

Investigating R&D Committee on Magnetic Sensors with Machine Learning

Technical Committee on Magnetism

1. Objective

Magnetic sensors can measure physical quantities and information using magnetism as a medium in a noncontact manner. Therefore, they can collect big data in diverse physical spaces, including the environment, disaster prevention, physical distribution, energy, healthcare, medical treatment, welfare, and education. Therefore, feature extraction in the physical space is important for efficient big data analysis using artificial intelligence in cyber space. Based on the aforementioned requirements, the establishment of this investigation committee is proposed to investigate trends in the research and development of machine learning, including deep learning and artificial-intelligence-based analysis technology, in addition to magnetic sensors and their systemization.

2. Background and internal and external research activities

The predecessor of this committee, the IEEJ “Investigation Committee on Function and Systemization of Magnetic Sensors” (April 1, 2017 to March 31, 2020), investigated trends in the research and development of new applications eyeing IoT, in addition to high function and systematization of basic technologies for magnetic sensors. The magnitude of expectations for magnetic application technology to realize Society 5.0, which achieves the economic development and solution of social problems, was referred to in a special commentary in the January issue of the *IEEJ Transactions on Electrical and Electronic Engineering* in 2019. For perfect synchronization of physical space and cyber space, (1) it is necessary to efficiently extract the feature quantity, matching information acquisition of physical space from magnetic sensor output including various information. In addition, magnetic sensors in IoT terminals require the realization of (2) improved magnetic detection performance, e.g., sensitivity and spatial resolution, and (3) realization of a long life through systematization by the combined use of wireless communication and environmental power generation. The aforementioned technology is attracting attention of the *IEICE* and *Japanese Society for Artificial Intelligence*.

3. Investigative matters

- (1) Investigate ways to use machine learning in magnetic sensors
- (2) Investigate magnetic detection performance and applied technologies of magnetic sensors
- (3) Investigate the systematization of magnetic sensors to extend their service life

4. Expected effects

- (1) Ascertain trends in the research and development of magnetic sensors and machine learning
- (2) Promote the design, development, and application of magnetic sensors based on machine learning
- (3) Contribute to the realization of Society 5.0, achieving economic development and solving social issues

5. Term of investigation

April 2020 to March 2023 (3 years)

6. Committee members

Position	Name	Affiliation	Member/Non-member category of IEEJ
Chairperson	Kunihisa Tashiro	Shinshu University	Member
Member	Masakatsu Asano	Daido Steel Co., Ltd.	Non-member
"	Kazushi Ishiyama	Tohoku University	Member
"	Toshiyuki Ueno	Kanazawa University	Member
"	Tsuyoshi Uchiyama	Nagoya University	Member
"	Mikihiko Ogane	Tohoku University	Member
"	Akihiko Kandori	Hitachi, Ltd.	Non-member
"	Takahiro Kudo	Fuji Electric Co., Ltd.	Member
"	Koshi Kurashima	Asahi Kasei Microdevices Corporation	Non-member
"	Hirokazu Genno	Kissei Comtec Co., Ltd.	Non-member
"	Taichi Goto	Toyohashi University of Technology	Member
"	Koichiro Kobayashi	Iwate University	Member
"	Kenji Shiba	Tokyo University of Science	Non-member
"	Takefumi Shimoguchi	Sumitomo Electric Industries, Ltd.	Member
"	Mitsuhiro Takahata	Kaiyo Denshi Kogyo Co., Ltd.	Non-member
"	Masaaki Takezawa	Kyushu Institute of Technology	Non-member
"	Yasushi Takemura	Yokohama National University	Member
"	Keiji Tsukada	Okayama University	Member
"	Hiroaki Tsujimoto	Osaka City University	Member
"	Junichi Hayasaka	Research Institute for Electromagnetic Materials	Member
"	Sadao Higuchi	Ceres, Inc.	Member
"	Sumio Masuda	Yokohama National University	Member
"	Hiroyuki Masuda	Seiko Epson Corporation	Non-member
"	Takashi Mikoshiba	Smart Sensors Technology Corporation	Member
"	Shin Yabukami	Tohoku University	Member
"	Takashi Yoshida	Kyushu University	Member
"	Yoshimasa Watanabe	Mitsubishi Electric Corporation	Member
Secretary	Hiroaki Kikuchi	Iwate University	Member
"	Akinobu Yamaguchi	University of Hyogo	Member
Assistant secretary	Yosuke Ito	Kyoto University	Member

7. Activity schedule

Committee meetings: 4 times/year; Secretariat: 2 times/year;

Cooperative Technical Meetings: 2 times/year

8. Reporting format

We will schedule a special issue of the *IEEJ Transactions on Electrical and Electronic Engineering A* (transactions on fundamentals and materials), and post investigative results in the form of overview and general articles.

Reasons for the special issue of *IEEJ Transactions on Electrical and Electronic Engineering A* rather

than technical reports:

By changing the report format from a technical report to a special issue of the IEEJ Transactions on Electrical and Electronic Engineering A, contributors and readers may include researchers belonging to IEEJ Societies C and E and those not belonging to the IEEJ but to the IEICE and the Japanese Society for Artificial Intelligence. Contributions to Society A are expected in the form of new members, submission fees, and sales of copies.