Cmos Ccd Sensors And Camera Systems 2nd Edition

This book constitutes the refereed proceedings of the 15th International Conference on Image Analysis and Processing, ICIAP 2009, held in Vietri sul Mare, Italy, in September 2009. The 107 revised full papers presented together with 3 invited papers were carefully reviewed and selected from 168 submissions. The papers are organized in topical sections on computer graphics and image processing, low and middle level processing, 2D and 3D segmentation, feature extraction and image analysis, object detection and recognition, video analysis and processing, pattern analysis and classification, learning, graphs and trees, applications, shape analysis, face analysis, medical imaging, and image analysis and pattern recognition.

The fully updated edition of this bestseller addresses CMOS/CCD differences, similarities, and applications, including architecture concepts and operation, such as full-frame, interline transfer, progressive scan, color filter arrays, rolling shutters, 3T, 4T, 5T, and 6T. The authors discuss novel designs, illustrate sampling theory and aliasing with numerous examples, and describe the advantages and limitations of small pixels. This monograph provides the very latest information for specifying cameras using radiometric or photometric concepts to consider the entire system--from scene to observer. Numerous new references have also been added.

Using images to reconstruct the world in three dimensions is a classical computer vision task. Some examples of applications where this is useful are autonomous mapping and navigation, urban planning, and special effects in movies. One common approach to 3D reconstruction is "structure from motion" where a scene is imaged multiple times from different positions, e.g. by moving the camera. However, in a twist of irony, many structure from motion methods work best when the camera is stationary while the image is captured. This is because the motion of the camera can cause distortions in the image that lead to worse image measurements, and thus a worse reconstruction. One such distortion common to all cameras is motion blur, while another is connected to the use of an electronic rolling shutter. Instead of capturing all pixels of the image at once, a camera with a rolling shutter captures the image row by row. If the camera is moving while the image is captured the rolling shutter causes non-rigid distortions in the image that, unless handled, can severely impact the reconstruction quality. This thesis studies methods to robustly perform 3D reconstruction in the case of a moving camera. To do so, the proposed methods make use of an inertial measurement unit (IMU). The IMU measures the angular velocities and linear accelerations of the camera, and these can be used to estimate the trajectory of the camera over time. Knowledge of the camera motion can then be used to correct for the distortions caused by the rolling shutter. Another benefit of an IMU is that it can provide measurements also in situations when a camera can not, e.g. because of excessive motion blur, or absence of scene structure. To use a camera together with an IMU, the camera-IMU system must be jointly calibrated. The relationship between their respective coordinate frames need to be established, and their timings need to be synchronized. This thesis shows how to automatically perform this calibration and synchronization, without requiring e.g. calibration objects or special motion patterns. In standard structure from motion, the camera trajectory is modeled as discrete poses, with one pose per image. Switching instead to a formulation with a continuous-time camera trajectory provides a natural way to handle rolling shutter distortions, and also to incorporate inertial measurements. To model the continuous-time trajectory, many authors have used splines. The ability for a spline-based trajectory to model the real motion depends on the density of its spline knots. Choosing a too smooth spline results in approximation errors. This thesis proposes a method to estimate the spline approximation error, and use it to better balance camera and IMU measurements, when used in a sensor fusion framework. Also proposed is a way to automatically decide how dense the spline needs to be to achieve a good reconstruction. Another approach to reconstruct a 3D scene is to use a camera that directly measures depth. Some depth cameras, like the well-known Microsoft Kinect, are susceptible to the same rolling shutter effects as normal cameras. This thesis quantifies the effect of the rolling shutter distortion on 3D reconstruction, depending on the amount of motion. It is also shown that a better 3D model is obtained if the depth images are corrected using inertial measurements. Att använda bilder för att återskapa världen omkring oss i tre dimensioner är ett klassiskt problem inom datorseende. Några exempel på användningsområden är inom navigering och kartering för autonoma system, stadsplanering och specialeffekter för film och spel. En vanlig metod för 3D-rekonstruktion är det som kallas "struktur från rörelse". Namnet kommer sig av