

Improve modeling & simulation accuracy using co-simulation between Abaqus and Dymola

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A gantry robot consists of a manipulator mounted onto an overhead system that allows movement across a horizontal plane. Gantry robot systems provide the advantage of large work areas and better positioning accuracy. Unfortunately those systems are often susceptible to vibrations that are impacting the position control system and imply system instabilities. To reduce vibration and improve positioning accuracy, a solution is to develop a controller which achieves a smoother motion.

In this case, co-simulation between plant i.e. finite element models and logical control systems model is needed to introduce analytical logic within multi-physics systems simulation.

The capability of coupling Abaqus and Dymola can be used to leverage logical-physical modeling's versatility. CATIA V6 platform is actually relying upon this philosophy enabling an innovative and iterative approach of finite elements simulation through an integration of control systems models to physical and multi-physical models.

A typical application workflow can be detailed as followed: measured data (sensors) are issued from Abaqus simulation then passed to Dymola which computes loads and/or displacements (solicitations) needed to attain Abaqus model's steady state.

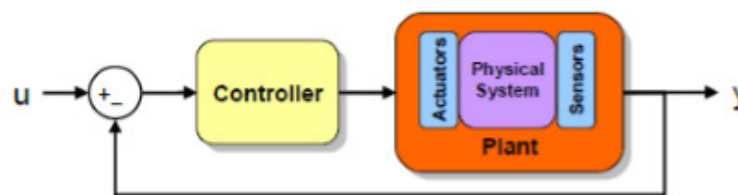


Figure 1 : Co-simulation workflow

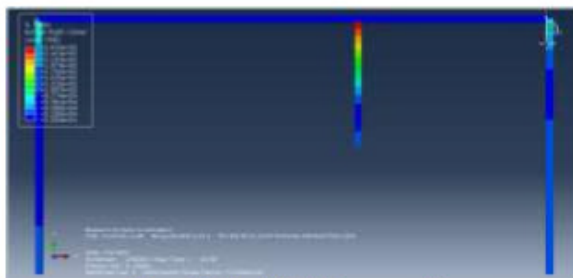


Figure 2 : Simplified Abaqus model

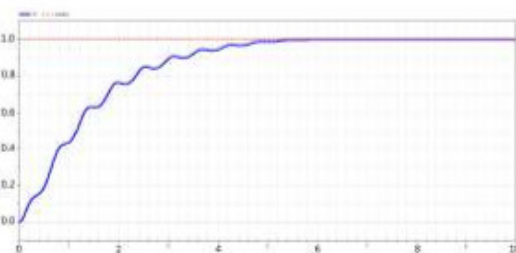


Figure 3 : Positioning result

This paper intends to present how we implemented this co-simulation process and results we obtained this way.