1. Impacts of situational urgency on drivers' collision avoidance behaviors

Accession number: 20163002642802
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Source title: Tongji Daxue Xuebao/Journal of Tongji University
Abbreviated source title: Tongji Daxue Xuebao
Volume: 44
Issue: 6
Issue date: June 1, 2016
Publication year: 2016
Pages: 876-883
Language: Chinese
ISSN: 0253374X
CODEN: TTHPDJ
Document type: Journal article (JA)
Publisher: Science Press
Abstract: Using the high fidelity Tongji University driving simulator with 8 degrees of freedom, this study examined impacts of situational urgency on drivers' collision avoidance behaviors. By combining different initial headways (<1.0 s, [1.0 s, 1.5 s), [1.5 s, 2.5 s]) and different lead vehicle deceleration rates (0.30g, 0.50g, 0.75g), rear-end collision scenarios with different levels of situational urgency were established. Drivers' perception response times (PRT), throttle release response times, throttle to brake transition times, brake delays, maximum brake pedal pressures and peak decelerations were compared across different levels of situational urgency. Results show: (1)At higher situational urgency, drivers release the accelerator faster, and brake to maximum more quickly and forcefully; (2)PRT was near 1.2 s when the initial headway was round 1.5 s, but PRT increased dramatically when initial headways were larger than 2.5 s, and could even reach 3 s; (3)Transition time between throttle release and brake initiation is about 0.8 s and is not affected by situational urgency; (4)At lower situational urgency, multi-stage braking behavior leads to longer delay from brake initiation to full braking.
Number of references: 17
Main heading: Brakes
Controlled terms: Automobile simulators - Behavioral research - Collision avoidance - Crashworthiness - Degrees of freedom (mechanics) - Sensory perception
Uncontrolled terms: Braking behavior - Driving simulator - High-fidelity - Lead vehicles - Rear-end collisions - Situational urgency - Tongji university - Transition time
Classification code: 461.4 Ergonomics and Human Factors Engineering - 602 Mechanical Drives and Transmissions - 662 Automobiles and Smaller Vehicles - 914.1 Accidents and Accident Prevention - 931.1 Mechanics
Numerical data indexing: Mass 3.00e-04kg, Mass 5.00e-04kg, Mass 7.50e-04kg, Time 1.20e+00s, Time 1.50e+00s, Time 2.50e+00s, Time 8.00e-01s
DOI: 10.11908/j.issn.0253-374x.2016.06.009
Database: Compendex

Data Provider: Engineering Village