
포스터 발표



전남 개조전기차 규제자유특구에 따른 구조 해석의 활용

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Structural safety analysis according to Jeonnam Modified Electric Vehicles Regulation Free Zone

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Key Words : Regulation free zone(규제자유특구), Modified electric vehicles(개조전기차), Electric vehicle(전기차), Structural analysis(구조해석), CAE(컴퓨터 이용 공학), Finite element analysis(유한요소해석)

ABSTRACT

A modified electric vehicle refers to an environmentally friendly technology that converts old internal combustion engine vehicles into electric vehicles by removing the internal combustion engine components and installing electric vehicle components. As carbon neutrality and environmental issues have become more prominent, there is an increasing interest in electric vehicles, and the need for research and development of modified electric vehicles is gaining attention. However, in Korea, there are regulations on the production and road driving of modified electric vehicles due to the lack of safety standards for modified electric vehicle driving, which has hindered their production and research and development. The Jeollanam-do Free Regulation Zone for Modified Electric Vehicles allows for the application of exemptions from regulations within the designated area, allowing for verification of the safety of modified electric vehicle driving and the establishment of safety standards through actual driving. This study aims to analyze the structural safety of converted electric vehicles based on finite element analysis during the production process, considering changes in vehicle weight. The research and development process for converted electric vehicles using finite element analysis includes analyzing the changes in load distribution on the vehicle frame due to the change in vehicle weight by inputting it into a 3D mesh model. Based on the resulting structural analysis data, an expected lifespan analysis of vulnerable areas and a design proposal for reinforcement are provided. Through this series of structural analysis processes, the structural safety of converted electric vehicles can be verified, based on the data obtained from the weight change analysis, which can be helpful for promoting the design and production of converted electric vehicles through analysis.

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좌회전 대 맞은편 직진 충돌을 고려한 차대 차 충돌 시뮬레이션

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Car-to-Car Simulation Considering LTAP/OD Crashes

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Key Words : LTAP/OD(좌회전 대 맞은편 직진), Crash simulation(충돌 시뮬레이션), Dummy behavior(터미 거동)

ABSTRACT

In this study, LTAP/OD (Left Turn Across Path/Opposite Direction) crash conditions during intersection driving are analyzed to derive boundary conditions for crash simulation, and then head and neck injuries are analyzed using crash simulation. Using the traffic accident database published by the National highway traffic safety Administration, the crash speed and LTAP/OD accident angle at the intersection are derived. Driving simulation is performed to derive the collision point in case of intersection LTAP/OD crash using driving path and vehicle contact section data. A car-to-car crash simulation model is constructed with the crash point, crash speed, angle, and six types of crash analysis. Based on the simulation results, a more dangerous case is selected, and an additional crash simulation is calculated with the driver and passenger dummies. The risk in this boundary condition is evaluated by analyzing the simulation result data for the neck of the dummy.

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머신러닝을 활용한 차세대 차량 고장진단 기술

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Next-Generation Vehicle Fault Diagnosis Technology Using Machine Learning

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Key Words : Machine learning(머신러닝), Fault diagnosis(고장진단), Classification algorithm(분류 알고리즘)

ABSTRACT

In various fields of machinery, machine defects are directly related to user safety and can cause physical and social losses. Therefore, various studies are being conducted to diagnose faults and failures. Recently, a technology has been developed that uses sensors to measure temperature, pressure, voltage, and sound in real-time to predict the remaining life and potential failure of mechanical devices. In this process, machine learning technology is applied to extract the characteristics of a normal state from real-time data and identify an abnormal state when other types of data are input. To achieve this, a classification algorithm capable of distinguishing between normal and abnormal data is used. Internal combustion engines and electric vehicles consist of various systems, such as power and braking systems, and numerous devices are used to configure each system. Therefore, next-generation fault diagnosis technology can be applied using machine learning based on the vibration and sound data of the vehicle. This study introduces the algorithm used for vehicle fault diagnosis and the algorithm learning process.

