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Seminar über Fragen der Mechanik

zu folgendem Vortrag wird herzlich eingeladen

Freitag, **28.02.2014, 11:00 Uhr**, Haberstraße 1, Raum 01.025

Fluid-structure interaction of mechanical systems immersed in low-subsonic flows: the wind turbine case

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In this lecture, I present an aeroelastic model of a three-blade large-scale horizontal-axis wind turbine, which consist of a non-linear-unsteady aerodynamic model and a structural model based on a combination of very different dynamic representations such as rigid bodies, assumed modes and finite elements integrated by means of a multibody system approach. The aerodynamic and structural models are coupled through a procedure, which allows transferring information in both directions without introducing spurious energy. The developed model comprises: i) a supporting tower; ii) a nacelle, which contains the electrical generator, power electronics and control systems; iii) a hub, in which the blades are connected to a rotating shaft; and, vi) three blades, which extract energy from the wind. Flexible blades are discretized into beam finite elements and the flexible tower is discretized into assumed modes. The nacelle and hub are considered rigid. The tower, nacelle and hub are modeled as a single kinematic chain, and each blade is modeled separately. To establish the blade-hub attachments, constraint equations are introduced. Thus, the resulting equations are differential algebraic. Finally, I present results, some of them are validations, which prove that the approach is reliable and does capture some interesting non-linear phenomena, and the remaining ones correspond to the aeroelastic response of a wind turbine during a smooth start-up maneuvering.

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