포스터 발표

실차 기반 V2X 통신 데이터 정확도 평가 시스템 설계

김유원* · 조병찬**

Design of the Vehicle-level V2X Communication Data Accuracy Evaluation System

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Key Words : V2X(차량사물통신), V2X In-Vehicle System(V2X 단말기), BSM(기본안전메시지), NCAP(자동차안전도평가), Autonomous Vehicle(자율주행자동차), Safety Regulation(안전기준), Connected-Car System(커넥티드카 시스템)

ABSTRACT

In this paper, We propose the design of Vehicle-level V2X Communication Data Accuracy Evaluation System for vehicle V2X communication performance safety evaluation. V2X communication is very important in a convergence level 4+ autonomous driving and connected car environment. It is necessary to evaluate V2X communication safety of vehicles equipped V2X In-Vehicle System, and one of them is V2X communication data accuracy evaluation. A vehicle-level V2X communication data accuracy evaluation requires that the evaluation system have to not interfaced with test vehicle and V2X In-Vehicle System installed in the test vehicle. Therefore, V2X communication data accuracy evaluation is baed on data that can be independently measured by the evaluation system. The data used for evaluation includes latitude and longitude, altitude, heading, acceleration, yaw angular velocity, and other elements. For this purpose, We have been designed V2X communication data accuracy evaluation system hardware and software tools, evaluation procedures, and etc. We plan to implement the vehicle-based V2X communication data accuracy assessment system based on this design and conduct vehicle-based experiment.

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Prescan 시뮬레이션을 통한 YOLO 알고리즘 성능 평가

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Performance Evaluation of YOLO Algorithm through Prescan Simulation

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Key Words : ADAS(첨단운전자지원시스템), AEB(자동 긴급 제동 장치), YOLO(딥러닝 기반 객체 탐지 알고리즘), Object Detection(객체 탐지), Prescan(차량 시뮬레이션 프로그램)

ABSTRACT

The Autonomous Emergency Braking (AEB) system, a key safety system among Advanced Driver Assistance System (ADAS) technologies, detects the risk of collision with objects ahead using sensor fusion between radar and camera sensors or solely with camera sensors. It activates the braking system to avoid or mitigate collisions. The object detection algorithm of the camera sensor plays a crucial role in implementing such a function. Among object detection algorithms, YOLO (You Only Look Once) is notable. Unlike the Two-Stage Detectors like R-CNN (Regions with Convolutional Neural Network) and Faster R-CNN, which sequentially proceed through region proposal and object classification, YOLO, a One-Stage Detector, performs both steps simultaneously, offering speed advantages over Two-Stage Detectors. Since the inception of YOLOv1 in 2016, continuous improvements have been made in object detection speed and accuracy, culminating in the development of YOLOv9 by 2024. While MATLAB natively supports YOLOv4, this study applied a pretrained YOLOv8 model to compare the impact of YOLOv4 and five sub-versions of YOLOv8 (n, s, m, l, x) on object detection performance in AEB simulations. The pedestrian-targeted AEB system, implemented in MATLAB/Simulink, utilized Siemens' Prescan simulation program to evaluate the performance of various YOLO algorithm versions. The study was conducted based on the EuroNCAP's CPNA75 scenario, with a pedestrian speed of 5 km/h, a vehicle speed of 40 km/h, and an initial longitudinal distance of 80 m between the vehicle and pedestrian. Key performance indicators included the distance between the vehicle and pedestrian at the initial recognition of the pedestrian in Prescan and the execution time of the AEB simulation. The comparison between YOLOv4 and YOLOv8 demonstrated that YOLOv8 generally outperformed YOLOv4 in both execution time and recognition distance. The plan is to conduct reproduction simulations for various accident scenarios in an AEB simulation environment where the YOLOv8 algorithm is applied in the future.