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모의충돌시험(sled)을 활용한 좌석 착좌 위치에 따른 인체 더미의 거동에 관한 연구

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A Study on the Behavior of Human Dummy According to Seating Position Using Simulated Crash Test(sled)

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Key Words : Test(모의 충돌 시험), Seat belt(좌석 안전띠), Seat(좌석), Dummy(인체모형), UN-ECE Regulation No.16 (유럽 안전 기준 16번), TEMA-pro(이미지분석시스템)

ABSTRACT

There are various safety devices that can protect passengers in an automobile accident. Among them, the seat belt is one of the most important safety devices to protect passengers. Depending on whether seat belts are worn correctly, it can affect the rate of injury or death in a traffic accident, and depending on the front/rear and side accidents, important body organs such as the head, neck, and chest can be seriously affected. In addition to whether seatbelts are worn or not, the position in which the passenger sits in the seat is also a major factor influencing the injury value.

In this study, the driver's (passenger's) seating position was separated by 0, 20, 40 and 60 mm between the human dummy and the seat back according to four conditions, and a dynamic load was applied that conformed to the UN-ECE Regulation No.16 standard. The movement tracking of the human dummy head and the movement distance of the chest and pelvis are to be measured. Through this test, it is possible to analyze the human body behavior according to the seating position of the driver (passenger).

In addition, based on the test results, it is judged that it can be used as research data for optimizing the activation time of the airbag, another safety device that alleviates impact.

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소형 전기자동차에 적용 가능한 파워트레인에 관한 연구

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A Study on Power-Train for Small Electric Vehicles

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Young-il Kim**, Byeongrae Son*

Key Words : Small electric vehicle(소형 전기자동차), Power-train(파워 트레인), Optimization(최적화), Small motor(소형 전동기), Independent suspension(독립식 현가장치)

ABSTRACT

최근 4차 산업혁명 시대와 탄소 중립의 시대가 가속화 진행되면서 전동기 기반의 화물, 승합, 승용 및 이륜 자동차 등 다양한 분야에 적용이 되어 이목이 점점 집중되고 있다. 현재 국내의 자동차 판매 시장에서 전동기 기반 자동차 판매 비율은 약 15% 정도를 차지하고 있다. 이 중 고전원 전기장치가 적용된 자동차는 충전 인프라나 고가의 구매 비용 등으로 구매 부담이 발생하여, 구매 비용 부분에서 부담이 다소 적고 이동 및 임시 정차 등이 편리한 장점이 있는 소형 전기자동차에 관심이 높아지고 있다. 그러나 소형 전기자동차의 여러 장점에 비해 고전원을 사용하지 않고서는 보통 60V 이하의 전원을 사용하기 때문에 출력이 제한적이며, 이로 인해 고속 주행이 가능한 도로에는 진입이 어려운 실정이다. 또한, 소형 전기자동차 제작기업들은 대부분 원가절감을 목적으로 일체형 차축 방식을 많이 적용함에 따라, 노면이 고르지 않은 길에서는 주행 승차감이 좋지 않다.

본 연구에서는 소형 전기자동차의 단점들을 보완하고자 80KW급의 높은 소형 전동기 적용, 감속기의 소형화 및 독립형 차축을 적용한 소형 전기자동차용 파워트레인에 대한 최적화 연구를 진행하였다. 전동기는 유사한 출력의 타사 모터 대비 5~10kg 가량 가벼운 특징을 가지는 Axial flux 방식의 고효율 AC모터를 적용하였다. 감속기는 전동기 스펙에 따라 2단 감속을 사용하여 모터 축과 구동축의 거리를 최소화하였으며, LSD 모듈을 적용한 독립형 차축으로 고하중이나 불안정한 노면에서 우수한 승차감을 발휘할 것으로 예상된다.

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3D Lidar기반 긴급상황인지 능력 개선 알고리즘 개발

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Development of 3D Lidar-Based Emergency Cognitive Improvement Algorithm

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Tae-Koo Kang**

Key Words : Autonomous driving(자율주행), Emergency stop(긴급정지), Lidar(라이다), Braking test(제동시험), Mobile platform(모바일 플랫폼), School zone(어린이보호구역), Dynamic event(동적 이벤트), Static event(정적 이벤트), Steering(조향)

ABSTRACT

In the process of implementing autonomous driving, we are using a LIDAR in front of us. In this paper, based on the ERP-42 platform, the LIDAR sensor is used while utilizing both 3D LIDAR and 2D LIDAR, and the recognition speed by LIDAR type for dynamic obstacles and static obstacles is included. As awareness of school zones has increased, we conducted intensive research on which type of LIDAR can quickly respond to children who may become dynamic obstacles. Based on the results, the sensor placement and algorithms on the autonomous driving platform can be strengthened to ensure safety against long fuel stops during autonomous driving.

