

Coupled Analysis with Fluid and Flexible Multibody Dynamics of 6-DOF Platform with Liquid Sloshing Tank

Authors : Sung-Pill Kim, Dae-Gyu Sung, Hee-Sung Shin, Jong-Chun Park

Abstract : When a sloshing tank filled partially with liquid is excited with the motion of platform, it can be observed that the center of mass inside the tank is changed and impact loads is instantaneously applied to the wall, which causes dynamic loads additionally to the supporting links of platform. In this case, therefore, the dynamic behavior of platform associated with fluid motion should be considered in the early stage of design for safety and economics of the system. In this paper, the dynamic loads due to liquid sloshing motion in a rectangular tank which is loaded up on the upper deck of a Stewart platform are simulated using a coupled analysis of Moving Particle Simulation (MPS) and Flexible Multi-Body Dynamics (FMBD). The co-simulation is performed using two commercial softwares, Recurdyn for solving FMBD and Particleworks for analyzing fluid motion based on MPS method. For validating the present coupled system, a rectangular sloshing tank being enforced with inline sway motion by 1-DOF motion platform is assumed, and time-varied free-surface elevation and reaction force at a fixed joint are compared with experiments.

Keywords : dynamic loads, liquid sloshing tank, Stewart platform, moving particle semi-implicit (MPS) method, flexible multi-body dynamics (FMBD)

Conference Title : ICAMME 2015 : International Conference on Applied Mathematics and Mathematical Engineering

Conference Location : London, United Kingdom

Conference Dates : July 25-26, 2015