

## Nine Axis Sensor Fusion Using Direction Cosine Matrix

This book constitutes the refereed proceedings of the 11th Chinese Conference on Biometric Recognition, CCBR 2016, held in Chengdu, China, in October 2016. The 84 revised full papers presented in this book were carefully reviewed and selected from 138 submissions. The papers focus on Face Recognition and Analysis; Fingerprint, Palm-print and Vascular Biometrics; Iris and Ocular Biometrics; Behavioral Biometrics; Affective Computing; Feature Extraction and Classification Theory; Anti-Spoofing and Privacy; Surveillance; and DNA and Emerging Biometrics.

Sensors and measurement systems is an introduction to microsensors for engineering students in the final undergraduate or early graduate level, technicians who wants to know more about the systems they are using, and anybody curious enough to know what microsystems and microsensors can do. The book discusses five families of sensors: Thermal sensors Force and pressure sensors Inertial sensors Magnetic field sensors Flow sensors For each sensor, theoretical, technology and application aspects are examined. The sensor function is modelled to understand sensitivity, resolution and noise. We ask ourselves: What do we want to measure? What are possible applications? How are the sensor chips made in the cleanroom? How are they mounted and integrated in a system? After reading this book, you should be able to: Understand important thermal, mechanical, inertial and magnetic sensors Work with characterization parameters for sensors Choose sensors for a given application and apply them Understand micromachining technologies for sensors Data fusion, the ability to combine data derived from several sources to provide a coherent,

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informative, and useful characterization of a situation, is a challenging task. There is no unified and proven solution which is applicable in all circumstances, but there are many plausible and useful approaches which can be and are used to solve particular applications. This volume presents the proceedings of the workshop Data Fusion Applications hosted in Brussels by the 1992 ESPRIT Conference and Exhibition. It contains 22 papers from 69 experts, who present advanced research results on data fusion together with practical solutions to multisensor data fusion in a wide variety of applications: real-time expert systems, robotics, medical diagnosis and patient surveillance, monitoring and control, marine protection, surveillance and safety in public transportation systems, image processing and interpretation, and environmental monitoring. The research forms part of the ESPRIT project DIMUS (Data Integration in Multisensor Systems).

This book covers a variety of topics in the field of mechatronics engineering, with a special focus on innovative control and automation concepts for applications in a wide range of field, including industrial production, medicine and rehabilitation, education and transport. Based on a set of papers presented at the 1st International Conference "Innovation in Engineering", ICIE, held in Guimarães, Portugal, on June 28-30, 2021, the chapters report on cutting-edge control algorithms for mobile robots and robot manipulators, innovative industrial monitoring strategies for industrial process, improved production systems for smart manufacturing, and discusses important issues related to user experience, training and education, as well as national developments in the field of mechatronics. This volume, which belongs to a three-volume set, provides engineering researchers and professionals with a timely overview and extensive information on trends and technologies behind the future developments of mechatronics

systems in the era of Industry 4.0. .

Electromagnetic Non-destructive Evaluation (ENDE) is an invaluable, non-invasive diagnostic tool for the inspection, testing, evaluation and characterization of materials and structures. It has now become indispensable in a number of diverse fields ranging from biomedics to many branches of industry and engineering. This book presents the proceedings of the 24th International Workshop on Electromagnetic Nondestructive Evaluation, held in Chengdu, China from 11 - 14 September 2019. The 38 peer-reviewed and extended contributions included here were selected from 45 original submissions, and are divided into 7 sections: eddy current testing and evaluation; advanced sensors; analytical and numerical modeling; material characterization; inverse problem and signal processing; artificial intelligence in ENDE; and industrial applications of ENDE. The papers cover recent studies concerning the progress and application of electromagnetic (EM) fields in the non-destructive examination of materials and structures, and topics covered include evaluations at a micro-structural level, such as correlating the magnetic properties of a material with its grain structure, and a macroscopic level, such as techniques and applications for EM NDT&E. Recent developments and emerging materials such as advanced EM sensors, multi-physics NDT&E, intelligent data management and maintaining the integrity of structures are also explored. The book provides a current overview of developments in ENDE, and will be of interest to all those working in the field.