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단조/주조 경량 휠의 내구 안전성에 관한 연구

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A Study on the Durability of Forged/Casting Light Wheels

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Key Words : Automobile wheel(자동차 휠), Casting(주조), Forging(단조), Durability(내구성), Fatigue(피로)

ABSTRACT

Electric cars are heavier than engine cars because of their battery weight. Therefore, research on weight reduction of parts. However, weight reduction can affect the durability safety of parts. Therefore, in order to reduce weight, it is necessary to increase the mechanical properties of the product. For this reason, the application of forged parts is being considered. In this paper, the durability safety evaluation was conducted according to the difference between the casting and forging methods using the uniaxial/multi-axial durability test of the wheel.

후기

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소비자 관점에서의 튜닝부품 스테빌라이저 평가 항목 선정에 관한 연구

박성현* · 손상우** · 이다연** · 정명식***

A Study on the Selection of Evaluation Items for Stabilizer Tuning Parts from a Consumer Perspective

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Key Words : Stabilizer(스테빌라이저), Anti-roll bar(안티롤바), Damping force(부싱), Bending strength(강성), Durability test(내구시험), Price(가격), Weight(중량)

ABSTRACT

The Stabilizer Stiffness Test is a procedure that measures a vehicle's roll behavior and its ability to prevent suspension from shifting to the left and right sides. Generally, the stiffness of the stabilizer is proportional to the cross-sectional diameter of the stabilizer bar. Therefore, increasing the cross-sectional diameter increases stiffness. However, when the diameter is increased, the weight of the stabilizer also increases. This means that rigidity and weight have opposite properties. Consequently, a non-rigidity test is conducted to evaluate stiffness characteristics relative to weight.

To establish the evaluation method, various domestic and foreign test standards were consulted. In particular, this paper cites JASO C617:2002 and the Automotive Tuning Parts Certification Criteria as important sources of concepts and methods.

This paper presents test methods and standards that enable consumers to directly compare and evaluate five criteria: component self-certification, durability, performance, weight, and price. This will contribute to the activation of a safe tuning culture.

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실차 시험용 필드로봇 헨가장치 기구 설계 및 주행 안정성 해석

박명연* · 김도현* · 정재일**

The Design of the Suspension Mechanism and the Analysis of Driving Stability for a Field Robot Used in Driving Tests

Myungyeun Park*, Dohyun Kim*, Jayil Jeong**

Key Words : Simulation(시뮬레이션), Field robot(필드 로봇), Driving tests(실차 시험), Vehicle(자동차)

ABSTRACT

In this study, we designed a suspension mechanism for a field robot to be used in driving tests and conducted a comparative analysis of reactive force and stroke based on the shape of the robot. The mechanism was designed with a height that the test vehicle can pass over, and we used two designs, one with a single rocker link and one with two rocker links connected in series, to confirm the power transmission of the rocker link. We fixed the length of the swing arm, the stiffness of the shock absorber, and the damping coefficient to calculate the reactive force according to the stroke length caused by contact between the ground and the wheel, and selected the load condition of each pivot point and the necessary reactive force of the mechanism as the objective function for optimal design. We analyzed the influence of the pivot point length variation on the objective function and conducted optimal design using experimental design methods. Based on the pivot points derived from the optimal design of the suspension mechanism, we evaluated the stability of the field robot movement, comparing the ground clearance change that occurs when the field robot drives on a road with unevenness based on the ground clearance in the neutral state of the suspension mechanism.

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New IIHS 측면 시험에 대한 연구

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Study on New IIHS Side Test

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Key Words : IIHS(미국 고속도로 안전 보험 협회), ATD(인체모형 형상의 시험 장치), EuroSID(유럽형 측면 충돌 인체 모형), SID IIs(소형 측면 충돌 인체모형)

ABSTRACT

The IIHS launched its first side test program in 2003. At that time, the federal government was already conducting side tests on new passenger vehicles as part of its New Car Assessment Program. However, the IIHS was concerned that the government tests did not fully capture the types of crashes that might occur in the real world. Because the height of the front end of the barrier was lower than the head of the crash test dummy, the federal tests did not assess the risk of head injury from impacts with taller vehicles. To fill this gap, they began their own tests with a different barrier that had the height and shape of the front end of a typical SUV or pickup truck at the time. In 2021, the IIHS revamped the test with harsher crashes and more realistic crash barriers. The new barriers are closer to the weight of today's SUVs, and the damage patterns that occur during a crash more accurately mimic the damage that can occur in an SUV crash than the old barriers. The barrier is closer to the ground and shorter than the old IIHS barrier, but still higher than the NHTSA barrier.