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UN Regulation No.151 BSIS 동적테스트 구현을 위한 시험 조건 제안

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Proposal of Test Conditions for Implemetation of UN Regulation No.151 BSIS Dynamic Test

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Key Words : UN regulation(유럽 법규), Blind Spot Information System(측후방사각지대), Blind Spot(사각지대), Field Test(실차평가), Proving Ground(시험장)

ABSTRACT

The UN Regulation No.151 BSIS(Blind Spot Information System) will be enforced on July, 2022, and be enforced to for their new registration on July 7, 2024. This Regulation is a safety regulation to improve accident prevention and safety of commercial vehicles such as M2, M3, N2, and N3. This function provides a collision risk warning to the driver about Cyclist in the blind spot in right-side turning situations of the vehicle. This regulation contains test procedures for dynamic test. However, dynamic test specifies test conditions for a point during the test, and the evaluation time is long, so the positional relationship may not be clear due to accumulated errors when evaluating under these conditions. Therefore, in this paper, we add initial conditions between the target system and the VUT and propose a theoretical equation for the initial conditions.

본 논문은 산업통상자원부와 한국산업기술진흥원이 지원하는 CAV기반 미래모빌리티 자율주행 평가플랫폼 구축 사업 (과제번호 : P0025186, 과제명 : CAV기반 난제적인 도로 주행 상황 재현 평가를 위한 기업지원 기반 구축)의 지원을 받아 수행한 연구임.

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V2I 교차로에서의 직진-직진 상황 시 자동긴급제동장치 모델 간 충돌 회피 및 감속 성능 비교

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Comparison of Automatic Emergency Braking System Model Performance at V2I Intersections in Straight Crossing Path Scenario

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Key Words : Intersection(교차로), Automatic Emergency Braking(자동긴급제동장치), V2I(차량 대 인프라)

ABSTRACT

In this study, we compared the collision avoidance performance and speed reduction capabilities of two different Autonomous Emergency Braking (AEB) algorithms in a flat intersection with a Vehicle-to-Infrastructure (V2I) system, specifically in a Straight Crossing Path scenario as defined by the EURO NCAP's AEB C2C Test Protocol. Collisions were simulated at speeds ranging from 10 to 70 km/h in increments of 10 km/h. The Vehicle Under Test (VUT) was a 2017 Mercedes E-Class, and the Ghost Vehicle Target (GVT) was a 2012 Volkswagen Beetle.A square V2I communication area with each side measuring 300 meters was established around the traffic light pole at the lower-left corner of the intersection. Within this area, the position and speed of the GVT were shared with the VUT through V2I communication when both vehicles were present. Two AEB models were used in the simulations, 1)A Path Prediction AEB model that utilized physics-based Constant Velocity and Constant Turn Rate Velocity models to forecast the paths of the VUT and GVT three seconds into the future. If these paths were predicted to intersect, the AEB would activate, 2) An NHTSA AEB model that calculated the Braking Distance based on the relative distance, relative speed, and maximum deceleration between the VUT and GVT. The AEB would activate if the actual distance fell below the calculated Braking Distance.The study compared the relative distance, relative speed, and occurrence of collisions when the AEB was activated. Additionally, it compared the speeds of each vehicle at the time of collision. Finally, it proposed factors in the V2I intersection scenario that could help prevent accidents using these two AEB algorithms.

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불리한 주행 환경에서 카메라 인식 성능 개선 연구

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Research on the Improvement of Camera Awareness Performance in Unfavorable Driving Condition

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Key Words : Driving condition(주행상황), Camera detection(카메라 인식), Sensor improvement(센서 성능 향상)

ABSTRACT

Sel.f-driving cars are driven in various environments, among which performance restrictions may occur due to unfavorable environments. This paper describes a technology for calibrating images by applying Lab color space to camera images taken under unfavorable environmental conditions. Through the application of the technology, the safety of the driver may be guaranteed by improving camera detection performance in unfavorable driving condition.

