



ADAS & 사고분석



차량의 계기판 게이지가 운행 상태로 정지된 원인의 사례 분석

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Analysis of the Cause for a Vehicle's Instrument Cluster Gauges Being Stuck in an Operational State

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Key Words : Accident investigation(사고조사), Instrument Cluster(계기판), Worm Gear Gauge(웜기어식 게이지), Power Interruption(전원 차단), Accident Reconstruction(사고 재구성)

ABSTRACT

The vehicle's Instrument Cluster is an essential safety system that provides the driver with real-time information on critical operating conditions such as speed, engine revolutions per minute (RPM), and fuel levels, ensuring safe and efficient driving. This study focuses on the gauge freezing phenomenon—specifically involving Worm Gear Type gauges—that occurs during a vehicular accident, and conducts a focused Root Cause Analysis of the electrical failures that allow the vehicle's state at the moment of impact to be deduced.

The analog needles driven by the Worm Gear Type mechanism become mechanically stuck (frozen) in their last position when the main power supply to the instrument cluster module is abruptly cut off. This power interruption is primarily caused by physical impact (accident) resulting in the severance of power supply wires or the blowing of a protective fuse. The instant power is lost, the stepper motor controlling the gauge needle loses all electrical control, locking the needle at the reading corresponding to the exact operational state just prior to the power loss. The core contribution of this analysis is the finding that this gauge freezing reliably indicates the precise moment of electrical disconnection during a collision. Consequently, the value displayed on the frozen gauge provides a direct basis for estimating the vehicle's state (speed, RPM, etc.) immediately preceding or at the moment of the accident. This interpretation is expected to serve as objective and effective evidence in future traffic accident investigations, aiding in the accurate accident reconstruction by decoding the vehicle's operational status at the time of impact.

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실사고 자료 기반의 AEB 시뮬레이션에 관한 연구

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AEB Investigation Research Based on Real Vehicle Collision Data

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Key Words : AEB(자동긴급제동), CDR(충돌자료기록장치), EDR(사고기록장치), Real Vehicle Collision(실사고), Safety Performance(안전 성능)

ABSTRACT

This study analyzes fatal accidents related to AEB reported in NHTSA accident investigations. Using accidents with CDR/EDR speed records as a reference, the initial speed, braking initiation, and collision speed were considered. The vehicle's pre-crash motion was reconstructed with an advanced automobile simulation program, and a basic AEB algorithm (warning-partial braking-full braking) was applied. The initial speed and collision speed were compared, and the concept of CCRs lateral overlap was additionally analyzed. Driving simulations were conducted under conditions of 100% and approximately 10% overlap by modifying vehicle sensor inputs, and the detection/response timing, collision occurrence, and variations in collision speed were compared. Based on publicly available accident data, the accident conditions were simplified, and changes in sensor settings and road conditions were applied to analyze the resulting vehicle safety performance. By reproducing real-world crash accidents and evaluating vehicle crash avoidance performance, this study proposes an analytical research methodology for autonomous driving technologies.

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다양한 ADAS 카메라 센서 아키텍처에 대한 KADAS 호환성 연구

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A Study on KADAS Compatibility with Diverse ADAS Camera Sensor Architectures

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Key Words : ADAS(첨단 운전자 보조시스템), KADAS(한국형 자율주행차 검사 시스템), Compatibility(호환성), Mono Camera(모노카메라), Stereo Camera(스테레오 카메라)

ABSTRACT

This study investigates the compatibility of the KADAS(Korea Automated Driving Vehicle Assessment System) - Based Vehicle in the Loop Simulation(VILS) environment with diverse ADAS Camera sensor architectures. Specifically, it analyzes the functional performance of Advanced Driver Assistance Systems(ADAS) for Vehicle A, equipped with a mono-camera system, and Vehicle B, utilizing a Stereo/Dual-camera system. The findings reveal that Vehicle A demonstrated high success rates in Adaptive Cruise Control(ACC) and Autonomous Emergency Braking(AEB) functions. In contrast, Vehicle B exhibited Severe performance degradation in the same VILS environment. This degradation is attributed to the VILS environment's inherent limitations in supporting the depth perception mechanisms of stereo/dual cameras and the conservative nature of their sensor fusion logic. This research underscores the critical need for improving ADAS evaluation technologies within VILS environments to accommodate various sensor architectures, thereby contributing essential foundational data for standardized ADAS performance assessment.