This paper introduces the new IIHS side crash tests that have been in place since 2021 and shows the results of each test. The results of the old and new IIHS tests are analyzed and expressed as a percentage of the general injury standard to indicate the severity scale of each test.

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차량의 자율주행을 위한 액추에이터 기반 제어 시스템 개발

신호영*** · 조영웅*** · 서유찬*** · 정유진*** · 김동환*** · 윤광훈*** · 신상훈** · 손병래*

The Development of Control System Based on Actuator for Vehicle's Autonomous Driving

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Key Words : Manual driving mode(수동 주행모드), Autonomous driving mode(자동 주행모드), Control actuators(제어 액추에이터), Autonomous(자율주행), Safety control system(안전제어 시스템)

ABSTRACT

자율주행 기술을 연구하고 개발하는 과정에 있어 자율주행 모드와 수동으로 주행하는 모드 전환은 빈번히 발생하며 특히 사람이 탑승하여 실험하는 경우 안전에도 큰 영향을 미칠 수 있다. 실제 차량의 경우에는 액셀 및 브레이크의 제어 값을 통신으로 대체함으로써 자율주행과 수동주행 모드 사이에 원활한 전환을 할 수 있다. 하지만 통신 프로토콜이 제공되지 않거나 통신 프로토콜이 없는 차량에는 적용할 수 없다. 이러한 차량을 제어하기 위해서는 모터를 이용하여 가감속 페달에 연결된 시스템을 사용하게 된다. 주행 중 위급상황이 발생하면 일반적으로 운전자는 브레이크 페달을 제어하여 감속을 시도한다. 하지만 가감속 페달에 모터가 직결된 경우 모터의 토크 값에 따라 운전자가 해당 페달을 제어하는 것은 불가능해 안전성이 낮아진다.

본 연구는 자율주행과 수동주행 모드에서 상호 변환이 가능하여 안전성 향상과 원활한 제어가 가능한 액추에이터 기반 제어 시스템을 구현하였다. 본 제어 시스템은 자율 주행모드 상태에서는 가변저항을 활용해 모터를 제어함으로써 차량의 정밀한 움직임을 구현하였고, 수동 제어의 경우 액추에이터와 페달 사이 연결부에 특수 제작한 베어링을 장착함으로써 액추에이터에 토크가 걸린 상태에서도 페달의 수동제어가 가능하도록 설계하였다. 긴급 상황이 발생하더라도 운전자가 페달을 조작해 주행 모드를 신속히 변경함으로써 높은 주행 안정성을 확보하고 차량의 오동작으로 인한 사고를 방지하는 이중 안전장치의 역할도 수행한다. 제안한 제어 시스템은 통신프로토콜이 제공되지 않는 차량과 통신 프로토콜이 없는 차량에도 활발한 연구 활동이 가능할 것으로 예상된다. 또한 향후 자율주행 분야가 확대될 것으로 예상되는 “2023 대학생 장차자동차 경진대회”에서 기존에 참여하던 대학생들의 자율주행 부문 진입 장벽을 낮추고 활발한 연구 활동을 촉진할 것으로 기대된다.

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국내 교차로에서 I-ADAS 장착 차량의 LTAP/OD 사고 예측 시뮬레이션

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Simulation of Accident Prediction for Domestic LTAP/OD at Intersections with I-ADAS Equipped Vehicles

Yunsik Shin*, Jayil Jeong**·†

Key Words : Accident reconstruction(사고재구성), Autonomous emergency braking(긴급자동제동), Urban area(도심 지역), I-ADAS(교차로 운전자 지원 시스템)

ABSTRACT

This study aims to predict potential accidents that may occur when applying I-ADAS to vehicles using AEB (Automatic Emergency Braking System) among the ADAS functions at intersections, based on actual traffic accidents in Korea. The simulation used a vehicle that detects surrounding vehicles without driver intervention and activates AEB when it is likely that a collision will occur at an intersection. First, 150 head-on collision accidents that occurred in Korea were classified and analyzed. Among the intersection accidents, the most frequently occurring accidents were LTAP/OD accidents, with a total of 75 accidents. Accident reconstruction was performed for these 75 accidents using a vehicle equipped with I-ADAS, and two AEB algorithms were applied during simulation. The first AEB algorithm detects and recognizes target vehicles within 200m on the same lane as the ego vehicle during driving. For this type of vehicle, accidents occurred in 21 out of the 75 intersection accidents, and 54 accidents were prevented. The second AEB algorithm was applied with a sensor angle of 130 degrees and a maximum distance of 50m, and in this case, only two accidents remained out of the 75 intersection accidents, and all other accidents were prevented.