att man avbildar (fotograferar) en miljö från flera olika platser, till exempel genom att flytta kameran. Det är därför något ironiskt att många struktur-från-rörelse-algoritmer får problem om kameran inte är stilla när bilderna tas, exempelvis genom att använda sig av ett stativ. Anledningen är att en kamera i rörelse ger upphov till störningar i bilden vilket ger sämre bildmätningar, och därmed en sämre 3D-rekonstruktion. Ett välkänt exempel är rörelseoskärpa, medan ett annat är kopplat till användandet av en elektronisk rullande slutare. I en kamera med rullande slutare avbildas inte alla pixlar i bilden samtidigt, utan istället rad för rad. Om kameran rör på sig medan bilden tas uppstår därför störningar i bilden som måste tas om hand om för att få en bra rekonstruktion. Den här avhandlingen berör robusta metoder för 3D-rekonstruktion med rörliga kameror. En röd tråd inom arbetet är användandet av en tröghetssensor (IMU). En IMU mäter vinkelhastigheter och accelerationer, och dessa mätningar kan användas för att bestämma hur kameran har rört sig över tid. Kunskap om kamerans rörelse ger möjlighet att korrigera för störningar på grund av den rullande slutaren. Ytterligare en fördel med en IMU är att den ger mätningar även i de fall då en kamera inte kan göra det. Exempel på sådana fall är vid extrem rörelseoskärpa, starkt motljus, eller om det saknas struktur i bilden. Om man vill använda en kamera tillsammans med en IMU så måste dessa kalibreras och synkroniseras: relationen mellan deras respektive koordinatsystem måste bestämmas, och de måste vara överens om vad klockan är. I den här avhandlingen presenteras en metod för att automatiskt kalibrera och synkronisera ett kamera-IMU-system utan krav på exempelvis kalibreringsobjekt eller speciella rörelsemönster. I klassisk struktur från rörelse representeras kamerans rörelse av att varje bild beskrivs med en kamera-pose. Om man istället representerar kamerarörelsen som en tidskontinuerlig trajektoria kan man på ett naturligt sätt hantera problematiken kring rullande slutare. Det gör det också enkelt att införa tröghetsmätningar från en IMU. En tidskontinuerlig kameratrajektoria kan skapas på flera sätt, men en vanlig metod är att använda sig av så kallade splines. Förmågan hos en spline att representera den faktiska kamerarörelsen beror på hur tätt dess knutar placeras. Den här avhandlingen presenterar en metod för att uppskatta det approximationsfel som uppkommer vid valet av en för gles spline. Det uppskattade approximationsfelet kan sedan användas för att balansera mätningar från kameran och IMU:n när dessa används för sensorfusion. Avhandlingen innehåller också en metod för att bestämma hur tätt en spline behöver vara för att ge ett gott resultat. En annan metod för 3D-rekonstruktion är att använda en kamera som också mäter djup, eller avstånd. Vissa djupkameror, till exempel Microsoft Kinect, har samma problematik med rullande slutare som vanliga kameror. I den här avhandlingen visas hur den rullande slutaren i kombination med olika typer och storlekar av rörelser påverkar den återskapade 3D-modellen. Genom att använda tröghetsmätningar från en IMU kan djupbilderna korrigeras, vilket visar sig ge en bättre 3D-modell.

Showcasing the most influential developments, experiments, and architectures impacting the digital, surveillance, automotive, industrial, and medical sciences, this text/reference tracks the evolution and advancement of CVIP technologies - examining methods and algorithms for image analysis, optimization, segmentation, and restoration.

This book presents a variety of perspectives on vision-based applications. These contributions are focused on optoelectronic sensors, 3D & 2D machine vision technologies, robot navigation, control schemes, motion controllers, intelligent algorithms and vision systems. The authors focus on applications of unmanned aerial vehicles, autonomous and mobile robots, industrial inspection applications and structural health monitoring. Recent advanced research in measurement and others areas where 3D & 2D machine vision and machine control play an important role, as well as surveys and reviews about vision-based applications. These topics are of interest to readers from diverse areas, including electrical, electronics and computer engineering, technologists, students and non-specialist readers. • Presents current research in

image and signal sensors, methods, and 3D & 2D technologies in vision-based theories and applications; • Discusses applications such as daily use devices including robotics, detection, tracking and stereoscopic vision systems, pose estimation, avoidance of objects, control and data exchange for navigation, and aerial imagery processing; • Includes research contributions in scientific, industrial, and civil applications. An engineering system contains multiple components that interconnect to perform a specific task. Starting from basic fundamentals through to advanced applications, Sensors and Actuators: Engineering System Instrumentation, Second Edition thoroughly explains the inner workings of an engineering system. The text first provides introductory material-p

