The Dynamic Response Simulation of Occupant in Rear-End Collisions

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ABSTRACT

The objective of this study is to simulate the dynamic response of the human body within a rear impacted vehicle. Most of the research in the impact analysis was performed by experimental approach and was expensive. Especially, the repeatability is very hard to produce in a destructive condition. Most of all, the analytic parameters which can be investigated are limited by the experimental approach. By using numerical techniques, this research employed the well-established multibody dynamics, Kane's equation, to develop a simulated system with visual graphic output to observe the rear impact response. According to the simulated results, at a constant impact velocity, the hyper-extension angle of a passenger's neck, chest and head were increased with the increasing of initial seat back angle. The maximum acceleration values also increased with the increasing of seat back angle. Furthermore, at a constant seat back angle, both extension angle and acceleration also increased with the increasing of impact velocity. This research provides a simulated system to investigate the passenger's dynamic response within a rear impacted vehicle. With the vehicle, human body and soft belt models established in this system, their interaction can be investigated according to preset parameters. From this computational approach, different parameters can be studied in order to reduce the injury risk of automobile accidents.

Key Words: Multibody Dynamics, Rear-End Collisions, Whiplash.
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