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원심주조 공법 적용 자동차 휠 내구특성 연구

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A Study on the Durability Characteristics of Automobile Wheel Using Centrifugal Casting

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Key Words : Automobile wheel(자동차 휠), Centrifugal casting(원심주조), Centrifugal force(원심력), Durability test(내구시험), Mold(금형), Molten metal(용탕)

ABSTRACT

Centrifugal casting is a method of filling aluminum molten metal into a mold using centrifugal force of equipment. It is important that the molten metal is filled into the mold before solidifying. There is an advantage that the rim part of wheel is denser than the existing wheel manufacturing methods. In this study, the wheel durability is improved by increasing the motor capacity to increase the effectiveness of centrifugal casting. Automobile wheels manufactured with improved processes were evaluated according to durability test standards. The process improvement effect was verified through a review of the durability and impact performance of wheels.

후기

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EV 아키텍처를 위한 전·후륜 브레이크의 모듈러 설계 개발에 관한 연구

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A Study on Development of Modular Design of Front and Rear Brake for Architecture of Electric Vehicle

J. H. Shim*, U. H. Shin**, S. R. Hwang*, J. H. Lee*, W. S. Yim*, Y. J. Woo**

Key Words : Modular design(모듈러 설계), Brake architecture(제동 아키텍처), Regenerative braking(회생 제동), Hydraulic braking(유압 제동), Electric efficiency mode(전비 모드)

ABSTRACT

There are recently two major issues in automobile industry. One is modular design for vehicle architecture and the other is development of electric vehicle instead of existing internal combustion engine vehicle. First, many vehicle manufacturers like Europe and Japan have adopted the methodology of modular design in order to develop vehicles effectively. Also, they have achieved many good results such as productivity and profitability through it. Second, they are really trying to develop electric vehicle to get the high market share against a variety of environmental regulations. In this paper, new brake architecture is proposed in order to respond to such a situation. To do this, physical interfaces for brake parts are established, for example, interfaces between brake system like caliper, disc and other counter-parts. And then, we analyze effective factors of brake system for electric vehicles which are reflecting vehicle specifications. Finally, we suggest architecture of brake system which is optimized for electric vehicles.

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고에너지 밀도 리튬이온 배터리 모듈의 내부저항 편차가 열적 성능에 미치는 영향

유수호* · 이기수**

Effects of Internal Resistance Deviation on Thermal Performance of High Energy Density Lithium-Ion Battery Module

Suho Yu*, Geesoo Lee**

Key Words : Battery module(배터리 모듈), Internal resistance(내부저항), Thermal performance(열적 성능), CFD (전산유체역학)

ABSTRACT

A number of lithium-ion battery cells (LIBs) are composed of the battery modules for urban air mobility (UAM) that are capable of high discharge of 8 C-rate and have over 300 Wh/kg high energy density. A battery module configured with multiple battery cells inevitably has an internal resistance deviation between cells, and in particular, the UAM battery module uses large-capacity cells, so the internal resistance deviation between cells is relatively large. Since the amount of heat generated varies depending on the internal resistance, different heating characteristics affect the output power between cells. This result causes a degradation in the output power of the entire battery module, and thus research is needed to determine the effect of the internal resistance deviation between cells on the exothermic characteristics for stable battery thermal management. This study used a 90 Ah pouch type lithium-ion battery of the HMC series. The maximum charging voltage is 4.2V and the cut-off voltage is 2.5V. Considering the electrical characteristics of the entire module, two semi-modules consisting of two cells were connected in series to form a total of 4S. Between the two battery cells in the semi-module, an insulation pad for preventing fire transition and buffering due to volume change was mounted and fixed with an external aluminum case. The deviation of the internal resistance of the prototype sample of the LIB was set to a maximum of 1 m Ω , and the welding resistance between the tabs was also considered. A commercial CFD code of AVL FireM was used. Considering the operating environment of UAM for semi-battery modules, the temperature deviation between cells was analyzed according to the change in battery discharge conditions and -23°C~40°C.

