



TECHNISCHE UNIVERSITÄT  
ILMENAU

Institut für Automatisierungs- und  
Systemtechnik

Prof. Dr.-Ing. Johann Reger  
Fachgebiet Regelungstechnik

## Advanced control of electric vehicles and development of wireless in-wheel motors

Kolloquium

Prof. Hiroshi Fujimoto

Dept. of Electrical Engineering  
University of Tokyo

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## Zusammenfassung

Electric vehicles (EVs) have attractive potential not only for energy and environmental performance but also for vehicle motion control because electric motors have quick and measurable torque response. The speaker's laboratory has developed a completely original EV which has active front and rear steering systems. We installed high-torque direct-drive in-wheel motors and lateral force sensors to all wheels. In the first part of this talk, our recent studies on advanced motion control and autonomous driving to enhance safety, driving comfort, and cruising range will be briefly introduced. In the second part, a new type of in-wheel motor, which receives electric power by wireless power transfer using magnetic resonance coupling and control signals by wireless communication, in order to avoid the disconnection of power and signal cables have been developed. This system is called Wireless In-Wheel Motor (W-IWM). In this system, it is also possible to directly transmit power to the in-wheel motor without cables from underground coils for dynamic charging in future. This paper introduces the overview and design methods of the W-IWM. We also evaluate the characteristics of the W-IWM when installed on an electric vehicle and demonstrate its effectiveness by driving tests.

## Curriculum Vitae

Hiroshi Fujimoto received the Ph.D. degree in the Dept. of Electrical Engineering from the Univ. of Tokyo in 2001. In 2001, he joined the Dept. of Electrical Engineering, Nagaoka Univ. of Technology, Niigata, Japan, as a research associate. From 2002 to 2003, he was visiting scholar in the School of Mech. Engineering, Purdue Univ., USA. In 2004, he joined the Dept. of Electrical and Computer Engineering, Yokohama National Univ., Yokohama, Japan, as a lecturer and he became an associate professor in 2005. He is currently an associate professor of the Univ. of Tokyo since 2010. He received the Best Paper Awards from the IEEE Transactions on Industrial Electronics in 2001 and 2013, Isao Takahashi Power Electronics Award in 2010, and Best Author Prize of SICE in 2010. His interests are in control engineering, motion control, nano-scale servo systems, electric vehicle control, and motor drive. He is a senior member of IEE of Japan and IEEE. Dr. Fujimoto is also a member of the Society of Instrument and Control Engineers, the Robotics Society of Japan, and the Society of Automotive Engineers of Japan. He serves as an associate editor of IEEE/ASME Transactions on Mechatronics from 2010 to 2014, IEEE Industrial Electronics Magazine from 2006, IEE of Japan Transactions on Industrial Application from 2013, and Transactions on SICE from 2013. He was a chairperson of IEEE/IES Technical Committee on Motion Control from 2012 to 2013.