This book aims to explore the latest practices and research works in the area of sensor fusion. The book intends to provide a collection of novel ideas, theories, and solutions related to the research areas in the field of sensor fusion. This book is a unique, comprehensive, and up-to-

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date resource for sensor fusion systems designers. This book is appropriate for use as an upper division undergraduate or graduate level text book. It should also be of interest to researchers, who need to process and interpret the sensor data in most scientific and engineering fields. The initial chapters in this book provide a general overview of sensor fusion. The later chapters focus mostly on the applications of sensor fusion. Much of this work has been published in refereed journals and conference proceedings and these papers have been modified and edited for content and style. With contributions from the world's leading fusion researchers and academicians, this book has 22 chapters covering the fundamental theory and cutting-edge developments that are driving this field.

Sensor Fusion - Foundation and Applications comprehensively covers the foundation and applications of sensor fusion. This book provides some novel ideas, theories, and solutions related to the research areas in the field of sensor fusion. The book explores some of the latest practices and research works in the area of sensor fusion. The book contains chapters with different methods of sensor fusion for different engineering as well as non-engineering applications. Advanced applications of sensor fusion in the areas of mobile robots, automatic vehicles, airborne threats, agriculture, medical field and intrusion detection are covered in this book. Sufficient evidences and analyses have been provided in the chapter to show the effectiveness of sensor fusion in various applications. This book would serve as an invaluable reference for professionals involved in various applications of sensor fusion.

This book presents the latest research on Ambient Intelligence including software and applications. Ambient Intelligence (Aml) is a paradigm emerging from Artificial Intelligence, in which computers are used as proactive tools for assisting people with their day-to-day

activities, making everyone's lives more comfortable. Another main concern of Aml originates from the human-computer interaction domain and focuses on offering ways to interact with systems in a more natural way by means of user-friendly interfaces. This field is evolving rapidly, as can be seen in emerging natural language and gesture-based types of interaction. This symposium was jointly organized by the Universidade do Minho, Technical University of Valencia, Hiroshima University, and University of Salamanca. The latest installment was held in Ávila, Spain, from 26th to 28th June 2019. The authors wish to thank the sponsors: IEEE Systems Man and Cybernetics Society, Spain Section Chapter and the IEEE Spain Section (Technical Co-Sponsor), IBM, Indra, Viewnext, Global Exchange, AEPIA, APPIA and AIR Institute.

This book presents endeavors to join synergies in order to create added value for society, using the latest scientific knowledge to boost technology transfer from academia to industry. It potentiates the foundations for the creation of knowledge- and entrepreneurial cooperation networks involving engineering, innovation, and entrepreneurship stakeholders. The Regional HELIX 2018 conference was organized at the University of Minho's School of Engineering by the MEtRICs and Algoritmi Research Centers, and took place in Guimarães, Portugal, from June 27th to 29th, 2018. After a rigorous peer-review process, 160 were accepted for publication, covering a wide range of topics, including Control, Automation and Robotics; Mechatronics Design, Medical Devices and Wellbeing; Cyber-Physical Systems, IoT and Industry 4.0; Innovations in Industrial Context and Advanced Manufacturing; New Trends in Mechanical Systems Development; Advanced Materials and Innovative Applications; Waste to Energy and Sustainable Environment; Operational Research and Industrial Mathematics;

Innovation and Collaborative Arrangements; Entrepreneurship and Internationalization; and Oriented Education for Innovation, Engineering and/or Entrepreneurship.

Understanding Smart SensorsArtech House

This book focuses on the development of wellness protocols for smart home monitoring, aiming to forecast the wellness of individuals living in ambient assisted living (AAL) environments. It describes in detail the design and implementation of heterogeneous wireless sensors and networks as applied to data mining and machine learning, which the protocols are based on. Further, it shows how these sensor and actuator nodes are deployed in the home environment, generating real-time data on object usage and other movements inside the home, and therefore demonstrates that the protocols have proven to offer a reliable, efficient, flexible, and economical solution for smart home systems. Documenting the approach from sensor to decision making and information generation, the book addresses various issues concerning interference mitigation, errors, security and large data handling. As such, it offers a valuable resource for researchers, students and practitioners interested in interdisciplinary studies at the intersection of wireless sensing processing, radio communication, the Internet of Things and machine learning, and in how they can be applied to smart home monitoring and assisted living environments.