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소프트웨어 안전성 향상을 위한 제안: 코딩 표준과 코드 생성

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A Suggestion to Improve Software Safety: Coding Standards and Code Generations

Kangwon Lee*, Donghun Shin**, Manbok Park***

Key Words : Safety(안전), Software(소프트웨어), Coding standard(코딩표준), Code generation(코드생성), Rust, C/C++

ABSTRACT

As cities and cars are becoming smarter, critical software must work safely and securely in all levels. C/C++ language, flexible and capable of generating highly efficient binary code, is widely used, especially in the low level software, closely working with sensors and actuators, thus interacting with systems outside of the computer. However, in some rare cases, C/C++ code is known to show undefined behavior; hence many developers in the industry applies coding standards such as MISRA-C or CERT-C to improve software safety and security. Also to deal with relatively stiff learning curve of hardware level C/C++ code, automatic code generation is also gaining its ground.

This work aims to review the current measures and/or practices to improve software safety & security and propose possible additional measure to further improvement. Also, a newer programming language named Rust will be reviewed in the perspective of software safety & security.

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보행자 AEBS 사고 재현 시뮬레이션 기반 구축에 관한 연구

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A Study on the Establishment of a Simulation-Based Platform for Reconstructing of Pedestrian AEBS Accidents

Sehwan Lee*, Sangwoo Kim*, Hyunggi Park*, Jaehyeong Lee**, Jonghyuk Kim**, Jihun Choi***, Woojeong Jeon****

Key Words : Autonomous driving(자율주행), ADAS(첨단운전자지원시스템), AEB(긴급제동장치), Traffic accident analysis(교통사고 분석), Driving simulator(주행 시뮬레이터), EuroNCAP AEB Test

ABSTRACT

Recently, the obligation to protect pedestrians has been strengthened in the road traffic law due to frequent pedestrian accidents. According to the statistics of the Korea Road Traffic Authority, there were 46,682 accidents in 2019, 36,601 accidents in 2020, and 35,665 accidents in 2021. Although the number of pedestrian accidents is decreasing every year, there are still many accidents occurring. In 2021 alone, 1,018 pedestrians died in traffic accidents. Existing pedestrian accident analysis has mainly focused on the fault of drivers, but with the increasing distribution of ADAS-equipped vehicles and the mandatory installation of AEBS, it is expected that the analysis will require additional factors such as the normal operation of AEBS, accident avoidance possibility when AEBS is in operation and analysis of the causes of malfunction.

Therefore, this study aims to establish a simulation-based platform that can scientifically analyze the various aspects of AEBS when pedestrian accidents occur in ADAS-equipped vehicles. Real-world experiments were conducted on the recently released Ioniq5 vehicles, using EuroNCap's VRU(Vulnerable Road User) test scenarios as a basis. Based on the data obtained from the real-world experiments, the simulation logic for the operation of the pedestrian AEBS was developed using PreScan and Matlab/Simulink, demonstrating the feasibility of accident reproduction through simulation. In the future, it is expected that the accurate analysis of pedestrian accidents will be possible by establishing a database of the operating and limiting characteristics of pedestrian AEBS for various types of vehicles and improving the simulation logic.

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튜닝부품 소음기 성능 품질 비교를 위한 평가항목 선정

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Selection of Evaluation Items for Comparison of Tuning Muffler Parts Performance and Quality

Juho Lee*, Byeongtae Lee**, Taehee Lee***

Key Words : Muffler(소음기), Maximum power(최대 출력), Maximum RPM(최대 회전수), Accelerated noise(가속소음), Exhaust Noise(배기소음), ISO 362(ISO 362 가속주행소음)

ABSTRACT

This study is designed to draw test method to assess the performance of the tuning mufflers and aim of providing information. As a device for reducing noise due to expansion as high temperature and high pressure exhaust gas generated by the engine, mufflers evaluate a method of measuring noise (Accelerated noise & Exhaust noise) due to expansion, the maximum power, and salt spray test. For the test method of the relevant test, refer to the ISO 362 method for measuring accelerated driving noise and the regulations on test inspection and procedures for manufactured vehicles [Attachment 18] (related to Article 6). This provides data on the performance of the tuning muffler objectively by this tests, allowing consumers to present information that is close to their needs.