Have you stepped up to a digital single-lens-reflex (dSLR) camera only to find the range of capabilities daunting? Combining features traditionally found on 35mm film cameras — precise shutter speed and exposure settings, interchangeable lenses and accessories, superior image quality — with the ease and storage capacity of digital cameras, a dSLR is a powerful new tool that can create truly great digital pictures. But the learning curve for photographers moving from the point-and-shoot digital world can be formidable. In this book, photographer and industry consultant Jon Canfield shows you how to take full advantage of dSLR photography, illuminating the entire process with nuggets of hard-won expertise. He also shows you how to use popular image-editing software such as Adobe Photoshop and Adobe Photoshop Elements to improve your images.The Digital SLR Guide is brimming with tips and tricks for getting the most from your equipment. The book is heavily illustrated with images and provides everything you need to know about choosing and using dSLR cameras and equipment. You'll learn how to: • Get the right stuff. Explore popular digital SLR cameras and compare accessories, such as lenses, flashes, and filters. • Learn the camera inside and out. Master dSLR camera controls and advanced features for maximum impact. • shoot like an expert. Cut to the chase with innovative, time-saving, and creative photography techniques. • Edit your images. Use Photoshop and Photoshop Elements to make your pictures even better. • Boost quality. Work with high-quality raw capture modes for the best possible photos.

Because of their high noise immunity and low static power supply drain, complementary metal-oxide-semiconductor (CMOS) devices produce less heat than other forms of logic and allow a high density of logic functions on a chip. These beneficial characteristics have fueled the use of CMOS image sensors in consumer electronics, robot vision, biotechnology, and medicine. With the introduction of smart functions in CMOS image sensors, even more versatile applications are now possible. Exploring this popular technology, Smart CMOS Image Sensors and Applications focuses on the smart functions implemented in CMOS image sensors as well as the applications of these sensors. After discussing the history of smart CMOS image sensors, the book describes the fundamental elements of CMOS image sensors. It covers some optoelectronic device physics and introduces typical CMOS image sensor structures, such as an active pixel sensor (APS). Subsequent chapters elucidate the functions and materials of smart CMOS image sensors and present examples of smart imaging. The final chapter explores various applications of smart CMOS image sensors. Several appendices supply a range of information on constants, illuminance, MOSFET characteristics, and optical resolution. This book provides a firm foundation in existing smart CMOS image sensor technology and applications, preparing you for the next phase of smart CMOS image sensors.

Biological systems are a source of inspiration in the development of small autonomous sensor nodes. The two major types of optical vision systems found in nature are the single aperture human eye and the compound eye of insects. The latter are among the most compact and smallest vision sensors. The eye is a compound of individual lenses with their own photoreceptor arrays. The visual system of insects allows them to fly with a limited intelligence and brain processing power. A CMOS image sensor replicating the perception of vision in insects is discussed and designed in this book for industrial (machine vision) and medical applications. The CMOS metal layer is used to create an embedded micro-polarizer able to sense polarization information. This polarization information is shown to be useful in applications like real time material classification and autonomous agent navigation. Further the sensor is equipped with in pixel analog and digital memories which allow variation of the dynamic range and in-pixel binarization in real time. The binary output of the pixel tries to replicate the flickering effect of the insect's eye to detect smallest possible motion based on the change in state. An inbuilt counter counts the changes in states for each row to estimate the direction of the motion. The chip consists of an array of 128x128 pixels, it occupies an area of 5 x 4 mm2 and it has been designed and fabricated in an 180nm CMOS CIS process from UMC.

This book brings together everything you need to achieve superior results with PC-based image processing and analysis. Thomas Klinger combines a highly accessible overview of the field's key concepts, tools, and techniques; the first expert introduction to NI's breakthrough IMAQ Vision software; and several start-to-finish application case studies. You also get an extensive library of code and image samples, as well as a complete trial version of IMAQ Vision for Windows.