Over the last few decades, both the aeronautics and space disciplines have greatly influenced advances in controls, sensors, data fusion and navigation. Many of those achievements that made the word “aerospace” synonymous with “high-tech” were enabled by innovations in guidance, navigation and control. Europe has seen a strong trans-national consolidation process in aerospace over the last few decades. Most of the visible products, like commercial

aircraft, fighters, helicopters, satellites, launchers or missiles, are not made by a single country – they are the fruits of cooperation. No European country by itself hosts a specialized guidance, navigation and controls community large enough to cover the whole spectrum of disciplines. However, on a European scale, mutual exchange of ideas, concepts and solutions is enriching for all. The 1st CEAS Specialist Conference on Guidance, Navigation and Control is an attempt to bring this community together. This book is a selection of papers presented at the conference. All submitted papers have gone through a formal review process in compliance with good journal practices. The best papers have been recommended by the reviewers to be published in this book.

This book provides insights into the International e-Conference on Intelligent Systems and Signal Processing (eISSP 2020) held By Electronics & Communication Engineering Department of G H Patel College of Engineering & Technology, Gujarat, India, during 28-30 December 2020. The book comprises contributions by the research scholars and academicians covering the topics in signal processing and communication engineering, applied electronics and emerging technologies, Internet of Things (IoT), robotics, machine learning, deep learning and artificial intelligence. The main emphasis of the book is on dissemination of information, experience and research results on the current topics of interest through in-depth discussions and contribution of researchers from all over world. The book is useful for research community, academicians, industrialists and postgraduate students across the globe.

This conference proceedings presents the research papers in the field of mine planning and mining equipment including themes such as mine automation, rock mechanics, drilling, blasting, tunnelling and excavation engineering. The papers presents the recent advancement

and the application of a range of technologies in the field of mining industry. It is of interest to the professionals who practice in mineral industry including but not limited to engineers, consultants, managers, academics, scientist, and government staff.

Recent advances in technology and manufacturing have made it possible to create small, powerful, energy-efficient, cost-effective sensor nodes for specialized telecommunication applications—nodes "smart" enough to be capable of adaptation, self-awareness, and self-organization. *Sensor Networks for Sustainable Development* examines sensor network technologies that increase the quality of human life and encourage societal progress with minimal effect on the earth's natural resources and environment. Organized as a collection of articles authored by leading experts in the field, this valuable reference captures the current state of the art and explores applications where sensor networks are used for sustainable development in: Agriculture Environment Energy Healthcare Transportation Disaster management Beneficial to designers and planners of emerging telecommunication networks, researchers in related industries, and students and academia seeking to learn about the impact of sensor networks on sustainable development, *Sensor Networks for Sustainable Development* provides scientific tutorials and technical information about smart sensor networks and their use in everything from remote patient monitoring to improving safety on the roadways and beyond.

This book focuses on novel implementations of sensor technologies, artificial intelligence, machine learning, computer vision and statistics for automated, human fall recognition systems and related topics using data fusion. It includes theory and coding implementations to help readers quickly grasp the concepts and to highlight the applicability of this technology. For

convenience, it is divided into two parts. The first part reviews the state of the art in human fall and activity recognition systems, while the second part describes a public dataset especially curated for multimodal fall detection. It also gathers contributions demonstrating the use of this dataset and showing examples. This book is useful for anyone who is interested in fall detection systems, as well as for those interested in solving challenging, signal recognition, vision and machine learning problems. Potential applications include health care, robotics, sports, human-machine interaction, among others.

