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著者名	Yusuke Deguchi Goshi Isshiki Keita Sado Yuki Nagatsu Shinji Ishii Hideki Hashimoto				

Verification of Ultra-High Resolution Magnetic Absolute Encoder Using Eccentric Structure and Neural Network

Yusuke Deguchi Goshi Isshiki Keita Sado Yuki Nagatsu Shinji Ishii Hideki Hashimoto

Abstract

High-precision motor control technology is required to realize a flexible robot that acquires the status of people and objects in space and supports them. The accuracy of motor control depends on the accuracy of angle and angular velocity information obtained from the encoder. Therefore, a high-precision encoder is indispensable for high-precision control. In conventional research, however, it has been difficult to simultaneously realize the miniaturization of the sensor and the realization of high accuracy. Therefore, the authors have developed a magnetic absolute encoder that is small and has high accuracy and high resolution by utilizing eccentric rotation. This encoder can improve the resolution by increasing a magnet pole. This research investigates the magnetic encoder with 128 poles. It turns out that the resolution of the encoder can be increased by 7 times compared to the conventional structure. However, the absolute angle calculation becomes difficult due to the increase of pole pairs in the conventional approach. Therefore, this research proposes the absolute angle calculation by using a neural network based on the signal data characterized by eccentric rotation. The proposed method is evaluated through simulations.

■理工学研究所との関連

研究代表者	橋本 秀紀	研究グループ	電気	年度	2018-2020
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