In the fields of documentation and conservation of cultural heritage assets, there is a constant need for higher quality records and better analytical tools for extracting information about the condition of artefacts. Digital photography and digital image processing provide these capabilities, and recent technological advances in both fields promise new levels of performance for the capture and understanding of colour images. This inter-disciplinary book covers the imaging of decorated surfaces in historical buildings and the digitisation of documents, paintings and objects in museums and galleries, and shows how user requirements can be met by application of powerful digital imaging techniques. Numerous case studies illustrate the methods.

Digital Video Surveillance and Security provides a blueprint for the IP-based electronic security system clients need, allowing security professionals to protect their client's place of business or home. The author gives detailed plans on the best camera position, areas of coverage, and hardware and software to select to maximize the effectiveness of newer lower-cost networked technologies. Clear, step-by-step descriptions and detailed illustrations describe the integration of such components as the current or new security system, door and window sensors, or other access controls, offering the capability of instantly launching a video of the area under surveillance on a computer or HDTV. Today's digital video surveillance solutions are networked, digitally archived, offering granular, managed accessibility from anywhere (any office, home, PDA, or smart phone), and providing interoperability and simple scalability. With recent advances in technology, DVS is economically attainable for most businesses. Security consultants can use this information to guide their clients in making budget-friendly choices of design and equipment and assembling the optimal system for their needs. Systems installers can use this step-by-step illustrated guide to master this crucial new technology. Vendor-neutral comparisons of camera equipment and recording options Common sense approach Highly visual presentation Case studies and descriptions of best practices Step-by-step guides Easy to read diagrams and schematics

This volume is about ultra high-speed cameras, which enable us to see what we normally do not see. These are objects that are moving very fast, or that we just ignore. Ultra high-speed cameras invite us to a wonderland of microseconds. There Alice (the reader) meets a ultra high-speed rabbit (this volume) and travels together through this wonderland from the year 1887 to 2017. They go to the horse riding ground and see how a horse gallops. The rabbit takes her to a showroom where various cameras and illumination devices are presented. Then, he sends Alice into semiconductor labyrinths, wind tunnels, mechanical processing factories, and dangerous explosive fields. Sometimes Alice is large, and at other times she is very small. She sits even inside a car engine. She falls down together with a droplet. She enters a microbubble, is thrown out with a jet stream, and finds herself in a human body. Waking up from her dream, she sees children playing a game: "I see what you do not see, and this is....". Alice thinks: "The ultra high-speed rabbit showed me many things which I had never seen. Now I will go again to this wonderland, and try to find something new. Providing a succinct introduction to the systemization, noise sources, and signal processes of image sensor technology, Essential Principles of Image Sensors discusses image information and its four factors: space, light intensity, wavelength, and time. Featuring clarifying and insightful illustrations, this must-have text: Explains how image sensors convert optical image information into image signals Treats space, wavelength, and time as digitized built-in coordinate points in image sensors and systems Details the operational principles, pixel technology, and evolution of CCD, MOS, and CMOS sensors with updated technology Describes sampling theory, presenting unique figures demonstrating the importance of phase Explores causes for the decline of image information quality In a straightforward manner suitable for beginners and experts alike, Essential Principles of Image Sensors covers key topics related to digital imaging including semiconductor physics, component elements necessary for image sensors, silicon as a sensitive material, noises in sensors, and more.

The new edition of CCTV, a high-level professional reference, is expanded to cover all video compression techniques used in the ever-increasing assortment of digital video recorders (DVRs) available on the market today. In addition to demystifying DVR technology, the third edition also clarifies the technology of data networking and explains various compression techniques. Along with all this, the book retains the particulars that made the previous editions convenient and valuable, including details of CCD cameras, lenses, coaxial cables, fiber-optics, and system design. Updated to address digital techniques, networking, and the Internet in closed-circuit television Includes brand new sections on CCTV networking, digital video recorders (DVRs), various video compression techniques, and understanding pixels and digital image quality Fully illustrated with dozens of photographs, tables, checklists, charts, diagrams, and instructions

