

Simulation and Analysis of Optical-Mechanical Systems

by

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Abstract

In this talk, methods and procedures are investigated for simulating the dynamical behavior of high-performance optics like a mirror telescope or lithography systems. With such instruments, even small mechanical vibrations, which have to be analyzed, can be critical to produce aberrated images. For that analyses, flexible multibody systems in combination with model order reduction methods can be used to obtain a simplified mechanical model. This model can be utilized for transient time simulations at low computational cost. The resulting deformations and motions can be transferred to an optical model. Furthermore, a (differential) ray tracing simulation can be performed, and the influence of the mechanics can be investigated with respect to the optical performance. In addition, many optical effects can be analyzed e.g. resulting from introducing heat into the lenses, and active control can be utilized to reduce errors. During the talk also a brief overview about further research activities at the Institute of Engineering and Computational Mechanics at the University of Stuttgart in Germany is given.



Peter Eberhard is full professor of mechanics and since 2002 director of the Institute of Engineering and Computational Mechanics (ITM) at the University of Stuttgart, Germany. He was Treasurer and Bureau member of IUTAM, the International Union of Theoretical and Applied Mechanics, and served before in many national and international organizations, e.g., as Chairman of the IMSD (International Association for Multibody System Dynamics) or DEKOMECH (German Committee for Mechanics). Research interests include multibody dynamics, control and active systems, particle methods, manufacturing, and others. Many projects are done together with currently about 60 companies in Germany and many other countries. He supervised about 65 completed doctoral theses and together with his team nearly 600 student theses in mechanics.