

Preface

Optomechatronics, as fusion of optical and mechatronic engineering, has played a key role in developing innovative products such as high precision instruments, defense, photonic systems, measurements, diagnostics, semiconductors, and so on. Furthermore, optomechatronic technologies have greatly contributed to the state of the art of industries in optics design, manufacturing, optical imaging, metrology, and other applications. By using the optomechatronic technologies, we are able to create innovative technologies, generate a new value, and thus provide sophisticated systems consisting of optical, mechanical, and electronical technologies. This book aims at covering a number of optomechatronics advantages and solutions. It includes 20 contributions that feature laser and fiber optics, nitride semiconductors, LIDAR technology, machine vision, optical imaging, micro-optoelectro-mechanical systems, optical metrology, optical-based sensors and actuators, optomechatronics for microscopes, optical pattern and fiber, optomechatronics for biomedical applications, optomechatronics for manufacturing applications, robotics for micro and nanoscales, and other applications. As revised and extended versions, the contributed articles are selected from the “Proceedings of the 2013 International Symposium on Optomechatronic Technologies held on Oct 28–30, 2013 in Jeju Island, Korea.” This edition is published in original, peer reviewed contributions covering the topic from research results and theories to verifications.

The 20 articles compiled in this book are representative of the broad range of methods and applications of optomechatronics. To help readers understand this book, we classify the 20 articles into 4 parts in area order.

The first part of six articles describes the current status and future prospects of optical imaging technology and application.

1. Integration of Image and ID-POS in ISZOT for Behavior Analysis of Shoppers
2. Low-Cost IR Visualizer Based on a Rotating Phosphor Screen for Accurate Beam Analysis
3. Evaluation of Heteroepitaxially Grown Semipolar {20-21} GaN on Patterned Sapphire Substrate
4. Development of a Low-Noise Three-Dimensional Imaging LIDAR System Using Two 1×8 Geiger-Mode Avalanche Photodiode Arrays

5. Quick Light-Mixing for Image Inspection Using Simplex Search and Robust Parameter Design
6. Dense 3D Reconstruction in Multi-camera Systems.

The second part of 3 articles describes optical metrology including measurement systems of microsphere, 3D microscope, and large surface.

7. Optimization of Coupling Condition in Distance between the Sphere and the Tapered Fiber for Diameter Measurement of Microsphere by Using WGM Resonance
8. UV Shadow Moiré for Specular and Large Surface Shape Measurement
9. Development of Measurement System for 3D Microscope

In the third part, there are 4 articles using optical-based mechanical systems including sensors and actuators.

10. Design and Fabrication of a Prototype Actuator for Fourier Transform Interferometry
11. Peak Search Method for the Optical Spectrum Signals
12. Magnetostriction-Induced Fiberoptic Metal Profile Detector
13. Liquid Viscosity Sensing Using Nonlinear Higher Order Harmonic Excitation in Fiberoptic Vibrating Sensor.

Lastly, the fourth part of 7 articles deals with optomechanics applications in biomedical, nonhuman surgical assistants, manufacturing, and robotics.

14. Simulation and Optimization of Nanoparticle Patterned Substrates for SERS Effect
15. An Image-Based Coordinate Tracking System Using a Focal Optics for Surgical Navigation
16. Feasibility Study of a Functional Near Infrared Spectroscopy as a Brain Optical Imaging Modality for Rehabilitation Medicine
17. Real-Time Monitoring System for Industrial Motion and Optical Micro Vibration Detection
18. Thermal Manipulation Utilizing Micro-cantilever Probe in Scanning Electron Microscopy
19. Sound-Source Tracking and Obstacle Avoidance System for the Mobile Robot
20. Object Tracking Robot Using Data Combination of Ultrasonic Sensor and Servomotor.

We hope to help readers gain useful information from the articles and create an innovative and novel concept or theory. Thank you.

Rainer Tutsch
Young-June Cho
Wei-Chih Wang
Hyungsuck Cho

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