This revision of the classic book on CCTV technology, CCTV Surveillance, provides a comprehensive examination of CCTV, covering the applications of various systems, how to design and install a system, and how to choose the right hardware. Taking into account the ever-changing advances in technology using digital techniques and the Internet, CCTV Surveillance, Second Edition, is completely updated with the recent advancements in digital cameras and digital recorders, remote monitoring via the Internet, and CCTV integration with other security systems. Continuing in the celebrated tradition of the first edition, the second edition is written to serve as a useful resource for the end-user as well as the technical practitioner. Each chapter begins with an overview, and presents the latest information on the relevant equipment, describing the characteristics, features and application of each device. Coverage of aging or obsolete technology is reduced to a historical perspective, and eight brand new chapters cover digital video technology, multiplexers, integrated camera-lens-housing, smart domes, and rapid deployment CCTV systems. Serves as an indispensable resource on CCTV theory Includes eight new chapters on the use of digital components and other related technologies that have seen a recent explosion in use Fully illustrated, the book contains completely updated photographs and diagrams that represent the latest in CCTV technology advancements

This book is a printed edition of the Special Issue "Photon-Counting Image Sensors" that was published in Sensors

This book presents an overview of smart camera systems, considering practical applications but also reviewing fundamental aspects of the underlying technology. It introduces in a tutorial style the principles of sensing and signal processing, and also describes topics such as wireless connection to the Internet of Things (IoT) which is expected to be the biggest market for smart cameras. It is an excellent guide to the fundamental of smart camera technology, and the chapters complement each other well as the authors have worked as a team under the auspice of GFP(Global Frontier Project), the largest-scale funded research in Korea. This is the third of three books based on the Integrated Smart Sensors research project, which describe the development of innovative devices, circuits, and system-level enabling technologies. The aim of the project was to develop common platforms on which various devices and sensors can be loaded, and to create systems offering significant improvements in information processing speed, energy usage, and size. This book contains extensive reference lists, introduces the reader to the subject in a tutorial style and also reviews state-of-the-art results, which allows it to be used as a guide for starting researchers.

A comprehensive and practical analysis and overview of the imaging chain through acquisition, processing and displayThe Handbook of Digital Imaging provides a coherent overview of the imaging science amalgam, focusing on the capture, storage and display of images. The volumes are arranged thematically to provide a seamless analysis of the imaging chain from source (image acquisition) to destination (image print/display). The coverage is planned to have a very practical orientation to provide a comprehensive source of information for practicing engineers designing and developing modern digital imaging systems. The content will be drawn from all aspects of digital imaging including optics, sensors, quality, control, colour encoding and decoding, compression, projection and display.• Contains approximately 50, highly illustrated articles (ranging from 20-40 pages), printed in full colour throughoutComprehensive 3-volume set, also available on Wiley Online Library. • Over 50 Contributors, with contributors from Europe, US and Asia. Contributors are both and from academia and industryThe 3 volumes will be organized thematically for enhanced usability:Volume 1: Image Capture and Storage• Image Capture and Storage Volume 2: Image Display and Reproduction• Image Display and Projection• Hardcopy Technology• Halftoning and Physical Evaluation• Models for Halftone ReproductionVolume 3: Imaging System Applications• Media Imaging• Remote Imaging• Medical and Forensic ImagingIdeal for engineers and designers in the dynamic global imaging and display industries

Image processing is fast becoming a valuable tool for analyzing multidimensional data in all areas of natural science. Since the publication of the best-selling first edition of this handbook, the field of image processing has matured in many of its aspects from ad hoc, empirical

approaches to a sound science based on established mathematical and p

"Advanced Image Acquisition, Processing Techniques and Applications" is the first book of a series that provides image processing principles and practical software implementation on a broad range of applications. The book integrates material from leading researchers on Applied Digital Image Acquisition and Processing. An important feature of the book is its emphasis on software tools and scientific computing in order to enhance results and arrive at problem solution.

