CONTROL ORIENTED MODELS FOR VEHICLE DYNAMICS

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Required/expected prior knowledge: Fundamentals of Calculus, General and Applied Physics, and Industrial Engineering Drawing

Class(es)  
Teacher(s)  Mario Terzo

COURSE OBJECTIVES

The course aims to provide the fundamental knowledges for the synthesis of physical-mathematical models of mechanical systems according to an approach that is functional to the design of the model-based controllers. The methodologies for modelling, the main sources of mechanical nonlinearities, as well as local linearization based tools are described, starting from the typical features of the mechanical systems, with particular reference to vehicle dynamics.

TABLE OF CONTENTS

- Systemic approach for the design of a mechanical system: mechatronic system; passive, semi-active and active controls; feedforward and feedback controls
- Modelling of mechanical systems: d’Alembert and Newton approaches, Lagrange approach, linear time-invariant mechanical systems, nonlinearities in mechanical systems, linearization technique
- State-space modelling, input-output modelling, transfer function, Laplace domain, Laplace transform, stability analysis
- Control of mechanical systems in terms of vibrational characteristics
- Longitudinal and lateral dynamics of road and railway vehicles
- Control of the dynamics of road and railway vehicles

EDUCATION METHOD

Lessons, numerical exercises with dedicated softwares

TEXTBOOKS AND LEARNING AIDS

- Vehicle dynamics and control, R. Rajamani, Springer Ed.
- Handbook of railway vehicle dynamics, S. Iwnicki, CRC Press

ASSESSMENT

Assessment will be  Written and Oral  Written Only  Oral Only  X
In case of written assessment, questions are  Multiple choicetests  Open questions  Numericalexercises
Other (es: project development, computer test …)