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PII: S0379-0738(18)30490-0
DOI: https://doi.org/10.1016/j.forsciint.2018.08.004
Reference: FSI 9428

To appear in: *FSI*

Received date: 1-6-2018
Revised date: 15-7-2018
Accepted date: 3-8-2018

Please cite this article as: Inhwan Han, Analysis of vehicle collision accidents based on qualitative mechanics, Forensic Science International https://doi.org/10.1016/j.forsciint.2018.08.004

Analysis of vehicle collision accidents based on qualitative mechanics

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Research highlights

- Artificial intelligence method using qualitative data for collision accident analysis.
- Reasoning method to estimate the changes in movements caused by the collision.
- Verification using vehicle crash tests and various collision accident cases.
- Prediction and avoidance of collision accidents for autonomous driving.

ABSTRACT

In this paper, a method for vehicle collision analysis based on qualitative mechanics is presented. In collisions where accurate quantitative information is difficult to gather, this analytic method can act as a useful complement. Based on qualitative dynamic theories, reasonings of various factors including qualitative vector, collision behavior, translational and rotational motion are suggested. Using the law of momentum conservation within the frame of rigid-body dynamics, vehicle collision analyses based on this qualitative reasoning were developed into an accident analysis tool. This newly developed qualitative collision analysis tool was verified using 45 cases of vehicle-to-vehicle collision test data, and its practicality was proved by performing analyses of various vehicle collision accidents.

Keywords: Qualitative mechanics, Collision accidents, Reconstruction analysis, Rigid-body impact, Qualitative spatial reasoning, Artificial intelligence