The first comprehensive and up-to-date reference on mechatronics, Robert Bishop's The Mechatronics Handbook was quickly embraced as the gold standard for the field. With updated coverage on all aspects of mechatronics, The Mechatronics Handbook, Second Edition is now available as a two-volume set. Each installment offers focused coverage of a particular area of mechatronics, supplying a convenient and flexible source of specific information. This seminal work is still the most exhaustive, state-of-the-art treatment of the field available. Mechatronics Systems, Sensors, and Actuators: Fundamentals and Modeling presents an overview of mechatronics, providing a foundation for those new to the field and authoritative support for seasoned professionals. The book introduces basic definitions and the key elements and includes detailed descriptions of the mathematical models of the mechanical, electrical, and fluid subsystems that comprise mechatronic systems. New chapters include Mechantronics Engineering Curriculum Design and Numerical Simulation. Discussion of the fundamental physical relationships and mathematical models associated with commonly used sensor and actuator technologies complete the coverage. Features Introduces the key elements of mechatronics and discusses new directions Presents the underlying mechanical and electronic mathematical models comprising many mechatronic systems Provides a detailed discussion of the process of physical system modeling Covers time, frequency, and sensor and actuator characteristics

This textbook provides a comprehensive, fully-updated introduction to the essentials of nanometer CMOS integrated circuits. It includes aspects of scaling to even beyond 12nm CMOS technologies and designs. It clearly describes the fundamental CMOS operating principles and presents substantial insight into the various aspects of design implementation and application. Coverage includes all associated disciplines of nanometer CMOS ICs, including physics, lithography, technology, design, memories, VLSI, power consumption, variability, reliability and signal integrity, testing, yield, failure analysis, packaging, scaling trends and road blocks. The text is based upon in-house Philips, NXP Semiconductors, Applied Materials, ASML, IMEC, ST-Ericsson, TSMC, etc., courseware, which, to date, has been completed by more than 4500 engineers working in a large variety of related disciplines: architecture, design, test, fabrication process, packaging, failure analysis and software.

The idea of writing a book on CMOS imaging has been brewing for several years. It was placed on a fast track after we agreed to organize a tutorial on CMOS sensors for the 2004 IEEE International Symposium on Circuits and Systems (ISCAS 2004). This tutorial defined the structure of the book, but as first time authors/editors, we had a lot to learn about the logistics of putting together information from multiple sources. Needless to say, it was a long road between the tutorial and the book, and it took more than a few months to complete. We hope that you will find our journey worthwhile and the collated information useful. The laboratories of the authors are located at many universities distributed around the world. Their unifying theme, however, is the advancement of knowledge for the development of systems for CMOS imaging and image processing. We hope that this book will highlight the ideas that have been pioneered by the authors, while providing a roadmap for new practitioners in this field to exploit exciting opportunities to integrate imaging and "smartness" on a single VLSI chip. The potential of these smart imaging systems is still unfulfilled. Hence, there is still plenty of research and development to be done.

Transparent in the visible range, phase objects can be studied in the optical range using holographic interferometry. Typically, the holograms are recorded on high-resolving-power holographic photo materials, but a lower spatial resolution is sufficient for successful research in many scientific applications. Holographic Interferometry: A Mach–Zehnder Approach offers practical guidance to research scientists and engineers using Mach–Zehnder holographic interferometry methods to study phase objects in the laboratory. The Mach–Zehnder approach allows the use of standard photographic film and electronic CCD/CMOS sensors with low resolving power, making it a simpler and more affordable option for testing many types of phase objects. This book demonstrates how to use standard photographic film for the optical recording and reconstruction of Mach–Zehnder holograms. It also illustrates techniques for using CCD/CMOS cameras to digitally record Mach–Zehnder holograms/interferograms of transparent objects. Bringing together original research and information scattered throughout existing literature, this book focuses on the holographic reference beam and shearing interferometry methods. In particular, it looks at how these methods and optical schemes can be directly applied to testing aerodynamic flows, as well as to plasmas, shocks, and waves in noncoherent laser–matter interactions. Numerous reconstructed and classic interferograms, deflectograms, and Schlierengrams illustrate the material, helping readers develop and design their own optimal optical scheme and choose applicable details to apply the approach. Describing methods in a mathematically simple and accessible way, this book is also suitable for graduate students in the fields of aerospace engineering and optics, as well as those in laser, thermal, and plasma physics.

