



Der Vorsitzende des Promotionsausschusses

EINLADUNG

Hiermit lade ich ein zum öffentlichen Promotionskolloquium von

Herrn M.Sc. Riccardo Mandriota

Antriebstechnik

(Prof. Dr.-Ing. Matthias Nienhaus)

am

Dienstag, 29. April 2025, 14:00 Uhr s.t.

per Videokonferenz: Link für MS Teams: <http://bit.ly/4j5hqru>

Raum für die Prüfung: Gebäude E2.9, Raum S 0.07

Thema der Dissertation:

An unknown input observation approach for torque-sensorless assistance in electric bicycles

Modern electric-powered bicycles require torque sensors, which increase the system cost and complexity, to detect cycling and generate electrical assistance. This dissertation explores torque-sensorless electrical aid strategies based on unknown input observation approaches and different pedaling torque model complexities. By relying on in-wheel and inertial measurements, the proposed state observers estimate the cycling torque and provide electrical aid without utilizing costly sensors. Unlike conventional methods, performance is assessed beyond torque estimation errors, considering the cycling effort reduction and the overall riding feeling. Simulations and outdoor tests performed in a variable slope scenario show that using an enhanced periodic pedaling torque model achieves assistance performance comparable to torque-sensor-equipped systems. The proposed assistance approach offers a cost-effective alternative in the growing light electric vehicle market.

Saarbrücken, 15. April 2025

Prof. Dr. Uli Kazmaier