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국내 페달 오조작 사고 특성 분석에 관한 연구

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A Study on the Characteristics of Pedal Misapplication Accidents in Korea

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Key Words : Pedal Misapplication(페달오조작), Advanced Driver Assistance Systems(첨단운전보조장치)

ABSTRACT

In recent years, a growing number of sudden unintended acceleration cases—such as the recent incident at Seoul City Hall—have raised public concern. According to investigations conducted by the National Forensic Service and the Korea Automobile Testing & Research Institute, most of these incidents were found to result from pedal misapplication rather than mechanical failure. This study aims to analyze the current status and characteristics of pedal misapplication accidents occurring in South Korea. To this end, accident data reported to a domestic insurance company over the past five years (January 1, 2019 – June 30, 2024) were examined using text analysis techniques. The results show that an average of 2,008 pedal misapplication accidents occur annually. These accidents frequently take place in situations requiring alternating use of the accelerator and brake pedals, particularly during parking or exiting maneuvers, which account for 48.0% of all cases. Notably, approximately one in four pedal misapplication accidents involved elderly drivers aged 65 or older—a rate about 1.5 times higher than their share of overall traffic accidents. Therefore, the findings highlight the urgent need to promote advanced driver assistance systems (ADAS) to help prevent pedal misapplication among elderly drivers.

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CCTV 영상 기반 차량 추적과 Gaussian Splatting 기반 3D 재구성을 활용한 교통사고 분석 지원 시스템

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Traffic Accident Analysis Support System Using CCTV-Based Vehicle Tracking and Gaussian Splatting 3D Reconstruction

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Key Words : Traffic accident analysis(교통사고 분석), Gaussian Splatting(가우시안 스플래팅), Point Cloud Visualization(포인트 클라우드 시각화), CCTV footage(CCTV 영상), Opencv csrt tracker(OpenCV CSRT 추적기)

ABSTRACT

The growing adoption of autonomous driving technology underscores the need for prompt and accurate determination of accident causes and responsibilities to ensure social and legal credibility. To address this, we propose a traffic accident analysis support system that leverages CCTV footage to selectively track target vehicles and reconstruct accident scenes into three-dimensional point clouds from two-dimensional images. The system employs an OpenCV-based CSRT tracker with BackgroundSubtractorMOG2 to extract target trajectories while suppressing non-target vehicles through background composition. A COLMAP-based 3D reconstruction module with scale correction and Gaussian Splatting further enhances visual realism and spatial accuracy. Experimental results demonstrate that the proposed approach improves the reliability and efficiency of accident investigations. Future integration with deep learning-based tracking and real-time 3D reconstruction is expected to establish a more advanced framework for accident analysis in the autonomous driving era.

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차량용 영상기록장치의 이미지 품질 결정 요소

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Factors Determining Image Quality in Digital Video Recording Systems

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Key Words : Digital video recording systems(디지털영상기록장치), Image Performance(이미지성능), Image Quality(이미지품질)

ABSTRACT

In-vehicle video recorders are increasingly used not only for accident evidence collection but also for driver assistance systems (ADAS) and general vehicle management. The performance of such devices is evaluated less by storage capacity or hardware specifications than by the quality of the recorded images.

This study categorizes the determinants of image quality into IP (Image Performance) factors and IQ (Image Quality) factors.

IP factors refer to objectively measurable indicators such as resolution, signal-to-noise ratio (SNR), and dynamic range, which directly affect the fidelity of image reproduction under various driving conditions, including day/night and low-light environments. IQ factors, on the other hand, reflect perceptual attributes such as color reproduction, sharpness, and distortion minimization, thereby contributing to the reliability of accident scene reconstruction and user satisfaction. Through experimental case studies, this work confirms that IP and IQ factors function in a complementary manner, and that a balanced enhancement of both is essential to improving the overall quality of video recorders. These findings are expected to support the establishment of performance evaluation criteria for automotive video recorders and, in the longer term, indirectly contribute to the reliability of driver assistance and safety-related functions.

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