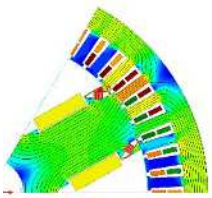
Name	Job Title	Area of Expertise
ABE Takashi	Professor	Electric Machinery, Power Electronics

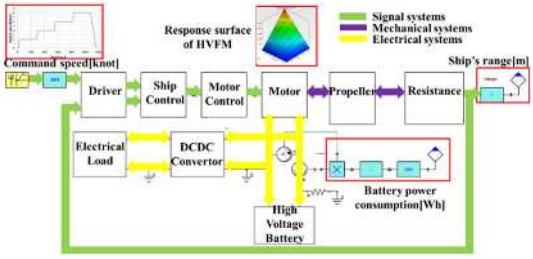
1. Main Research Topics

Our research focuses on the conversion, control, and efficient utilization of electrical energy to address various energy and environmental challenges expeditiously. We are advancing investigations into novel principal motors and high-performance motor drives and control systems by integrating academic and technological expertise in electrical machinery, power electronics (PE), and automatic control. Presently, we are pursuing research with the objective of applying these technologies to automobiles, ships, home appliances, and other domains.

① Research on high-performance motors

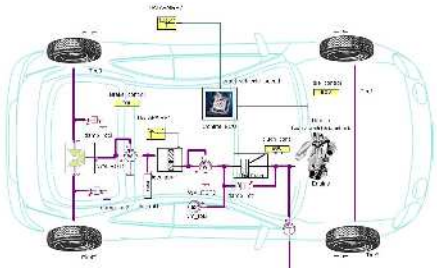


The research and development of a "half-wave rectified variable field flux motor" introduces an innovative magnetic flux generation principle that surpasses the capabilities of high-performance permanent magnet motors currently employed in various applications. This motor allows for the magnetic flux to be freely adjusted according to specific requirements. The design emphasizes high efficiency, high torque, and low vibration, utilizing the finite element method. Additionally, the development includes application-specific drive systems and control methods, alongside application-oriented system simulations that evaluate the entire electric drive system through simulations.



② Motor drive system development and system simulation

In the development of application-oriented motors, it is imperative to select, enhance, and develop diverse control and power conversion methodologies. Within our laboratory, we are engaged in research endeavors such as the "Development of a High-Efficiency Drive System for Small IPM Motors," which achieves high efficiency through portable battery operation, and the "Performance Enhancement of Switched Reluctance Motors," which leverages reluctance torque generated by the rotor's salient pole shape, obviating the need for permanent magnets. Additionally, we are advancing a "digital twin system" that facilitates fault diagnosis and prediction by employing simulation models of various electric drive systems.



2. Keywords

New principle motors, High performance motor drives, Model-based development

3. Remarks and Websites

We are developing motors and drive systems with new structures and principles that achieve high efficiency, high torque, and excellent control performance under various operating characteristics and usage environments, such as environmentally friendly electric drive systems for electric vehicles and battery-powered ships, as well as battery-driven home appliances.

researchmap: https://researchmap.jp/abet_map
Laboratory: http://www.eee.nagasaki-u.ac.jp/labs/pec/abe-otomo-lab/index.html