

Can Mathematics Help to Drive a Car Safer?

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Abstract: It is the goal of this work to support the development of a sensor system which is able to provide the management information system in a car with time resolved data, measuring the friction between the road and the tire. A finite element model of the tire is presented accounting for its most important characteristics (e.g. bulge, side wall, profile, steel belt, ply, rim). Numerical simulations will be compared with experimental results from a test facility as well as from real situations of cars on the road. The main numerical difficulties come from the geometrical nonlinearities caused by large deformations, the incompressibility of the elastomer and the special boundary conditions at the interface of the road and the tire. Nevertheless the results of the simulations are in good agreement with measurements taken from special prepared cars. The results of these investigations are useful for finding the most sensitive spots in the tire where one should place the sensors.

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