자율주행차의 경우 다양한 환경에서 주행이 이루어지며, 그중 불리한 환경으로 인한 성능의 제한이 발생할 수 있다. 본 논문은 불리한 환경 조건에서 촬영된 카메라 영상을 Lab 컬러스페이스를 적용하여 영상을 보정하는 기술에 대해 기술한다. 해당 기술 적용을 통해 불리한 주행 환경에서 카메라 인식 성능을 개선하여 운전자의 안전을 보장할 수 있다.

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충돌시 IDC 제어 모듈 기록 항목 비교 분석

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Comparative Analysis of IDC Control Module Record Data List of Crash

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Key Words : Advanced driver system(첨단 운전자 시스템), Crash data retrieval(충돌 데이터 추출기), Data storage for automated driving(자율주행데이터저장시스템), Event data recorder(사고기록장치)

ABSTRACT

Currently, automated vehicle technology is developing rapidly. Therefore, Level 3 automated vehicles are being prepared for commercialization both domestically and abroad. Additionally, international discussions are ongoing regarding standardization to clearly analyze responsibility and determine the cause of accidents in the event of automated vehicle accidents.

At present, Mercedes-Benz vehicles equipped with Level 3 DRIVE PILOT have recorded up to 5 events triggered by Stage 1 or Stage 2 triggers. These vehicles are fitted with an Intelligent Drive Controller (IDC) capable of storing sensor data related to vehicle operation during automated driving.

In this study, list of the items from the vehicle's IDC control module (Advanced Driver System) was analyzed using a CDR tool Help file. Furthermore, the list was analyzed based on the Department of Motor Vehicles' automated vehicle accident statistics on matters that need to be further supplemented to reveal the responsible party and cause of the accident.

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브레이크 저더 저감을 위한 디스크 비마찰면의 코닝 저감 요인 분석에 관한 연구

심재훈* · 황세라* · 전갑배* · 공창섭**

A Study on Analysis of Conning Reduction Factors on the Non-Friction Surface of Disc to Reduce Brake Judder

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Key Words : Judder vibration(저더 진동), Coning(코닝), Robust Design(강건설계), Non-friction Surface(비마찰면)

ABSTRACT

Braking judder vibration caused by thermal deformation of disc has been a major problem in brake system for a long time and many researchers have analyzed its mechanisms and developed solutions. However, judder vibration still occurs due to harsher vehicle driving conditions like increased power of EV(Electric Vehicle) and various environmental characteristics. In particular, in the case of eco-friendly vehicles such as EV, it is predicted that judder vibration will become a bigger problem due to the quiet driving condition compared to ICE(Internal Combustion Engine) vehicles. In addition, existing studies on judder vibration has been focused on the capacity and thermal deformation of the braking friction surface. So, the influence analysis of thermal deformation on the non-friction surface of the brake disc is relatively insufficient. In this study, we attempt to secure braking characteristics that are insensitive to thermal deformation in terms of the non-friction surface of the disc, focusing on the coning characteristic that occurs during braking thermal deformation. For this purpose, various factors of the non-friction surface of the disc are analyzed using robust design and the design standard for the robustness of the brake disc against judder vibration is proposed through the research results.

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요 각속도 피드백 및 계수 추정 기법을 이용하는 요 안정화를 위한 적응형 후륜 제어 알고리즘 개발

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Development of an Adaptive Rear Wheel Control Algorithm of Vehicle for Yaw Stabilization Based on Yaw Rate Feedback and Coefficient Estimation

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Key Words : Yaw stabilization(요 안정화), Rear wheel control(후륜 제어), Yaw rate feedback(요 각속도 피드백), Coefficient estimation(계수 추정), Recursive least squares(순환 최소 자승)