This book constitutes the proceedings of the Third International Conference on Internet of Things (IoT) Technologies for HealthCare, HealthyIoT 2016, held in Västerås, Sweden, October 18-19, 2016. The conference also included the First Workshop on Emerging eHealth through Internet of Things (EHIoT 2016). IoT as a set of existing and emerging technologies, notions and services provides many solutions to delivery of electronic healthcare, patient care, and medical data management. The 31 revised full papers presented along with 9 short papers were carefully reviewed and selected from 43 submissions in total. The papers cover topics such as healthcare support for the elderly, real-time monitoring systems, security, safety and communication, smart homes and smart caring environments, intelligent data processing and predictive algorithms in e-Health, emerging eHealth IoT applications, signal processing and analysis, and smartphones as a healthy thing.

Ambient Diagnostics addresses innovative methods for discovering patterns from affordable devices, such as mobile phones, watches, cameras, and game interfaces, to interpret multimedia data for personal health monitoring and diagnosis. This is the first comprehensive textbook on multidisciplinary innovations in affordable healthcare-from senso

To further improve the NLOS detection and mitigation performance for Ultra-wideband (UWB) system, this thesis systematically investigates the UWB LOS/NLOS errors. The LOS errors are evaluated in different environments and with different distances. Different blockage materials and blockage conditions are considered for NLOS errors. The UWB signal propagation is also investigated. Furthermore, the relationships between the CIRs and the accurate/inaccurate range measurements are theoretically discussed in three different situations: ideal LOS path, small-scale fading: multipath and NLOS path. These theoretical relationships are validated with real measured CIRs in the Bosch Shanghai office environment. Based on the error and signal propagation investigation results, four different algorithms are proposed for four different scenarios to improve the NLOS identification accuracy. After the comparison of the localization performance for TOA/TDOA, it is found that on normal office floor, TOA works better than TDOA. In harsh industrial environments, where NLOS frequently

occurs, TDOA is more suitable than TOA. Thus, in the first scenario, the position estimation is realized with TOA on the office floor, while in the second scenario, a novel approach to combined TOA and TDOA with accurate range and range difference selection is proposed in the harsh industrial environment. The optimization of the feature combination and parameters in machine learning algorithms for accurate measurement detection is discussed for both scenarios. For the third and fourth scenarios, the UWB/IMU fusion system stays in focus. Instead of detecting the NLOS outliers by assuming that the error distributions are Gaussian, the accurate measurement detection is realized based on the triangle inequality theorem. All the proposed approaches are tested with the collected measurements from the developed UWB system. The position estimation of these approaches has better accuracy than that of the traditional methods.

The Second Edition of the bestselling Measurement, Instrumentation, and Sensors Handbook brings together all aspects of the design and implementation of measurement, instrumentation, and sensors. Reflecting the current state of the art, it describes the use of instruments and techniques for performing practical measurements in engineering, physics, chemistry, and the life sciences and discusses processing systems, automatic data acquisition, reduction and

analysis, operation characteristics, accuracy, errors, calibrations, and the incorporation of standards for control purposes. Organized according to measurement problem, the Electromagnetic, Optical, Radiation, Chemical, and Biomedical Measurement volume of the Second Edition: Contains contributions from field experts, new chapters, and updates to all 98 existing chapters Covers sensors and sensor technology, time and frequency, signal processing, displays and recorders, and optical, medical, biomedical, health, environmental, electrical, electromagnetic, and chemical variables A concise and useful reference for engineers, scientists, academic faculty, students, designers, managers, and industry professionals involved in instrumentation and measurement research and development, Measurement, Instrumentation, and Sensors Handbook, Second Edition: Electromagnetic, Optical, Radiation, Chemical, and Biomedical Measurement provides readers with a greater understanding of advanced applications.

Now in its third edition, Understanding Smart Sensors is the most complete, up-to-date, and authoritative summary of the latest applications and developments impacting smart sensors in a single volume. This thoroughly expanded and revised edition of an Artech bestseller contains a wealth of new material, including critical coverage of sensor fusion and energy harvesting, the latest

details on wireless technology, and greater emphasis on applications through the book. Utilizing the latest in smart sensor, microelectromechanical systems (MEMS) and microelectronic research and development, Engineers get the technical and practical information they need keep their designs and products on the cutting edge. Providing an extensive variety of information for both technical and non-technical professionals, this easy-to-understand, time-saving book covers current and emergent technologies, as well as their practical implementation. This comprehensive resource also includes an extensive list of smart sensor acronyms and a glossary of key terms.

