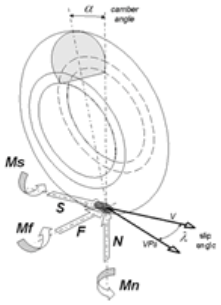
MECHANICS COLLOQUIUM



Monday, Feb 21, 2005
15:45-16:45 h.
Delft University of Technology
Faculty of Mechanical Engineering
Mekelweg 2, Delft
Room E

"A Physical Tire Model for the Analysis of Motorcycle Dynamics''

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Abstract - A physical tire model based on simplifying mechanical assumptions is derived for analysing the stability and handling of motorcycles. The model is qualitatively valid for the whole range of possible operating conditions. A one-dimensional brush model on a two-parameter Pasternak foundation, which is sometimes called an enhanced string model, is used for the normal and lateral directions. For the longitudinal direction, the model is simplified by assuming the belt inextensible. The response in the tangential direction is related to the normal pressure through the friction force only, which is of the Coulomb type with a difference between the static and kinetic coefficient of friction. The analysis is limited to the behaviour under steady-state conditions and under slow variations of these conditions; for these cases the model can be reduced to a point contact model. The inputs to the tire model are the normal tire deflection, the camber angle, the longitudinal and lateral slips and the normal spin. The resultant normal, lateral and longitudinal forces and the aligning moment are the outputs. The non-stationary behaviour is described by a differential model, which can be related to the more familiar first-order relaxation length models. Characteristics of tire forces for a sample tire are shown for a range of operating conditions.

This work was done in collaboration with Dr A.A. Popov.

About the speaker - Dr Meijaard studied mechanical engineering at Delft University of Technology. In 1991, he graduated on a doctoral thesis on the dynamics of mechanical systems. After some stints at Delft University of Technology, he joined the University of Nottingham as a research associate to work in the field of motorcycle dynamics in 2002.