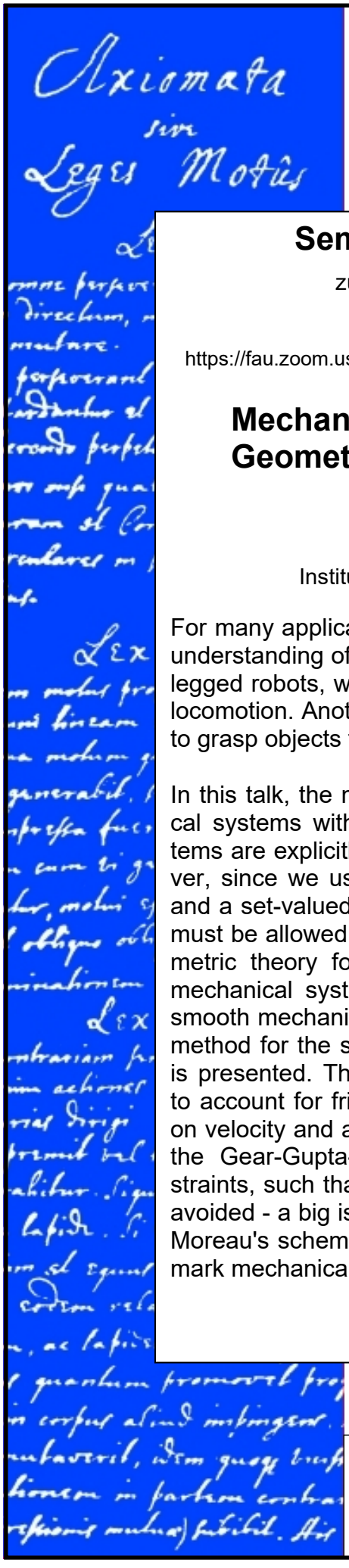

FRIEDRICH-ALEXANDER UNIVERSITÄT ERLANGEN-NÜRNBERG
TECHNISCHE FAKULTÄT

Seminar über Fragen der Mechanik

zu folgendem Vortrag wird herzlich eingeladen

Dienstag, 01.06.2021, 15:00 Uhr

https://fau.zoom.us/j/62226087549?pwd=Q0ozR21zNi9JVmF5TlpkUXM2WS9qUT09

Mechanical systems with frictional contact: Geometric theory and numerical simulation

Giuseppe Capobianco

Institut für Nichtlineare Mechanik, Universität Stuttgart

For many applications, the modeling of frictional contact is crucial for the understanding of the system's dynamics. This is for example the case for legged robots, where the contact of the foots with the ground is used for locomotion. Another prominent example are industrial robots, which need to grasp objects for the fulfillment of their task.

In this talk, the mathematical description and the simulation of mechanical systems with frictional contact are presented. Typically, these systems are explicitly time-dependent, due to actuation for example. Moreover, since we use a hard contact model including unilateral constraints and a set-valued Coulomb-type friction law, the velocity of such systems must be allowed to jump whenever an impact occurs. Hence, first a geometric theory for the description of time-dependent finite-dimensional mechanical systems is introduced and the fundamental ideas of nonsmooth mechanics are discussed. Then, a nonsmooth generalized-alpha method for the simulation of mechanical systems with frictional contacts is presented. This method extends existing generalized-alpha schemes to account for frictional contact by including a Coulomb-type friction law on velocity and acceleration level. Moreover, the presented method uses the Gear-Gupta-Leimkuhler approach to stabilize the unilateral constraints, such that numerical penetration of the contacting bodies can be avoided - a big issue of the most popular time-stepping schemes such as Moreau's scheme. Finally, the method is validated using a set of benchmark mechanical systems.

Prof. Dr.-Ing. P. Steinmann
Prof. Dr.-Ing. K. Willner
Lehrstuhl für Technische Mechanik
Egerlandstraße 5, 91058 Erlangen

Prof. Dr.-Ing. S. Leyendecker
Lehrstuhl für Technische Dynamik
Immerwahrstraße 1, 91058 Erlangen