타이어 기술

타이어 패턴 설계 인자에 따른 성능 영향도 연구

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A Study on the Tire Pattern Design Parameter for the Tire Performance

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Key Words : Longitudinal groove(종그루브), Pattern noise(패턴 소음), Steering performance(조종성)

ABSTRACT

The Tire performance largely affects the Vehicle performance. That's why that the noise, steering and hydro performance of tire is important. A main process of the tire development is largely in two stages. Stage 1 is a Pattern design and stage 2 is a Structure design. Various tire performances are influenced largely by the tire pattern and once the tire pattern design is determined, it's hard to change it. So, the tire pattern design is important. The tire pattern consists mostly of grooves and sipes. And the groove consists of longitudinal and lateral groove. This is about the study on the effect of longitudinal groove on tire performance. We carved longitudinal grooves on the SMT(smooth tire) and each tire's longitudinal grooves are different in a width, depth and gap between each longitudinal groove. We evaluated these carved tire with the vehicle and the evaluation items are noise, PBN(pass by noise), hydroplaning and steering performance.

First, we made a Pattern noise index and PBN index by the longitudinal groove, and then analysed the hydroplaning and steering performance results. From those results, we analysed a correlation between noise and other performances

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젖은 노면에서의 타이어 안전 성능 평가 방법 연구

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Wet Performance Test for Safety

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Key Words : Aquaplaning(수막현상) , Safety(안전)

ABSTRACT

With the fast-changing trends in the automotive industry, eco-friendliness and autonomous driving have become more prevalent, particularly with the growing popularity of electric vehicles. As a result, even tyres are being designed with eco-friendly materials to keep up with these changes. Maintaining high performance, especially in wet conditions, is crucial for safe driving. This paper presents a study on test methods that can accurately assess and improve the wet performance. The primary objective of this study is to address the issue of safety in wet conditions by proposing various test methods, with a specific focus on aquaplaning. The study introduces a dynamic analysis technique to enhance understanding and efficiency in assessing aquaplaning, and presents a new method to further improve the accuracy and reliability of testing procedures.

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가변 지오메트리 서스펜션을 고려한 타이어 특성 분석

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Analysis on Tire Characteristics in Consideration of Variable Geometry Suspension

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Key Words : Variable geometry suspension(가변 지오메트리 서스펜션), Tire characterisitcs(타이어 특성), Tire data analysis(타이어 데이터 분석), Camber and toe angles(캠버 각과 토우 각)

ABSTRACT

This paper presents a comprehensive analysis of tire characteristics and their influence on vehicle performance, with a specific focus on variable geometry suspension systems. The primary aim of this study is to enable optimal control of camber and toe angle adjustments in a range of driving situations by analyzing tire characteristics, particularly tire lateral force, in connection with variable geometry suspension systems. The tire characteristics are measured using MTS Flat-Track test platform and the measurements are used as the reference tire data set. This comprehensive analysis allows for the assessment of the interaction between tire properties and suspension systems under various driving conditions. By carefully analyzing tire data, this research uncovers the potential for implementing precise control of camber and toe angle adjustments, ultimately resulting in improved handling and stability of the vehicle.

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타이어 마찰 특성을 고려한 4륜 독립 조향/구동/제동 차량의 제어 분배 로직

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Control Allocation Algorithm for Four-Wheel Independent Steering/Driving/Braking Vehicles Considering Tire Friction Characteristics

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Key Words : Control allocation(제어 분배), Tire characteristics (타이어 특성), Four-wheel independent steering(사륜독립 조향), Four-wheel independent driving(사륜독립구동), Four-wheel independent braking(사륜독립제동)

ABSTRACT

For vehicles using multiple actuators, an appropriate control allocation is required. This is particularly true of Four-Wheel Independent Steering/Driving/Braking vehicles (4WIS/4WID/4WIB). The proper control allocation can improve dynamic performance and improve passenger satisfaction. In this paper, we introduce a strategy using an efficiency matrix for control allocation. First, the longitudinal force and steering angle is calculated using Pseudo inverse with the Fixed Efficiency Matrix (FEM). The yaw moment due to lateral acceleration is ignored because the tire force is not considered in FEM. Second, the Dynamic Efficiency Matrix (DEM) takes into consideration the coupling characteristics of the longitudinal and lateral tire forces. At this time, the friction ellipse is modeled through a combined slip model to accurately describe the nonlinear characteristics of tire forces. The longitudinal force/steering angle with additional yaw moment is obtained through the modeled friction ellipse by using the friction ellipse fitting function. CarSim and MATLAB/Simulink are used to evaluate the proposed algorithm. The simulation results show that FEM and DEM have a good performance in the straight section. However, in the cornering section, DEM have better safety and path tracking performance than FEM. The consideration of additional yaw moments improves the distribution of the control force.

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눈길 타이어 트랙 및 선행차 인식을 통한 강건 차로 유지 알고리즘 개발

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Development of Robust Lane Keeping Algorithm Based on Tire Track and Preceding Vehicle Detection on Snowy Road

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Key Words : Autonomous driving(자율주행), Snowy roads(눈길), Lane keeping (차로 유지), Tire track detection(타이어 트랙 인식), Deep learning(딥러닝)

ABSTRACT

Self-driving is a technology that control a vehicle by recognizing the surrounding situation and planning the motion. Due to unusual driving conditions, the commercialization of Level 4 autonomous driving is currently being delayed. The cause is that there is a situation in which perception is imperfect. In this study, a lane keeping algorithm is developed for snow conditions. When it snows, the lane detection rate decreases. A detection algorithm for track by tires is developed to replace the lane detection. The tire track has a different color and shape depending on the amount of snow and preceding vehicles. Data of various shapes and colors are collected and data augmentation is performed to enrich the dataset. The custom dataset is created using the CVAT, and the preceding vehicle and tire tracks are recognized using Yolov5. The recognition rate was set at 70% or higher. The image read by the mono camera is converted into a bird's eye view so that the vehicle can find a driving route. The driving route and the preceding vehicle are weighted to increase the performance of the lane keeping in snowy road. The results of this study can be used as reference data for autonomous driving in adverse conditions in the future.

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