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Evaluation of the best approach for finite element simulation of a robotic gripper - A case study

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Abstract

This paper presents a case study on the behavior of a manipulation tool, known as a Gripper, attached to an articulated robot in the condition of immediate stop. The goal is to demonstrate how structural analysis can be carried out, taking into account all dynamic aspects of the Gripper's behavior. The study uses Ansys version 18 to perform a series of analyses, including kinematic, modal, harmonic, transient, and explicit analyses, with simplifications made to the geometry and material of the system. The results show that the explicit analysis best represents the propagation of vibration along the structure, and the transient analysis with an implicit solver is not recommended due to significant convergence difficulties. The study concludes that the response corresponds to what actually happened in the welding cell and that the failure of the Gripper was almost inevitable due to poor welding and the abrupt stop at a point where the robot reached its maximum speed.

Keywords: Dynamic analysis, Robotic gripper, Gripper analysis, Explicit simulation, Implicit simulation