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CMOS/CCD Sensors and Camera SystemsSociety of Photo Optical

Explains the circuit design of silicon optoelectronic integrated circuits (OEICs), which are central to advances in wireless and wired telecommunications. The essential features of optical absorption are summarized, as is the device physics of photodetectors and their integration in modern bipolar, CMOS, and BiCMOS technologies. This information provides the basis for understanding the underlying mechanisms of the OEICs described in the main part of the book. In order to cover the topic comprehensively, Silicon Optoelectronic Integrated Circuits presents detailed descriptions of many OEICs for a wide variety of applications from various optical sensors, smart sensors, 3D-cameras, and optical storage systems (DVD) to fiber receivers in deep-sub-?m CMOS. Numerous detailed illustrations help to elucidate the material.

Achieve the Best Camera Design: Up-to-Date Information on MCMs Miniature camera modules (MCMs), such as webcams, have rapidly become ubiquitous in our day-to-day devices, from mobile phones to interactive TV systems. MCMs—or "smart" cameras—can zoom, adjust their frame rate automatically with illumination change, focus at different distances, compensate for hand shake, and transform captured images. With contributions from academics and field engineers, Smart Mini-Cameras discusses the structure, operation principles, applications, and future trends of miniature mobile cameras. It compares this technology with traditional digital still cameras and explains the specific requirements of MCM components (imposed by the size or type of application) in terms of optical design, image sensor, and functionalities. The book describes the implementation of several active functionalities, including liquid crystal auto focus (AF) and optical image stabilization (OIS). It also explores how new technologies, such as the curved detector and transforming optics, are stimulating novel trends, including a miniature panoramic lens on mobile phones. By providing you with an understanding of the components and performance tradeoffs of MCMs, this book will help you achieve the best camera design. It also answers frequently asked questions, such as the importance of the number of megapixels in a mobile phone camera and the value of AF and OIS features.

This thesis provides a thorough noise analysis for conventional CIS readout chains, while also presenting and discussing a variety of noise reduction techniques that allow the read noise in standard processes to be optimized. Two physical implementations featuring sub-0.5-electron RMS are subsequently presented to verify the proposed noise reduction techniques and provide a full characterization of a VGA imager. Based on the verified noise calculation, the impact of the technology downscaling on the input-referred noise is also studied. Further, the thesis covers THz CMOS image sensors and presents an original design that achieves ultra-low-noise performance. Last but not

least, it provides a comprehensive review of CMOS image sensors.

Experimental solid mechanics is the study of materials to determine their physical properties. This study might include performing a stress analysis or measuring the extent of displacement, shape, strain and stress which a material suffers under controlled conditions. In the last few years there have been remarkable developments in experimental techniques that measure shape, displacement and strains and these sorts of experiments are increasingly conducted using computational techniques. Experimental Mechanics of Solids is a comprehensive introduction to the topics, technologies and methods of experimental mechanics of solids. It begins by establishing the fundamentals of continuum mechanics, explaining key areas such as the equations used, stresses and strains, and two and three dimensional problems. Having laid down the foundations of the topic, the book then moves on to look at specific techniques and technologies with emphasis on the most recent developments such as optics and image processing. Most of the current computational methods, as well as practical ones, are included to ensure that the book provides information essential to the reader in practical or research applications. Key features: Presents widely used and accepted methodologies that are based on research and development work of the lead author Systematically works through the topics and theories of experimental mechanics including detailed treatments of the Moire, Speckle and holographic optical methods Includes illustrations and diagrams to illuminate the topic clearly for the reader Provides a comprehensive introduction to the topic, and also acts as a quick reference guide This comprehensive book forms an invaluable resource for graduate students and is also a point of reference for researchers and practitioners in structural and materials engineering.

A smart camera is an integrated machine vision system which, in addition to image capture circuitry, includes a processor, which can extract information from images without need for an external processing unit, and interface devices used to make results available to other devices. This book provides content on smart cameras for an interdisciplinary audience of professionals and students in embedded systems, image processing, and camera technology. It serves as a self-contained, single-source reference for material otherwise found only in sources such as conference proceedings, journal articles, or product data sheets. Coverage includes the 50 year chronology of smart cameras, their technical evolution, the state-of-the art, and numerous applications, such as surveillance and monitoring, robotics, and transportation.

