Institute of Mechanics and Mechatronics

MECHATRONICS - AN EMERGING RESEARCH FIELD

Modern devices, vehicles and industrial processes require an increasing amount of synergetic interaction of mechanic, electric and electronic components. The previously unavowed challenges encountered in this context led to the research field of Mechatronics. Both the analysis and synthesis of complex mechatronic systems require the bundling of state-of-the-art engineering techniques. Hence, the Institute of Mechanics and Mechatronics comprises different research groups covering all relevant disciplines in the field of Mechatronics. Research is conducted into theoretical foundations as well as in state-of-the-art equipped laboratories.

MECHANICS OF SOLIDS

Research in the field of mechanics of solids focuses on the modelling and analysis of structures and dynamic systems. Key competencies lie in nonlinear stability analysis and model reduction techniques with applications in tethered satellite systems, friction induced vibrations as well as in buckling and bulging problems.

TECHNICAL DYNAMICS AND VEHICLE DYNAMICS

Technical dynamics addresses research in fields such as machine dynamics, vibration analysis or rotor dynamics. Research activities primarily consider vibrations encountered in various systems as well as their driving forces. Important outcomes are new methodologies for active and passive vibration reduction. Furthermore, research is performed on the simulation, optimisation and control of different vehicles such as road vehicles, rail vehicles or even aircraft using multibody dynamics. A key role is awarded to man-machine interactions ranging from driver analysis to biomechanics and biomedical science.

MEASUREMENT AND ACTUATOR TECHNOLOGY

Research in the field of measurement and actuator technology is focused towards new Finite-Element schemes to solve the multi-field problems (magneto-mechanics, piezoelectrics, electrostatic-mechanics, mechanics-acoustics, etc.). Recent topics range from the development of intelligent sensors and actuators (MEMS loudspeaker, piezoelectric stack actuators, electro-dynamic force actuators, Coriolis flow meters, etc.) up to flywheel energy storage systems based on magnetic bearing. A second strong research topic is acoustic engineering where the focus is on combined measurement and simulation based methods to analyse noise mechanisms (both vibrational and flow induced noise) within complex technical systems (motors, fans, air conditioning systems, electric transformers, etc.) and to develop appropriate methods for passive or/and active noise reduction.

CONTROL AND PROCESS AUTOMATION

Control engineering considers the automation and optimisation of a large variety of processes ranging from the micro-scale up to industrial power plants. Research focuses on new methodologies for nonlinear system identification, robust control and advanced process control with applications in complex dynamic systems as they are encountered in the automotive, aerospace and chemical process industries.

Christian Doppler Laboratory for model based calibration methodologies

The research goals of this long term collaboration between TU Vienna and AVL List GmbH are the development of new and integrated methodologies for model based calibration of automotive systems (combustion engines, powertrain systems, Li-Ion cells) and the industrial implementation of these methodologies. The central research programme is focused on basic research and enhancement of existing concepts. It includes the aspects of experiment design, nonlinear system identification and automated controller stability analysis and design. Through the combination of basic research and application oriented problem formulations the obtained expertise can be readily transferred into commercial products. More information at mbc.tuwien.ac.at