A U S H A N G

FREIE UNIVERSITÄT BERLIN
Fachbereich Mathematik und Informatik

Promotionsbüro, Arnimallee 14, 14195 Berlin

D I S P U T A T I O N

Freitag, 2. Dezember 2016, 12.30 Uhr

Ort: Raum 031, Arnimallee 6, 14195 Berlin

Disputation über die Doktorarbeit von

Herrn Phillip Maximilian Berndt

Thema der Dissertation:
Mathematical Modeling of the Shockless Explosion Combustion

Thema der Disputation:
Orbital mechanics and the Apollo program

Die Arbeit wurde unter der Betreuung von **Prof. Dr.-Ing. R. Klein** durchgeführt.

Abstract: Prediction of the motion of the planets in the Solar system has been promoting scientific progress since ancient times. Attempts to explain the nature of their motion eventually led to the discovery of the law of universal gravitation in the late 17th century. It allows to describe the problem as a second-order ordinary differential equation system. More than 300 years later, we know how to explicitly solve this system for the case of two bodies and for some special cases of larger systems, but still require numerical simulation for everything else.

Yet, 47 years ago, our understanding of the system was already sufficient to reliably land two men on the moon. This is fascinating, because while computers at that time could already solve the boundary value problem for ballistic flight of a rocket in a gravitational potential, it was out of the question to solve it again in real time to compensate for slight errors in firings of the rocket, let alone optimize for the necessary correctional engine burns. Instead, a system of clever approximations was devised, together with the mathematical machinery to control the resulting error.

The talk will explore the interplay between mathematical modelling and the engineering reality at the time of the Apollo program. It will give a deeper introduction to the mathematical formulation of the problem and acquaint the audience with some of the key challenges imposed by the technology of that time, followed by a presentation of how they were overcome.

Die Disputation besteht aus dem o. g. Vortrag, danach der Vorstellung der Dissertation einschließlich jeweils anschließenden Aussprachen.

Interessierte werden hiermit herzlich eingeladen

Der Vorsitzende der Promotionskommission
Prof. Dr.-Ing. R. Klein