

PERTURBATION METHODS FOR PARTIAL DIFFERENTIAL EQUATIONS

PROJECT LEADERS

AW Heemink

RESEARCH THEME

Mathematical and computational methods for fluid flow analysis

PARTICIPANTS

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COOPERATIONS

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FUNDED

1st 80% 2nd - 3rd 20%

START OF THE PROJECT

2003

INFORMATION

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PROJECT AIM

The main focus within this project is to develop and to apply perturbation methods to analyze initial value problems and (initial)boundary value problems for partial differential equations. The applications are in a variety of fields, such as: the wind of rain-wind induced oscillations of elastic structures (such as bridges, high-rise buildings, and overhead power transmission lines); the vibrations of conveyor belts; the morphodynamic evolution of coastal systems (such as beaches, and estuaries); and the dynamics of polymers in shear flow.

PROGRESS

In 2008 the applicability of different types of perturbation methods was investigated. For problems with boundary damping, for nonselfadjoint problems, for weakly nonlinear problems, and for problems with variable coefficients all kinds of computational aspects have been studied by using perturbation methods, methods from dynamical system theory, numerical methods, and stochastic methods.

DISSERTATIONS

1. J.W. Hijmissen, On aspects of boundary damping for cables and vertical beams. Promotor: A.W. Heemink and co-promotor: W.T. van Horssen, TU Delft, October 14, 2008.

SCIENTIFIC PUBLICATIONS

1. J.W. Hijmissen and W.T. van Horssen, On the weakly damped vibrations of a vertical beam with a tip-mass, *Journal of Sound and Vibration*, 310, 2008, p 740-754.
2. I.V. Andrianov and W.T. van Horssen, On the transversal vibrations of a conveyor belt: Applicability of simplified models, *Journal of Sound and Vibration*, 313, 2008, p 822-829.
3. J.W. Hijmissen and W.T. van Horssen, On transverse vibrations of a vertical Timoshenko beam, *Journal of Sound and Vibration*, 314, 2008, p 161-179.
4. A. Rohe, F. Molenkamp and W.T. van Horssen, On the uniqueness of solutions for the Dirichlet boundary value problem of linear elastostatics in the circular domain, *Acta Mechanica*, 197, 2008 p 43-62.
5. M. van der Vegt, H.M. Schuttelaars, and H.E. de Swart. 2007, Modelling the formation of undulations of the coastline: the role of tides, *Cont. Shelf Res.*, 27, p 2014-2031.
6. J. van de Kreeke, R.L. Brouwer, T.J. Zitman, and H.M. Schuttelaars. 2008, The effect of a topographic high on the morphological stability of a two-inlet bay system, *Coastal Engineering*, 55, p 319-332.
7. M.C. ter Brake and H.M. Schuttelaars. 2007, Influence of bed slope related sediment fluxes on morphodynamic equilibria in tidal embayments. In *River, Coastal and Estuarine Morphodynamics 2008*, Dohmen-Janssen and Hulscher (editors), p 25-32.