INTEGRATED TRACTION AND BRAKE TORQUE CONTROL METHOD AND CONTROL DEVICE FOR ELECTRIC VEHICLES

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SOLUTION

A system has a common structure for the traction control and antilock braking (ABS) functions, and consists of feedforward (predictive) and feedback (reactive) contributions. The estimated values of the tyre-road friction coefficient and the vertical wheel force are used for saturating the torque demand $T_{dem}$, thus yielding the predictive torque value for the specific wheel $T_{pred}$. The reactive torque contribution $T_{react}$ is activated only when specific conditions on the slip ratio are satisfied, i.e., is used to correct $T_{pred}$ in the case of significant longitudinal slip of the individual tyre. $T_{react}$ is the output of a feedback controller mainly based on the reference slip ratio, the estimated slip ratio, and vehicle velocity. For the ABS function the system splits the contribution for each vehicle corner into the torque shares to be generated by the electric motor and the friction brake.

Block diagram of integrated control device
ADVANTAGES

Accurate and smooth slip ratio tracking performance, with special benefits for active safety and driving comfort. Considerable stopping distance reduction at braking due fast and precise response of electric motors. Possibility of energy regeneration in ABS mode. Off-road capability – the system guarantees a high performance in transient and rough road surface conditions.

SCOPE OF APPLICATION

In general, application is useful for electric vehicles with individually controlled in-wheel motors or individually controlled on-board motors.