ABSTRACT

This study proposes an adaptive rear wheel control algorithm of vehicle for yaw stabilization based on yaw rate feedback and coefficient estimation. Rear wheel steering system has been widely used and applied to improve vehicle handling performance and advance steering mode. Also, the rear wheel steering system can be used for vehicle safety control such as yaw stabilization. In this study, rear wheel control algorithm has been proposed based on coefficient estimation with yaw rate feedback. The first order yaw dynamic equation that consists of unknown coefficient and wheel angles has been used. The coefficient has been estimated real-time using recursive least squares(RLS) method with multiple forgetting factors. The estimated coefficients from the RLS have been used to compute the rear wheel steering control input based on the Lyapunov direct method. In order for yaw stabilization of vehicle, the desired yaw rate has been designed using the current yaw rate and proportional constant that has value less than one. The proportional constant used to design the desired yaw rate can be the value between 0 and 1. In the current research step, the proportional constant has been designed as a fixed value for yaw stabilization performance evaluation. The rear wheel control algorithm proposed in this study was designed in Matlab/Simulink environment and the CarMaker software was used for reasonable performance evaluation of the rear wheel control algorithm. It is expected that the proposed rear wheel control algorithm with coefficient estimation can be used as a rear wheel control algorithm for yaw stabilization of vehicle when the vehicle is in unstable condition.

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자율주행 모빌리티의 결합 동적 모델을 이용하는 시스템 파라미터 독립 적응 조향 제어 알고리즘 개발

라한별* · 정준호** · 오광석***

Development of a System Parameter-Free Adaptive Steering Control Algorithm for Autonomous Mobility Using Coupled Dynamic Model

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Key Words : Autonomous mobility(자율주행 모빌리티), System parameter-free(시스템 파라미터 독립), Steering control(조향 제어), Coupled dynamic model(결합 동적 모델), Path tracking(경로 추종)

ABSTRACT

This study describes a system parameter-free adaptive steering control algorithm for autonomous mobility using coupled dynamic model. Various model-based control algorithms for path tracking of autonomous mobility require relatively accurate mathematical model and system parameters such as geometric and dynamic parameters. The system parameters of mobility may be changed by environment or system condition changes. Because of its change characteristics, derivation of accurate parameter values or real-time estimation algorithms is needed to secure reasonable control performance. In order to overcome the mentioned limitation, coupled dynamic model that consists of control errors and inputs has been designed and real-time coefficient estimation algorithm has been designed using recursive least squares with multiple forgetting. The coefficients in the coupled dynamic model is designed to be estimated by using control errors and inputs. The estimated coefficients are used to derive steering control inputs. The cost function has been designed using control errors and the Lyapunov direct method has been used to derive front and rear steering control inputs for path tracking. The proposed path tracking control algorithm was designed in Matlab/Simulink environment and the CarMaker software was used for reasonable performance evaluation of the control algorithm. The evaluation results showed the reasonable path tracking and it is expected that the proposed control algorithm can be used as a universal path tracking algorithm that does not need system parameters for various autonomous mobility platforms.

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다중차량 횡방향 동기화 주행 제어 전략

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Multi-Vehicle Lateral Synchronized Driving Control Strategy

Hyeon-kyu Yu*, Baek-soon Kwon**

Key Words : Bicycle model(자전거 모델), Synchronized driving(동기화 주행), Ackermann steering(애커만 조향), Kinematic model(운동학적 모델), Master-Slave Control(마스터 슬레이브 제어)

ABSTRACT

Large cargo handled at ports or airports varies in size and shape, so it is subject to spatial constraints to transport them in only one vehicle. In this paper, we present a synchronized driving control strategy for two vehicles to increase the degree of freedom of transportation of cargo. The two autonomous vehicles proposed in this study are linked in the lateral direction to safely transport one large cargo. The main idea is to keep the distance between loading points constant, i.e., to regard the whole system as a single rigid body. This can be achieved from the kinematic conditions of general planar motion of a rigid body. The overall synchronization control algorithm consists of two parts. The first part determines the vehicle speed and steering angle required for both vehicles to have the same instantaneous rotation center in Ackermann steering mechanism. However, since it is impossible to achieve the required speed and steering angle at every moment, additional steering and acceleration control are determined to reduce the position errors between the vehicles in the second part. The two vehicles form a master-slave relationship to generate a trajectory of a virtual vehicle with a constant lateral offset from the master vehicle, which the slave vehicle tracks. The proposed control algorithm has been validated through computer simulation studies. This study focuses on the synchronization of two vehicles, but it can be extended to multiple vehicles.

