

Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Design of container velocity profile for the suppression of liquid sloshing¹ DONGJOO KIM, Kumoh National Institute of Technology — In many industrial applications, high-speed position control of a liquid container causes undesirable liquid vibrations called ‘sloshing’ which poses a control challenge in fast maneuvering and accurate positioning of containers. Recently, it has been shown that a control theory called ‘input shaping’ is successfully applied to reduce the sloshing, but its success comes at a cost of longer process time. Therefore, we aim to minimize liquid sloshing without increasing the process time when a container moves horizontally by a target distance within a limited time. In this study, sensing and feedback actuation are not permitted but the container velocity is allowed to be modified from a given triangular profile. A new design is proposed by applying input shaping to the container velocity with carefully selected acceleration time. That is, the acceleration time is chosen to be the 1st mode natural period, and the input shaper is determined based on the 3rd mode natural frequency. The proposed approach is validated by performing numerical simulations, which show that the simple modification of container velocity reduces the sloshing significantly without additional process time in a feedforward manner.

¹Supported by the NRF programs (NRF-2015R1D1A1A01059675) of Korean government

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Date submitted: 03 Aug 2016

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