This book features papers presented at IIH-MSP 2018, the 14th International Conference on Intelligent Information Hiding and Multimedia Signal Processing. The scope of IIH-MSP included information hiding and security, multimedia signal processing and networking, and bio-inspired multimedia technologies and systems. The book discusses subjects related to massive image/video compression and transmission for emerging networks, advances in speech and language processing, recent advances in information hiding and signal processing for audio and speech signals, intelligent distribution systems and applications, recent advances in security and privacy for multimodal network environments, multimedia signal processing, and machine learning. Presenting

the latest research outcomes and findings, it is suitable for researchers and students who are interested in the corresponding fields. IIH-MSP 2018 was held in Sendai, Japan on 26–28 November 2018. It was hosted by Tohoku University and was co-sponsored by the Fujian University of Technology in China, the Taiwan Association for Web Intelligence Consortium in Taiwan, and the Swinburne University of Technology in Australia, as well as the Fujian Provincial Key Laboratory of Big Data Mining and Applications (Fujian University of Technology) and the Harbin Institute of Technology Shenzhen Graduate School in China.

This two volume set constitutes the refereed proceedings of the 14th EAI International Conference on Communications and Networking, ChinaCom 2019, held in November/December 2019 in Shanghai, China. The 81 papers presented were carefully selected from 162 submissions. The papers are organized in topical sections on Internet of Things (IoT), antenna, microwave and cellular communication, wireless communications and networking, network and information security, communication QoS, reliability and modeling, pattern recognition and image signal processing, and information processing.

The intense development of novel data-driven and hybrid methods for structural health monitoring (SHM) has been demonstrated by field deployments on large-

scale systems, including transport, wind energy, and building infrastructure. The actionability of SHM as an essential resource for life-cycle and resilience management is heavily dependent on the advent of low-cost and easily deployable sensors. Nonetheless, in optimizing these deployments, a number of open issues remain with respect to the sensing side. These are associated with the type, configuration, and eventual processing of the information acquired from these sensors to deliver continuous behavioral signatures of the monitored structures. This book discusses the latest advances in the field of sensor networks for SHM. The focus lies both in active research on the theoretical foundations of optimally deploying and operating sensor networks and in those technological developments that might designate the next generation of sensing solutions targeted for SHM. The included contributions span the complete SHM information chain, from sensor design to configuration, data interpretation, and triggering of reactive action. The featured papers published in this Special Issue offer an overview of the state of the art and further proceed to introduce novel methods and tools. Particular attention is given to the treatment of uncertainty, which inherently describes the sensed information and the behavior of monitored systems.

Exciting new developments are enabling sensors to go beyond the realm of simple sensing of

movement or capture of images to deliver information such as location in a built environment, the sense of touch, and the presence of chemicals. These sensors unlock the potential for smarter systems, allowing machines to interact with the world around them in more intelligent and sophisticated ways. Featuring contributions from authors working at the leading edge of sensor technology, *Technologies for Smart Sensors and Sensor Fusion* showcases the latest advancements in sensors with biotechnology, medical science, chemical detection, environmental monitoring, automotive, and industrial applications. This valuable reference describes the increasingly varied number of sensors that can be integrated into arrays, and examines the growing availability and computational power of communication devices that support the algorithms needed to reduce the raw sensor data from multiple sensors and convert it into the information needed by the sensor array to enable rapid transmission of the results to the required point. Using both SI and US units, the text: Provides a fundamental and analytical understanding of the underlying technology for smart sensors Discusses groundbreaking software and sensor systems as well as key issues surrounding sensor fusion Exemplifies the richness and diversity of development work in the world of smart sensors and sensor fusion Offering fresh insight into the sensors of the future, *Technologies for Smart Sensors and Sensor Fusion* not only exposes readers to trends but also inspires innovation in smart sensor and sensor system development.