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실차 실험을 통한 보행자 대상 AEB의 TTC선도 역설계에 관한 연구

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A Study on the Reverse Engineering of TTC Contours for Pedestrian Target AEB through Real-World Testing

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Key Words : Reverse Engineering(역설계), VRU(보행자), AEB(긴급제동장치). FCW(전방충돌경고). TTC(충돌소요시간)

ABSTRACT

As a mandatory automobile safety policy, AEB devices have been mandated for all vehicles released in Korea from July 1, 2022. Because actual vehicle testing requires a lot of time and money, there are limitations in checking AEB operating characteristics every time a new vehicle is released. Thus, this study aimed to analyze the AEB operation characteristics according to the type of vehicle and to reverse-engineer the corresponding TTC(Time to Collision) diagram for each type. The experimental vehicles selected were recently launched the 2023 Grandeur and the 2024 SantaFe. Based on previous research findings, where EuroNCAP's CPNA(Car to Pedestrian Nearside Adult) and CPFA(Car to Pedestrian Farside Adult) AEB operation characteristics were found to be symmetrical, the experiment was limited to the CPNA scenario. AEB operation characteristics were analyzed focusing on FCW(Forward Collision Warning), AEB partial braking, and full braking TTC. The TTC for AEB partial braking and full braking showed mutual similarity regardless of the vehicle type and increased proportionally with the vehicle's speed. FCW TTC was similar up to a vehicle speed of 30 kph. however, it was observed that the Grandeur had relatively smaller TTC values compared to the SantaFe thereafter. Moreover, it was noted that FCW TTC increased as the pedestrian's speed decreased and as the collision point moved from CPNA 25% to 75%. Accordingly, using Matlab/Simulink's Look-up Table and Akima Spline, AEB partial braking and full braking TTC were reverse-engineered into a 2-dimensional diagram, while FCW TTC was reverse-engineered into a 3-dimensional diagram for each vehicle. It is expected that through this study, the number of experiments required to understand the AEB operation characteristics for each vehicle can gradually be reduced. Additionally, continuous research is planned for the application of collision risk prediction models related to FCW TTC in reverse-engineering methods in the future.

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A Study on the Development of an Emergency Pneumatic Supply Device Based on Brake Pedal Simulator for Brake-by-Wire Systems

Kyu Hwan Lee*, Dong Keon Lee**, Hyun Tek Lim**, Jae Chang Kuk***, Sung Wook Lee****

Key Words : Emergency Braking(비상 제동), Pneumatic Supply Device(공압 공급 장치), Brake Pedal Simulator(제동 페달 시뮬레이터), Brake-by-Wire Systems(브레이크 바이 와이어 시스템)

ABSTRACT

This study presents the development and evaluation of an innovative emergency pneumatic supply device designed to enhance the safety of brake-by-wire (BBW) systems. BBW systems rely on electronic signals to control braking, offering potential benefits in terms of efficiency and performance. However, a critical challenge associated with BBW systems is the possibility of complete system failure, leaving vehicles without a reliable braking mechanism.

The study explores two key aspects: hardware design and software logic development. The hardware design focuses on creating a robust structure that can effectively introduce pneumatic motion into the existing hydraulic braking system. In parallel, the research team developed sophisticated software logic specifically tailored for emergency stopping scenarios. This software logic dictates the operation of the emergency pneumatic supply device, ensuring timely activation and precise control of the compressed air pressure during critical situations.

