosh Behavior using Continuous-time Hammerstein Model based Sine Cosine Algorithm

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## Abstract:

This paper presents the identification of liquid slosh plant using the Hammerstein model based on Sine Cosine Algorithm (SCA). 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 SCA 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 pole-zero map. The results show that the SCA based method is able to produce a Hammerstein model that yields identified output response close to the real ex-perimental slosh output.

**Keywords:** Slosh behavior, Sine Cosine Algorithm, Hammerstein model.

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