Experts in the field of bitemark evidence confront complexities ranging from the identification and collection of evidence, to microscopic analysis, to legal implications and courtroom admissibility. Now in its second edition, Bitemark Evidence reflects the knowledge, training, experience, opinions, and research of 27 authors from around the world

The consumer electronics market has never been as awash with new consumer products as it has over the last couple of years. The devices that have emerged on the scene have led to major changes in the way consumers listen to music, access the Internet, communicate, watch videos, play games, take photos, operate their automobiles—even live. Digital electronics has led to these leaps in product development, enabling easier exchange of media, cheaper and more reliable products, and convenient services. This handbook is a much-needed, comprehensive engineering guide to the dynamic world of today's digital consumer electronics. It provides complete details on key enabling technologies, standards, delivery and reception systems, products, appliances and networking systems. Each chapter follows a logical progression from a general overview of each device, to market dynamics, to the core technologies and components that make up that particular product. The book thoroughly covers all of the key digital consumer product categories: digital TV, digital audio, mobile communications devices, gaming consoles, DVD players, PCs and peripherals, display devices, digital imaging devices, web terminals and pads, PDAs and other handhelds, screenphones/videophones, telematics devices, eBooks and readers, and many other current and future products. To receive a FREE daily newsletter on displays and consumer electronics, go to: http://www.displaydaily.com/ ·Surveys crucial engineering information for every digital consumer product category, including cell phones, digital TVs, digital cameras, PDAs and many more—the only reference available to do so ·Has extremely broad market appeal to embedded systems professionals, including engineers, programmers, engineering managers, marketing and sales personnel—1,000,000+ potential readers ·Helps engineers and managers make the correct design decisions based on real-world data

Meant for students and practicing engineers, this book provides a clear, comprehensive and up-to-date introduction to Digital Image Processing in a pragmatic style. An illustrative approach, practical examples and MATLAB applications given in the book help in bringing the theory to life.

This document shows the current state of the research work done around the SmartSpectra project. The SmartSpectra project is a Research, Technological development and Demonstration (RTD) project funded under EU s Fifth Framework Programme (FP5) by the Information Society Technologies (IST) Programme. The project pursues the development of a Smart Multispectral System for Commercial Applications. SmartSpectra is an acronym of "Smart Multispectral System for Commercial Applications." In this project, a Smart Multispectral System will be designed and implemented. The system will allow multispectral imaging with an aff ordable cost and proven robustness, in order to achieve a broad use of multispectral techniques in several commercial areas and applications. The system will have the capability to be integrated in currently established production systems. Moreover,it will be flexible enough to be applicable to a wide range of applications. The document is organized as follows: In the introductory chapter, we present the SmartSpectra project, emphasizing the parts in which we are involved. Next chapter is devoted to explain the concept of the SmartSpectra camera, defining its specifications. Chapters 3 and 4 detail the realised work regarding Workpackages 2 and 3 of the project. Workpackage 2 deals with the optical and sensing part of the SmartSpectra system. It summarizes the state of the art in VIS & NIR technologies, lists the purchased sensors for the project and describes the AOTF (Acousto-Optic Tunable Filter) technology. Workpackage 3 explains the sensor electronics and interface. Two different prototypes of the SmartSpectra camera are described, along with the Firewire subsystem. These chapters are followed by a Progress Review and Future Work. Last chapter is a final summary of the work. The document ends with a group of annexes showing the outcomes of the work.

Shrinking pixel sizes along with improvements in image sensors, optics, and electronics have elevated DSCs to levels of performance that match, and have the potential to surpass, that of silver-halide film cameras. Image Sensors and Signal Processing for Digital Still Cameras captures the current state of DSC image acquisition and signal processing technology and takes an all-inclusive look at the field, from the history of DSCs to future possibilities. The first chapter outlines the evolution of DSCs, their basic structure, and their major application classes. The next few chapters discuss

high-quality optics that meet the requirements of better image sensors, the basic functions and performance parameters of image sensors, and detailed discussions of both CCD and CMOS image sensors. The book then discusses how color theory affects the uses of DSCs, presents basic image processing and camera control algorithms and examples of advanced image processing algorithms, explores the architecture and required performance of signal processing engines, and explains how to evaluate image quality for each component described. The book closes with a look at future technologies and the challenges that must be overcome to realize them. With contributions from many active DSC experts, Image Sensors and Image Processing for Digital Still Cameras offers unparalleled real-world coverage and opens wide the door for future innovation.