To assess the effectiveness of the proposed solution, the study employed computer simulations. These simulations analyzed the generated braking pressure exerted by the emergency pneumatic system and the resulting deceleration of the vehicle. Through this simulation-based evaluation, the researchers were able to determine the feasibility of achieving sufficient braking force for safe emergency stops.

The findings of this study demonstrate the promising potential of integrating pneumatic assistance into existing hydraulic brake systems. The successful development of this emergency pneumatic braking system paves the way for further research and implementation, contributing to enhanced vehicle safety on the road.

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ADAS 차량의 사고 분석을 위한 차량 및 보행자 타겟 통합 AEB 시뮬레이션에 관한 연구

이민환* · 윤재열* · 이재형** · 김종혁*** · 최지훈*** · 전우정****

A Study on Integrated Vehicle and Pedestrian Target AEB Simulation for Accident Analysis of ADAS Vehicles

Minhwan Lee*, Jaeyeol Yoon*, Jaehyeong Lee**, Jonghyuk Kim***, Jihun Choi***, Woojeong Jeon****

Key Words : ADAS(첨단운전자지원시스템), AEB(긴급제동장치), C2C(차대차), CPNA, CPFA(보행자시나리오), LRR(장거리 레이다), MRR(중거리 레이다), TTC(충돌시간), GNN(추적알고리즘), MIO(가장 중요한 객체)

ABSTRACT

The National Highway Traffic Safety Administration (NHTSA) in the U.S. mandated the installation of Autonomous Emergency Braking (AEB) systems in all new vehicles starting May 31, 2023, following South Korea's earlier mandate on July 1, 2022. While AEB functionality is primarily designed and tested based on specific predefined scenarios (C2C, CPNA, CPFA, etc.) within national safety assessment systems, real-world road environments present diverse accident situations beyond these scenarios.

This study focused on developing a unified AEB simulation logic to address diverse traffic accident scenarios, especially those involving both vehicles and pedestrians in the frontal zone. Using Siemens' Prescan for ADAS simulation, the research integrated a sensor fusion approach combining cameras and radars (Long Range Radar - LRR, Mid Range Radar - MRR). The camera, equipped with the YOLOv8 deep learning algorithm, identified and distinguished between vehicles and pedestrians, assigning unique IDs to each. The Global Nearest Neighbor (GNN) algorithm further verified whether objects detected by both sensors were identical, enhancing the accuracy of object identification and localization.

The simulation determined the Most Important Object (MIO) based on longitudinal distance for vehicles and both lateral and longitudinal distances for pedestrians. In scenarios with both vehicle and pedestrian targets, the MIO was chosen by comparing their longitudinal distances. The study also derived Autonomous Emergency Braking operation Time-To-Collision (TTC) charts from real vehicle experiments for both categories of targets, applying the relevant TTC charts based on the identified MIO.

The simulation outcomes closely matched the real-world performance of AEB systems in tests, validating the feasibility of accurately simulating AEB operations in complex scenarios involving both vehicles and pedestrians. This research underscores the possibility of enhancing AEB system simulations for a wider range of accident scenarios, advocating for ongoing studies to further understand and improve AEB effectiveness in varied environments.

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딥러닝 기반 Optical flow를 활용한 속도 분석 프로세스 개발

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Development of Vehicle Speed Analysis Process Using Deep Learning-Based Optical Flow

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Key Words : Vehicle speed analysis(차량 속도 분석), Optical flow(광학 흐름), Flowformer++(딥러닝 모델), CNN(합성곱 신경망)

