

TOPICS ON NOVEL SENSORS, MATERIALS, AND RELATED TECHNOLOGIES ON ARTIFICIAL INTELLIGENCE OF THINGS APPLICATIONS: PART 8-1

PREFACE



In recent years, the booming economic development in Asia, particularly the leading manufacturing industries from automobiles, machinery, computers, communication, consumer products, and flat panel displays to semiconductors and micro/nano areas have attracted intense attention among universities, research institutions, and many industrial corporations. Therefore, applications of novel sensors, materials, and related technologies in electronic and mechanical devices have become rapidly developing fields. Manufacturing is the economic lifeline of a country and has been regarded as a labor-intensive industry. To reduce production costs, devices for the Internet of Things (IoT) have been widely developed. IoT is composed of most integrated end devices and facilities, such as intelligent sensors for internal control, industrial systems, mobile terminal systems, floor control systems, and home intelligent facilities. Smart devices and external control information are utilized with the hope of attracting companies that manufacture high-value-added products in the fields of aerospace, automotive, Information Technology (IT) molds, textiles, optoelectronics, watches, medical devices, automation, energy, and semiconductor-related parts and components to drive the country's economy. Therefore, the key to maintaining a competitive advantage in domestic manufacturing in the future still relies on the development of novel manufacturing and precision machinery-related technologies.

In addition, artificial intelligence (AI) is intelligence exhibited by machines, particularly computer systems. The artificial intelligence of things (AIoT) is the combination of AI technologies with IoT infrastructure to achieve more efficient IoT operations, improve human-machine interactions and enhance data management and analytics. The scope of this topics entitled "Novel Sensors, Materials, and Related Technologies on Artificial Intelligence of Things Applications" covers fundamental and novel sensors, materials, and technologies related to AIoT for electronic, mechanical, and electrical engineering, including their synthesis and integration with many elements, the design of electronic and optical devices, sensing technologies, evaluation of various performance characteristics, and exploration of their broad applications to industry, environmental control, materials analyses, and so forth. In part 8-1 of this topics, 17 excellent papers in four categories of sensors and materials fields have been selected.

- (1) Physical/Mechanical Sensors: "Interactive Orchard Intrusion Detection System Using Sensors and Human-in-the-Loop Control" by Lu *et al.*, and "Design and Electromagnetic Analysis of an Ultra-broadband Six-layer Planar Optical Absorber" by Liao *et al.*,

and “Investigation of WO₃-doped Ga₂O₃ films as Deep-ultraviolet and Visible-light Photodetectors” by Kuo *et al.*, and “High-precision Air-bearing Linear Motor Positioning Platform: Modeling, Sensing Integration, and Control Performance Evaluation” by Lee *et al.*

- (2) Bio/Chemical Sensors: “Residual–Dense–Attention U-Net with Convolutional Block Attention Module for Automatic Intracerebral Hemorrhage Segmentation from Sensor-derived Computed Tomography Data” by Pan *et al.*
- (3) Related Technologies: “3D Structured Light Depth Sensor and Algorithm for Vehicle Dynamic Motion Detection” by Lan *et al.*, and “Sensor-based Monitoring and Diagnosis of High-voltage Equipment in Modern Power Systems” by Zhang *et al.*, and “Sensor Data Fusion and Processing Using Temporal Graph Neural Network for Real-time Cost Variance Analysis in Production Lines” by Liu *et al.*, and “Sensor-guided Real-time Monitoring of Microbial Succession in Anaerobic Baffled Reactors” by Jiang *et al.*, and “Multichannel Sensor System for Real-time Monitoring of Up-flow Anaerobic Sludge Bed Anaerobic Ammonium Oxidation Bioreactors” by Xiang *et al.*, and “Sensor-based Color Design Evaluation Model Integrating Commission Internationale de l’Éclairage $L^*a^*b^*$, Human Perception, and Analytic Hierarchy Process” by Wang *et al.*, and “Driver Fatigue Detection Using Frequency-modulated Continuous Millimeter-wave Radar and Machine Learning with Feature Extraction” by Tseng *et al.*
- (4) Sensor Applications: “Bimodal Fusion Recognition of Cigarette Tobacco Mold Contamination Level Based on Odor and Spectral Information” by Liu *et al.*, and “Tracking Attention Dynamics: An Electroencephalography-based Analysis of Concentration Shifts During Human–AI Interaction” by Zeng *et al.*, and “Analysis of Optic Nerve Stress, Strain, and Pressure in Human Eyes with Different Axial Lengths under Different G-force Levels at a Normal Intraocular Pressure of 20 mmHg” by Lee *et al.*, and “Finite Element Evaluation of Mechanical and Sensing Responses of a Helmeted Human Head under Impact” by Chi *et al.*, and “Feasibility and Performance Analysis of Ground-penetrating Radar Integration for Autonomous Navigation of Quadraped Robots” by Ma *et al.*

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