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퍼스널 모빌리티 차량 및 보행자 교통사고 시 사후컴퓨터단층촬영을 이용한 조사체계 구축의 중요성

이희영* · 이강현* · 김희정* · 공준석* · 강찬영* · 최두루* · 추연일* · 유진호* · 육현*

The Importance of Establishing an Investigation System Using Post-Mortem Computed Tomography in Personal Mobility Vehicle and Pedestrian Traffic Accidents

Hee Young Lee*, Kang Hyun Lee*, Hee Jung Kim*, Joon Seok Kong*, Chan Young Kang*,
Doo Ruh Choi*, Yeon Il Choi*, Jin Ho Yoo*, Hyun Youk*

Key Words : Motor vehicle crashes(교통사고), Minor crashes(경미사고), Prediction model(예측모형)

ABSTRACT

가해자에 대한 정보를 파악하기 힘든 대부분의 교통약자에 대한 사망사고는 응급실 내원 시 사망자의 과거병력, 가족이나 수사관의 진술 등의 제한적 정보에만 의존하여 사인에 대한 의견을 제시하는 경향이 있어 실제 교통사고의 인체상해기전을 파악하는데 어려움이 있다. 고전적인 수동키펠드나 자전거, 이륜차 등의 사고는 꾸준히 있어 왔고 다소 줄어가는 상황이지만 전동키펠드와 같은 퍼스널 모빌리티(Personal Mobility, PM)의 보급이 급증하고 배달서비스에 많이 이용되면서 PM 관련 교통사고는 2017년 117건에서 2021년 1,735건으로 10배 이상 늘었고, PM 사고로 발생한 사망자 수는 2021년 19명으로 2020년 10명보다 두 배 가량 증가하고 있다. 이렇게 차량 관련 데이터베이스를 각 지역마다 구축하고 정책제안, 차량 안전도 보강 등을 위한 다양한 데이터베이스 분석이 이루어져 전체 교통사고 사망자는 감소하고 있으나 보행자 사고 비율 증가, PM 관련 사고 비율 증가, 이륜차 관련 사고 증가가 관찰되고 있지만 정책적 예방대책, 안전대책, 관련 법체계, 안전장치에 관한 연구 및 논의는 제자리에 머물고 있다. 퍼스널 모빌리티 탑승자 및 보행자 사고 후 응급실 도착전 사망(DOA)으로 내원하거나 손상부위를 정확히 확인하기 전에 사망 시 사후컴퓨터단층촬영(Postmortem CT)을 통해 이전에는 조사되지 않던 중증 사망 환자의 인체상해 자료를 자세히 조사하고 퍼스널 모빌리티 탑승자 및 보행자 사고에 대해 실사고 조사체계를 구축하여 최종적으로 퍼스널 모빌리티 이용자, 보행자 관련 교통사고에서 인체상해 기전 분석을 위한 데이터베이스를 구축을 하고자 한다.

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튜닝부품 서스펜션 성능 품질 비교를 위한 평가항목 선정

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Selection of Evaluation Items for Comparison of Tuning Suspension Parts Performance and Quality

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Key Words : Shock absorber(쇼크업소버), Damping force(감쇠력), Bending strength(굽힘강도), Temperature characteristics(온도특성), Durability test(내구시험), Price(가격), Weight(중량)

ABSTRACT

The purpose of this study is to derive suitable test items to evaluate the performance and quality of suspension for tuning. In particular, we focused on the shock absorber, which performs an important function in the suspension system. The shock absorber reduces vibration of the vehicle, maintain tire contact with the road surface, and connects the vehicle body and the wheels. In this study, considering the function of the suspension, we proposed methods for measuring the damping force according to temperature and damping valve settings, damping efficiency at high temperature, bending yield strength, durability test, and measuring price and weight. In order to establish this evaluation method, various domestic and foreign test standards were referred. In particular, concepts and methods from RS R 0019, KS R 4060, Automotive Tuning Parts Certification Criteria, and ASTM D6272-17 were cited. By using the evaluation items derived from this study, the performance and quality of tuning suspension can be compared to provide information to consumers, contributing to the activation of a safe healthy tuning culture.