ABSTRACT

In traffic accidents, drivers exceeding the speed limit by more than 20 km/h face criminal liability under the Act on Special Cases concerning the Settlement of Traffic Accidents. The vehicle's speed at the time of the accident is a critical factor in determining whether the driver could avoid the accident, emphasizing the need for accurate speed analysis. With the growing popularity of dashcams, there is an increased demand for speed analysis from such recordings. To estimate vehicle speeds from dashcam videos, the computer vision algorithm Optical Flow is employed. However, conventional formula-based Optical Flow techniques, such as the Farneback algorithm, show significant inaccuracies, leading to limitations in their practical application. To address this, the study introduces a vehicle speed analysis process using deep learning-based Optical Flow. Recent advancements in deep learning have led to the development of models based on the Transformer network, such as RAFT and FlowFormer++, which have improved the precision of Optical Flow. Among these, using FlowFormer++ significantly enhanced the precision of Optical Flow, which was then applied to a CNN(Convolutional Neural Network)-based speed prediction model to develop a process that predicts vehicle speed with improved accuracy. Using 10,891 images from the KITTI dataset, with 10,191 for training and 700 for testing, the study validates the deep learning model against the traditional Farneback algorithm. As a result, using FlowFormer++ led to a significant reduction in RMSE from 8.85 km/h to 0.77 km/h and a decrease in error rate from 12.67% to 1.00% compared to Farneback, demonstrating the advantages of the deep learning approach. Future research will aim to gather data across various road environments like urban streets and highways, and under different driving conditions such as daytime, nighttime, and rainy weather, to fully ensure the usability and accuracy of the vehicle speed analysis process using deep learning-based Optical Flow.

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운전자 졸음 예측을 위한 fNIRS 기반 의식상태 분류

이현민* · 김태훈* · 안진웅**

fNIRS-Based Consciousness State Classification for Predicting Driver Drowsiness

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Key Words : Drowsy driving (졸음 운전), fNIRS (기능적 근적외선 분광법), Deep neural network (심층신경망)

ABSTRACT

Lack of sleep can increase the risk of traffic accidents even if the driver does not feel drowsy. This study aims to classify the fNIRS signal into three consciousness states: awake, drowsiness, and sleep. The subject fell asleep during the experiment when mounted with fNIRS measuring equipment. In this process, the subject was instructed to press a button according to a given auditory stimulation at random intervals. The signal was labeled as awake when the subject responded to auditory stimulation three times in succession and labeled as sleep when the subject did not respond three times in succession. The signal of the moment from awake to sleep was labeled with drowsiness. A transformer-based neural decoding model, ORC-T, is used for the classification, using input embeddings that reflect the spatial characteristics of fNIRS data. ORC-T embeds the fNIRS channel into a new channel with depth-wise convolution layers based on the fNIRS optode layout. Embedded data is classified in the classifier through the 2d convolution layer and transformer encoder. ORC-T produced an average accuracy of 97.29±0.81% in a 4-second window for the k-fold CV and 62.00±13.49% in a 4-second window for the LOSO CV.

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크레인류 건설기계 검사기준 및 제도의 개선방향에 대한 연구

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A Study on Improvement Direction of Inspection Standards and Regulations of Crane-type Construction Machinery

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Key Words : Crane inspection(크레인 검사), Tower crane(타워크레인), Mobile crane(기중기)

ABSTRACT

Accidents involving crane-type construction machinery cranes such as tower cranes and mobile cranes often result in significant loss of life. Therefore, crane-type construction machinery cranes are classified as high-risk construction equipment. Currently, inspections of crane-type construction machinery in Korea mainly rely on sensory inspections such as visual and auditory inspections. In order to overcome the limitations of existing inspection criteria and regulations, recent research efforts have been actively focused on advancing the inspection of crane-type construction machinery. In this study, through comparison and analysis of the inspection standards and regulations for crane-type construction machinery in Japan, which has adopted a safety management system similar to that of Korea, the shortcomings and improvement directions of the inspection system for crane-type construction machinery in Korea were identified.

