



교통사고의 법공학적 분석



ACU 스왑을 통한 급발진 주장 사고에서의 EDR 신뢰성 확인

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Experimental Verification on the Effect of Preventing Sudden Acceleration Accidents Due to EPB Operation

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Key Words : EDR(Event Data Recorder), Sudden Acceleration Accidents, ACU(Airbag Control Unit) Swap

ABSTRACT

국과수 자체 통계에서 해마다 급발진 사고는 증가하는 추세를 보이고 있다. 그동안 국과수에서 급발진 주장 사고를 감정해온 방법을 보면 사고차량만 감정하던 시절부터 CCTV 영상, 블랙박스, EDR이 순차적으로 보급됨에 따라 급발진 주장 사고를 감정하는 방법도 순차적으로 변화해오고 있다. CCTV 영상에서 제동등이 소등 상태인 것, 블랙박스 영상에서 엔진 음향을 분석하여 제동 페달을 밟았을 때 나오는 엔진음의 변화가 보이지 않는 것, EDR에서 제동페달을 밟지 않고 가속페달을 밟은 것으로 기록된 것을 근거로 감정관은 급발진 주장 사고가 운전자의 페달 착각에 의해 발생한 것을 말해 줄 수 있다. 이 중 EDR의 경우 2000년대 초 중반 대중에게 널리 알려지기 시작하며 현재까지 급발진 외 기타 사고해석에도 많은 도움이 되는 기록임에도 불구하고 몇몇 인터넷 상 유명인을 필두로 일부 대중들은 여전히 EDR의 신뢰성에 대해 근거 없는 반론을 제기하기도 한다. 따라서 국과수 교통과에서는 급발진 주장 사고 중 사고차량의 운행이 가능한 건에 대해 EDR을 기록하는 ACU를 신품 ACU로 스왑(교체)하여 차량의 주행 상태를 가감없이 기록하는지 확인하여 사고당시 EDR 기록의 신뢰성을 확인하는 과정을 거쳤다. 이 과정은 에어백 전개에 관련된 부품에 전개 전 정상 저항 범위에 해당하는 저항을 장착하여 에어백 관련 고장 코드가 발생하지 않게 하고, 신품 ACU 교체 후 베리언트 코딩, 그 외 진단기, 테베소프트 사의 DAQ 장비를 이용하여 차량운행을 기록 후 ACU에 기록된 EDR과 비교 검증하는 과정을 거쳤다. 그 결과 ACU에 기록된 EDR은 사고차량의 주행 상태를 가감없이 기록한 것으로 확인되어 앞으로 급발진 주장 사고에서 차량 운행이 가능한 경우 해당 방법을 통해 EDR의 신뢰성을 입증하여 급발진 주장 사고 감정에 활용할 수 있을 것으로 예상된다.

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경사로에서 주행 기어 상태 정차로 인한 사고 사례

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Accident Case Resulting from Stopping in Drive Gear on Incline

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Key Words : Accident case, Gear shifting(변속), Driver mistake(운전자 실수), Vehicle Safety(차량 안전)

ABSTRACT

This study aims to investigate accidents resulting from parking in the Drive Gear on inclines. It seeks to explore how the act of stopping a vehicle with the transmission engaged in the Drive Gear on an incline can lead to accidents due to driver negligence. Analyzing such accident cases could provide guidelines for safe driving on inclines to vehicle drivers and may also contribute to research directions focusing on driver negligence and vehicle safety. This case study intends to examine the characteristics and sequence of accidents caused by parking in the Drive Gear, thereby offering a deeper understanding of safety measures for accident prevention. Furthermore, considering the technical aspects of the vehicle's braking and transmission systems, the study aims to propose recommendations to minimize accidents resulting from parking in the Drive Gear.

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차량에 형성된 흔적을 통한 가속페달 오조작 사례 분석

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Analysis of Cases of Accelerator Pedal Operation Mistakes Based on the Traces Formed on the Vehicle

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Key Words : Traffic accident(교통사고), Shoe pterns(신발 문양), Sudden unintended acceleration(급가속), Accident investigation(사고조사), Accelerator pedal(가속페달)

ABSTRACT

The vehicle accidents are caused by various causes such as human factors(carelessness of vehicle drivers etc.), vehicle defects(braking system defects etc.) and environmental factors. It is required to identify whether the accident is caused by careless of the driver or vehicle defect because of the legal responsibility of the driver.

Therefore, in order to determine the exact cause of the traffic accident, trace inspection formed on the vehicle, inspection using diagnostic equipment, vehicle blackbox images inspection, and vehicle electronic equipment inspection method are used.

Among them, traces formed on the vehicle include traces of shoe patterns formed on the vehicle's accelerator pedal, traces of deformation of the brake pedal structure due to strong external force and traces formed on the driver's shoes.

This trace inspection method can help prove whether the driver mistakenly pressed the accelerator pedal in a traffic accident. If a similar case occurs in the future, it is thought to it can be used to determine the cause of the accident.

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EPB 작동에 따른 급발진 사고 방지 효과에 대한 실험적 검증

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Experimental Verification on the Effect of Preventing Sudden Acceleration Accidents Due to EPB Operation

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Key Words : EPB(Electronic Parking Brake System), Sudden Acceleration Accidents, Brake Override System(BOS),

ABSTRACT

We verified the effects that operation of EPB(Electrical Parking Brake System) preventing sudden acceleration accidents, experimentally. For this work, we checked the change in deceleration of the vehicle by fully activating the EPB or repeatedly activating and deactivating it while driving at high speeds of 100 km/h or more for Hyundai Motor Company's IONIQ electric vehicle, which has recently suffered a number of suspected sudden acceleration accidents.

In addition, we monitored the operation of the EPB, changes in the instrument panel, brake pedal effort, vehicle speed, and deceleration, and recorded all experimental procedures.

Based on this, we also considered other ways to slow down the vehicle, including activating the EPB as a way to deal with unintentional acceleration in a driving situation.

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브레이크 챔버의 다이어프램 파열로 인한 사고 사례

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Cases of Accidents Caused by Rupture of the Diaphragm in the Brake Chamber

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Key Words : Air Brack(공기 브레이크), Brake Chamber(브레이크 챔버), Diaphragm(다이어프램)

ABSTRACT

There was an accident that a chartered bus was pushed down a hill in Tongyeong-si, impacting other vehicles and street trees behind it. In a black box video, it was observed that the bus's brake lights were turned on, and a record of the brake pedal being operated was also verified on the digital tachograph. Because the right-rear brake chamber of the bus was damaged due to the impact of the accident, normal inspection could not be performed. However, fatigue cracks had progressed along the circumferential direction of the diaphragm and some penetration was also observed. It was estimated that the accident occurred due to reduced braking power which was caused by compressed air leaks.

In a similar case, there was an accident in Yeosu-si, where a cargo truck hit pedestrians and vehicles. During the brake inspection of the cargo truck, a defect was identified that was causing compressed air to leak from the brake chamber. By disassembling the brake chamber, it was observed that the diaphragm was ruptured.

If compressed air leaks from the brake chamber and the brake pedal is continuously operated, excessive consumption of compressed air can lead to a decrease in overall braking power. Since accident involving large vehicles often lead in serious casualties, it is important to prevent accidents through inspections and maintenance.

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