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Optimization and Sensitivity Analysis of Suspension System in a Vehicle Impact Using Dynamics and Computational Simulations JUNHYUK JONATHAN LEE, RICHARD KYUNG, Choice Research Group — The dynamics analysis in a vehicle impact-absorption uses optimization to predict motion while considering many factors, such as mass, acceleration, and damping, including the overall equations of motion itself. The predictive dynamics model for impact-absorption system is used in order to simulate the movement of the multi-link manipulator such as a car suspension system. Since the car suspensions regulate the bodys motion and health, it is physically and biologically important and fundamental to analyze the reaction forces on the human body and the car elements itself during the impact-absorption process. Presented model is set up as a spring-mass-damper system that is combined with the multi-link system with a two-degree of freedom serial or parallel chain mechanism. In this research, the governing equations of motion are derived using the two-degree of freedom in the car suspension system, considering various factors and conditions. This research also studies the phenomena between the human bodies and car elements accountable for the forces causing injury through mechanical and vibrational analysis. The lumped element, spring-mass systems containing several hypothetical mass components with springs and dashpots are analyzed using computational simulations.

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