This book constitutes the thoroughly refereed post-conference proceedings of the 8th International ICST Conference on Mobile and Ubiquitous Systems: Computing, Networking, and Services, *MobiQuitous 2011*, held in Copenhagen, Denmark, in December 2011. The 34 revised full papers presented were carefully reviewed and selected from numerous

submissions. They cover a wide range of topics ranging from localization and tracking, search and discovery, classification and profiling, context awareness and architecture, location and activity recognition as well as a best paper session, an industry track, and poster and demo papers.

### Spatial Reasoning and Multi-Sensor Fusion

This edited book contains invited papers from renowned experts working in the field of Wearable Electronics Sensors. It includes 14 chapters describing recent advancements in the area of Wearable Sensors, Wireless Sensors and Sensor Networks, Protocols, Topologies, Instrumentation architectures, Measurement techniques, Energy harvesting and scavenging, Signal processing, Design and Prototyping. The book will be useful for engineers, scientist and post-graduate students as a reference book for their research on wearable sensors, devices and technologies which is experiencing a period of rapid growth driven by new applications such as heart rate monitors, smart watches, tracking devices and smart glasses.

Non-destructive testing (NDT) systems can generate incomplete, incorrect or conflicting information about a flaw or a defect. Therefore, the use of more than one NDT system is usually required for accurate defect detection and/or quantification. In addition to a reduction in inspection time, important cost savings could be achieved if a data fusion process is developed to combine signals from multisensor systems for manual and remotely operated inspections. This gathering of data from multiple sources and an efficient processing of information help in decision making, reduce signal uncertainty and increase the overall performance of a non-destructive examination. This book gathers, for the first time, essays from leading NDT experts involved in data fusion. It explores the concept of data fusion by providing a comprehensive

review and analysis of the applications of NDT data fusion. This publication concentrates on NDT data fusion for industrial applications and highlights progress and applications in the field of data fusion in areas ranging from materials testing in the aerospace industry to medical applications. Each chapter contains a specific case study with a theoretical part but also presents experimental results from a practical point of view. The book should be considered more as a pragmatic introduction to the applications of NDT data fusion rather than a rigorous basis for theoretical studies.

The proliferation of powerful but cheap devices, together with the availability of a plethora of wireless technologies, has pushed for the spread of the Wireless Internet of Things (WIoT), which is typically much more heterogeneous, dynamic, and general-purpose if compared with the traditional IoT. The WIoT is characterized by the dynamic interaction of traditional infrastructure-side devices, e.g., sensors and actuators, provided by municipalities in Smart City infrastructures, and other portable and more opportunistic ones, such as mobile smartphones, opportunistically integrated to dynamically extend and enhance the WIoT environment. A key enabler of this vision is the advancement of software and middleware technologies in various mobile-related sectors, ranging from the effective synergic management of wireless communications to mobility/adaptivity support in operating systems and differentiated integration and management of devices with heterogeneous capabilities in middleware, from horizontal support to crowdsourcing in different application domains to dynamic offloading to cloud resources, only to mention a few. The book presents state-of-the-art contributions in the articulated WIoT area by providing novel insights about the development and adoption of middleware solutions to enable the WIoT vision in a wide

spectrum of heterogeneous scenarios, ranging from industrial environments to educational devices. The presented solutions provide readers with differentiated point of views, by demonstrating how the WIoT vision can be applied to several aspects of our daily life in a pervasive manner.

This book constitutes the refereed post-conference proceedings of the Second EAI International Conference on Wearables in Healthcare, HealthWear 2020. Due to COVID-19 pandemic the conference was held virtually. The 16 revised full papers were carefully reviewed and selected from 40 submissions. They focus on wearable devices and systems for healthcare and wellbeing. The papers are organized in topical sections as follows: PPG and algorithms focusing on photoplethysmography, PPG monitoring and cardiorespiratory measurement. The next section focus on IoT and smart sensors on the use of wearable devices and systems for Internet of Medical Things application. The third section is a new session introducing wearable applications. This track focuses on the intrinsic multidisciplinary of wearable devices, and includes works on methodology and design aspect of wearable research.

