ABSTRACT

Optimal power distribution of all wheel drive electric vehicle considering regenerative braking

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ICEVs (Internal combustion engine vehicles) are regarded as the main culprit in environmental pollution, and electric vehicles are emerging as one of the solutions to climate change and environmental problems. Due to high dynamic performance along with environmental aspects, electric vehicles are attracting a lot of attention from drivers. Due to the long charging time of battery, the problem of mileage has emerged. To solve the problem, research on improving the fuel efficiency of vehicles is being conducted. Among them, in the case of a four-wheel drive electric vehicle, it is expected to improve the fuel efficiency of the vehicle by distributing power by utilizing the difference in between the front and rear wheel motors efficiency.

Existing studies on the power distribution of vehicles have focused on the driving

force distribution. But higher fuel efficiency improvement can be expected through power distribution considering the characteristics of electric vehicles and regenerative braking. Therefore, in this paper, considering regenerative braking energy recovery, power distribution optimization was performed to minimize energy consumption while driving. When performing regenerative braking, braking stability was secured by considering the longitudinal control of the vehicle.

To evaluate the performance of power distribution optimization, an electric vehicle simulation model was developed by using model-based design, and the evaluation was conducted by applying the optimization result. As a result of the driving simulation, it was confirmed that the energy consumed during driving was reduced by 3.40% through optimization of the driving force distribution, and the energy recovered through regenerative braking increased by 2.60%. When the two power distributions were performed simultaneously, the vehicle's final fuel economy was improved by 5.80%. Through this, it was confirmed that the need to optimize the distribution of driving force and braking force considering regenerative braking was confirmed.