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튜닝용 전기차 모터 성능 안전성 검증에 대한 고찰

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A Study on the Performance Stability Verification of Electric Vehicle Motor for Tuning

Hyeonwook Jung*, Jeeho Lee**

Key Words : Electric vehicle tuning motor(전기차 튜닝용 모터), Motor output test(모터 출력 시험), Motor rotation test(모터 회전수 시험)

ABSTRACT

The automotive industry, which was centered around internal combustion engines, is facing a rapid paradigm shift through the convergence with various industries such as electric/electronics and software. As the transition to a carbon-neutral society is demanded, the demand for electric vehicles continues to increase, and there is a growing demand for eco-friendly tuning of existing vehicles, not just for the supply of new electric vehicles. The process of tuning internal combustion vehicles into electric vehicles requires the installation of a power-based drive system and a high-voltage battery system, and it requires strong demands for component/vehicle safety and reliability as they need to be controlled safely. This paper conducted a safety evaluation of the drive motors for tuning electric vehicles, as small and medium-sized enterprises lack the means and capabilities to develop the performance, safety, and reliability of the powertrain. The test evaluated the maximum output, maximum 30-minute output, partial output, and rotational speed of the motors to be installed in the converted electric vehicles using a motor dynamometer and power analyzer. A total of three motors were tested, with an output of one 40 kW-class motor, one 81.4 kW-class motor, and one 150 kW-class motor, respectively. Each motor satisfied all the test evaluation criteria, and no abnormalities were found in the tested motors. The motors tested in this paper were tested for pre-conversion performance checks in the development stage of converting internal combustion vehicles into electric vehicles. If the motors are installed with other components in the future and converted into electric vehicles, an evaluation of the performance, safety, and reliability of the powertrain in real vehicle conditions will be necessary.

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Development of Suspension System Design Technology to Improve Steering Safety of Ultra-Small Mobility Platform

KyuKwon Choi*, HeungShik Lee**, SungYong Ha***

ABSTRACT

Developed and developed vehicle dynamics-based vehicle modeling to improve the steering safety of the micro mobility platform. 2-post rig was attempted through full car configuration and kinematic behavior analysis through 4 post analysis bench, and based on this, a 3D model was created for the vehicle, and the target dynamics analysis proceeded. Select design variables derived from sensitivity evaluation and propose an optimal design plan. It was proposed, but the upper part of the existing spring damper bracket was removed and the size of the front module was reduced through the optimization design for the front module according to the module condition using 3D software, and the spring damper was optimized by installing a small size. Stress analysis using easy flex was performed using the 2-post rig of the simulation based on the location of the strain gauge in the lower arm durability test, and an unevenness of about 3 mm was installed on an arbitrary straight road to confirm the stress generating area during driving. In addition, the spring simulation for each damper 1 and 4 was optimized for each of the 9 hard points in the 4 post simulation after the 2 post.

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Simulator Study on the Elderly Driving Performance at Non-Square Intersection During Night Driving

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Key Words : Driving simulator(운전시뮬레이터), Elderly drivers(고령운전자), Non-square intersection(비직각 교차로), Night driving(야간운전)

ABSTRACT

The driving simulator(MDS) test was conducted on 30 elderly people over 65 years old and 10 non-aged people recruited through the Senior Welfare Center. When turning non-square intersections during night driving, the failure rate of elderly drivers was 31.1%, which was about three times higher than that of non-elderly people(10.0%). When entering the main line after turning, there was a high possibility of invading the center line due to reverse driving.

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유한요소법을 이용한 비공기압 타이어의 젖은 노면 견인력 해석

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Wet Traction Analysis of Non-Pneumatic Tire Using Finite Element Method

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Kyoung Moon Jeong***

Key Words : Wet traction(젖은 노면 견인력), Non-pneumatic tire(비공기압 타이어), Finite element method(유한요소법), Solid-fluid coupling (고체-유체 연성)

ABSTRACT

In general, non-pneumatic tires are required to perform the same function and performance as pneumatic tires. Among various driving performance factors, traction performance through tire-road friction is one of the important performance factors. Driving on wet road surfaces increase the risk of accidents as the frictional force of the tire decreases compared to driving on dry road surfaces. Therefore, the validity of the analysis results was verified by comparing the results of the non-pneumatic tire model and the pneumatic tire model in the analysis of wet traction performance. The finite element model was designed with pneumatic tires and non-pneumatic tires to which three patterns of block shape were applied. The wet traction analysis utilized a solver capable of analyzing structural, material flow, and solid-fluid coupling in a single analysis environment. The analysis results were compared and analyzed by calculating the driving direction force, vertical force, and coefficient of friction.

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