Many sensors are currently available at prices lower than USD 100 and cover a wide range of biological signals: motion, muscle activity, heart rate, etc. Such low-cost sensors have metrological features allowing them to be used in everyday life and clinical applications, where gold-standard material is both too expensive and time-consuming to be used. The selected papers present current applications of low-cost sensors in domains such as physiotherapy, rehabilitation, and affective technologies. The results cover various aspects of low-cost sensor technology from hardware design to software optimization.

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Under the motto “Healthcare Technology for Developing Countries” this book publishes many topics which are crucial for the health care systems in upcoming countries. The topics include Cyber Medical Systems Medical Instrumentation Nanomedicine and Drug Delivery Systems Public Health Entrepreneurship This proceedings volume offers the scientific results of the 6th International Conference on the Development of Biomedical Engineering in Vietnam, held in June 2016 at Ho Chi Minh City.

The book discusses the latest developments and outlines future trends in the fields of microelectronics, electromagnetics and telecommunication. It contains original research works presented at the International Conference on Microelectronics, Electromagnetics and Telecommunication (ICMEET 2018), organised by GVP College of Engineering (A), Andhra Pradesh, India. The respective papers were written by scientists, research scholars and practitioners from leading universities, engineering colleges and R&D institutes from all over the world, and share the latest breakthroughs in and promising solutions to the most important issues facing today’s society.

This book covers the Cortex-M, a 32-bit MCU (microcontroller unit) built with an ARM processor core, and the Mbed OS, an operating system developed to efficiently manage processors. The book is largely divided into five parts. In Part 1, the background of the microcontroller, necessity, characteristics, and configuration of the Mbed OS will be described. Part 2 is about programming for basic input/output devices, and lays the foundation by learning not only basic functions but also their utilization. In studying basic input/output functions supported by Mbed OS over several chapters, it is configured to first look at basic concepts and develop utilization skills through practice using those functions. For example, learning the

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functions of the Timer class will help you to think from various viewpoints about the structure of the program. In Part 3, the major communication methods such as UART, I2C and SPI necessary to design and realize an embedded system will be studied since they have not been covered in detail in despite of their importance. In addition to the interface with peripherals using these communication methods, topics about efficient communication using callback functions are also examined. Part 4 covers advanced programming topics related to Bus I/O, RTOS, and Circular Buffer. In particular, RTOS classes such as Thread, Mutex, and Queue will be learned through various examples. Part 5 introduces projects that require multiple functions and concepts of Mbed OS, so that readers can improve their application skills. For example, we will challenge to develop ultrasonic rangefinder, stepper motor drive, encoder reading, DC motor PID control, Lidar scanner, and AHRS (attitude heading reference system) using IMU (inertial measurement unit) sensor to enhance the overall application capabilities and further to obtain practical system configuration skills.

This book presents new methods and approaches to real-world problems as well as exploratory research that describes novel artificial intelligence applications, including deep learning, neural networks and hybrid algorithms. This book constitutes the refereed proceedings of the Artificial Intelligence Trends in Intelligent Systems Section of the 6th Computer Science On-line Conference 2017 (CSOC 2017), held in April 2017.

This book constitutes extended and revised versions of the selected papers from the 13th International Joint Conference on Biomedical Engineering Systems and Technologies, BIOSTEC 2020, held in Valletta, Malta, in February 2020. The 29 revised and extended full papers presented were carefully reviewed and selected from a total of 363 submissions. The

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papers are organized in topical sections on biomedical electronics and devices; bioimaging; bioinformatics models, methods and algorithms; bio-inspired systems and signal processing; health informatic.

To realize the full potential of micro- and nanoscale devices in system building, it is critical to develop systems engineering methodologies that successfully integrate stand-alone, small-scale technologies that can effectively interface with the macro world. So how do we accomplish this? Systems Engineering for Microscale and Nanoscale Technologie

This book addresses the techniques for modeling and integration of data provided by different sensors within robotics and knowledge sources within machine intelligence. Leaders in robotics and machine intelligence capture state-of-the-art technology in data sensor fusion and give a unified vision of the future of the field, presented from both the theoretical and practical angles.

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