The present thesis is concerned with the dynamics of railway vehicles. In the thesis the dynamics of a mathematical model of the Danish IC3 train is treated. The mathematical model consists of half a carbody, one bogie and two wheelsets. The creepage-creepforce relation is approximated by the theory of Shen, Hedrick and Elkins. The derivation of the dynamical equations is described, and special focus is placed on the contact between wheel and rail. This contact is treated locally elastic which means that the wheel is allowed to penetrate the rail. This method is capable of taking into account multiple coexisting contact areas between the wheel and rail. Various examples of the geometrical contact between wheel and rail are given and the influence of track gauge and rail inclination on the contact is outlined. The contact-geometry for a worn wheel-profile on new rails is determined and used in the simulations of the dynamics of the IC3 train. In the thesis the dynamics are numerically investigated for the IC3 running on three different track configurations: 1) A perfectly straight track 2) A measured track with irregularities 3) A curve When running on a straight track, we follow the linear and nonlinear critical velocities in dependence of the coefficient of adhesion, the longitudinal stiffness of the primary suspension and the damping coefficient of the secondary yaw-damper. By the term "nonlinear critical velocity" is meant the lowest velocity where a stable oscillating solution vanishes in a saddle-node bifurcation. The critical velocities are computed for the track-gauges 1432 mm and 1435 mm and the rail-inclinations 1/20 and 1/40. The difference between linear and nonlinear analysis is discussed in detail. It is shown that the difference is quite substantial. The numerical calculations indicate that the track-gauge and rail-inclination has a great influence on the dynamics of the IC3 train. The computer simulations of the IC3 running on a measured track with irregularities are compared with the measured signals obtained during a test-run. The physical conditions when negotiating a curve are discussed. Finally a sum up of the experimental experiences obtained during test-runs are presented. A comparison and discussion of the test and computer results are given.
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