

# Rolling Contact Mechanics at The Technical University of Denmark

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## ABSTRACT

First I will bring a brief tribute to Professor Kalker as a member of the International Association of Vehicle Systems Dynamics (IAVSD).

Next I shall turn to the exploration of a higher order discontinuity at zero creep in the rolling contact models by Kalker and Vermeulen – Johnson. It is the result of a personal communication with Professor Kalker and an early example of a discontinuity in nonlinear dynamics with a real physical background. In addition the influence of another higher-order discontinuity on a bifurcation that occurs in railway vehicle dynamics will be described, Slivsgaard [1], True [2].

In the main part of the lecture some results of the Ph.D. thesis by Birkedal Nielsen [3] will be presented. It was written with Professor Knothe as a co-adviser. In his thesis Birkedal Nielsen extends the work of Professor Kalker to a) rolling problems with a speed dependent coefficient of adhesion, and b) rolling between rough or corrugated surfaces. The results are limited to two-dimensional contact. They can in principle be extended to three dimensions but it has not yet been done and it will be very elaborate.

In case a) examples of creep curves will be shown. In case b) some results of evolution of corrugation and stability of corrugation – both stationary and moving – will be shown.

[1] Slivsgaard, E.C., On the Interaction between Wheels and Rails in Railway Dynamics, Ph.D thesis IMM, The Danish Technical University, 1995.

[2] True, H., On a new Phenomenon in Bifurcations of Periodic Orbits, Dynamics, *Bifurcation and Symmetry, New Trends and New Tools, Sept 3-9, 1993*, p. 327-331, 1994, Kluwer Academic Publishers, P.O. Box 322, NL-3300 AH Dordrecht, The Netherlands.

[3] Birkedal Nielsen, J., New Developments in the Theory of Wheel/Rail Contact Mechanics, Ph.D. thesis, IMM, The Technical University of Denmark, 1998.

