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# 수동안전 1



## 대시보드 LED 조명을 이용한 운전자 위기 상황 주의 향상

강혜란\* · 김나현\*\* · 이찬수\*\*\*

### Improving Driver's Attention in Emergency Situation Using Dashboard LED Lighting

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**Key Words** : Driving safety(주행안전성), LED lighting(LED 조명), Attention level(주의 수준)

#### ABSTRACT

Driver's attention is crucial in preventing accidents. It is important to improve drivers' attention in dangerous situations like collisions. We installed LED ambient line lighting on the edge of the dashboard to draw attention in dangerous situations. We implemented car-to-car risk scenarios, such as Euro NCAP's front turn across path, cut-in, cut-out, using a simulation program to investigate the effect of dashboard lighting on driving safety. For each scenario, the intensity, chromaticity, position and dynamics of the dashboard LED lighting were varied and evaluate the participants' reactions in the emergency situation in addition to questionnaire survey. An eye tracker was also utilized to identify the areas on which participants primarily focused during the experiment. Based on the experimental results, we propose a guideline for designing dashboard LED lighting to improve attention according to driving situations, which may have implications for the development of safer driving systems.

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## 자율주행자동차 편이자세 승객의 거동 연구

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### Study for the Reclined Occupant Behavior of Autonomous Vehicle

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Kyungjin Kim\*\*\*, Hyung-Jin Chang\*\*\*\*, Siwoo Kim\*\*\*\*\*

**Key Words :** Occupant behavior(승객 거동), Reclined posture(편이 자세), Frontal impact simulation(정면 충돌 해석), Autonomous vehicle(자율주행 자동차)

#### ABSTRACT

The kinematic response of reclined occupants in frontal sled tests were evaluated to define biofidelity targets for various surrogates and to describe the biomechanical response of reclined postures in frontal impacts. The frontal impact sled simulations were performed and results and conclusion provide the conceptual framework to evaluate autonomous vehicle crashworthiness. They showed the kinematic and injury results motivated the development of injury criteria for the lumbar spine and pelvis and comprehensive understanding to predicted diverseness of occupant posture.

#### 후기

본 연구는 ‘자율주행기술개발혁신사업, 주행 및 충돌상황 대응 안전성 평가기술 개발’의 연구결과로서 국토교통부와 국토교통과학기술진흥원의 지원 하에 수행되었으며, 이에 관계자 여러분께 감사드립니다.

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## 시트 장착 승객 구속 에어백의 충돌 보호 성능 연구

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### A Study of the Collision Protection Performance of Seat-Mounted Occupant Restraint Airbags

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**Key Words** : Autonomous vehicles(자율주행차), New airbag(신기술 에어백), Protection performance(보호 성능)

#### ABSTRACT

Recently, a development of autonomous vehicle has been carried out actively, and the vehicle interior is expected to change a lot compared to conventional one. For example, change of steering-wheel position, ultra-slim cockpit, B-pillarless design, etc. are applied. Therefore, it is obvious that conventional airbag could not be installed directly to new vehicle interior. In addition, to provide various seating postures to passengers, seating posture also become various such as leaned, swivel, and face-to-face. In case of the vehicle seat, the seat position can be in coincidence with passenger position regardless of the interior changes. Therefore, it is obvious that the airbag can protect and restraint passenger more effectively and efficiently when installed inside the seats. In this study, we developed a new airbag that is mounted on both sides of the seat and can protect passengers in several collision modes. It can protect a passenger for both the side/frontal collision and normal/leaned posture. Also, the protection performance was verified through a series of frontal/side SLED tests. It was proven that the protection performance of normal seating is similar that of the conventional airbag, and the protection performance is improved in leaned seating.

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## 전기자동차 전용 시트의 개념 모델 연구

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### Conceptual Seat Model Study for Electric Vehicle

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Kyungjin Kim\*\*\*

**Key Words :** Seat foam(시트 폼), Comfort(안락감), Seat frame(시트 프레임), Structural analysis(구조해석), Topology optimization(위상 최적화), Electric vehicle(전기자동차)

#### ABSTRACT

In the development of new type of electric vehicle, interest in the interior parts of vehicle is to become more significant in terms of the occupant safety and comfort. This study proposed an optimal design of driver seat according to the design requirements for frame stiffness. Although the strength and stiffness analyses were performed to evaluate the seat frame structure, topology optimization was carried out based on the experimental and computational results and the derived optimal model and baseline seat design was updated. The conceptual seat design for the electric vehicle in this study showed that the model development process is appropriate for the seat design parameters.

#### 후기

본 연구는 ‘대구경북 지역혁신플랫폼 미래차전환부품사업단 [미래차 R&D 콜라보] 세부연구과제, 디지털트윈 기술을 적용한 전기자동차 전용 시트모델 개념설계 연구’의 연구결과로서 대구경북 지역혁신플랫폼 미래차전환부품사업단의 지원 하에 수행되었으며, 이에 관계자 여러분께 감사드립니다.

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### Development of Relaxed Seat Occupant Protection Passenger Airbag

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**Key Words** : Relaxed seat(릴렉스 시트), Passenger airbag(동승석 에어백), SLED test(슬레드 테스트), Variable depth cushion(가변 딥스 쿠션),

#### ABSTRACT

Most vehicle manufacturers are adopting indoor relaxation seats as an interior concept for the future self-driving era. This not only helps the driver relax comfortably by laying down the seat backrest angle when he/she does not need to drive to his/her destination but also helps passengers who do not need to drive rest or relax in the vehicle. However, this seating position increases the risk of injury or even death of passengers in a car accident because vehicle manufacturers basically design safety devices according to laws or commercial conditions based on general seats required by each country when designing safety devices. Therefore, we developed a variable depth cushion airbag that can adjust the cushion volume by a Tether Release Unit (TRU) to protect these relaxation passengers in this study. In addition, to verify the passenger protection performance of these new concept airbags, the test was conducted following the USNCAP 35mile front and the North American regulation 25mile unbelted procedures. Depending on the conditions, the seat-mounted Belt In Seat (BIS) belt was used, and PKAB (Passenger Knee Airbag) and seat cushion airbags were also added for lower body restraint.

As a result, it was confirmed that the same performance was secured in the normal seating state and the relaxed seating improved by 15% in the head and 30% in the neck compared to the existing mass-production cushion. In addition, the 5% Unbelted regulation test confirmed the results of 50% head and 10% neck improvement.

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