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임베디드 보드 환경에서 LiDAR의 PCD기반 자율주행을 위한 객체 인식 시스템 구현

임다연* · 김인수** · 박재홍***

Implementation of an Object Detection System for Autonomous Driving Based on Embedded Board Environment

Da Yeon Lim*, In Su Kim**, Jae Hong Park***

Key Words : Autonomous Driving(자율주행), LiDAR(라이다), Deep Learning(딥러닝), Object Detection(객체인식), Embedded System (임베디드 시스템)

ABSTRACT

This study proposes an optimized deep learning model and environment for data processing of LiDAR, one of the perception sensors for autonomous vehicles, in an embedded board environment. The aim is to enhance the processing speed and reliability of autonomous driving functionalities by efficiently handling the point cloud data (PCD) collected by LiDAR sensors.

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블랙박스 영상 분석을 위한 단안 카메라 깊이 추정과 이미지 영역 분할 활용 방안 연구

최성은* · 김영빈** · 김주명** · 전윤성*** · 박정만**** · 박종진****

Study on Utility Method of Monocular Camera Depth Estimation and Image Segmentation for Dashboard Camera Video Analysis

Seongeun Choi *, Yeongbin Kim**, Jumyung Kim**, Yunseong Jeon***, Jeongman Park****, Jongjin Park****

Key Words : Dashboard camera(블랙박스), Monocular depth estimation(단안 깊이 추정), Image segmentation(이미지 영역 분할), Traffic accident analysis(교통사고분석)

ABSTRACT

Traffic accident analysis and scene reconstruction are important task to investigate responsibility. This study was conducted to analyze the accidents by analyzing the physical and relative relationship between the vehicle and the surrounding environment at the time of the accident through a dashboard camera. It will be beneficial if odometry of Ego vehicle and surrounding vehicle are determined by each time stamp. However, due to the monocular camera setup of dashboard camera footage, such applications are challenging task. In this study, we compute position of surrounding vehicle at the time of the accident by using monocular depth estimation model. In prior studies of monocular depth estimation, self-supervised learning is mainstream. But there is problem about domain gap because their accuracy is been fine-tuning at training domain and specific camera parameter. Traffic accidents occur regardless of urban or highway, and dashboard cameras have different resolutions and camera parameter by model and device, the MiDaS 3.1 model and the UniDepth model, which have demonstrated excellent performance in the zero-shot regime, are utilized for robust depth estimation. In addition, in order to separate pixel needed for analysis accidents, YoloV8 model is used as image segmentation model. The MiDaS 3.1 model represents relative inverse depth, while the UniDepth model represents metric depth. Therefore, experiments and comparing both models are conducted in the field and then evaluate their utility.

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대형경유차 친환경전환 촉진을 위한 검사제도 강화 및 비용편익분석 연구

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Research on the Need to Strengthen the Inspection System and Cost-Benefit Analysis to Promote Eco-Friendly Conversion of Large Diesel Vehicles

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Key Words : Air environment improvement Convenience(대기환경 개선편익), Establishment of reduction device maintenance process (저감장치 정비 프로세스 구축), Analysis of improvement effect of automobile inspection pass rate (자동차검사 합격률 개선효과 분석), Vehicle inspection cost benefit economics analysis (자동차 검사비용편익 경제성 분석), Estimation and quantification of reductions according to exhaust gas improvement scenarios (매연 배출가스 개선 시나리오에 따른 저감량 추정 및 계량화)

ABSTRACT

In order to promote the eco-friendly conversion of large diesel vehicles, it is necessary to analyze the current situation considering the serious environmental damage caused by exhaust gases even if the market share of large diesel vehicles is low.Additionally, improving inspection systems, strengthening standards, establishing systems, and properly maintaining soot abatement equipment are essential. It is necessary to analyze the economic feasibility of strengthening inspection standards through a cost-benefit analysis according to scenarios for strengthening inspection standards, and these efforts will lead to successful results by increasing the voluntary conversion rate of owners of large diesel vehicles. In addition, if government support projects for eco-friendly conversion of large diesel vehicles increase and standards are continuously strengthened, air quality will improve more rapidly and a sustainable clean environment will be created to be passed on to future generations, and the carbon neutrality goal can be quickly achieved.

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