Noise Reduction Techniques In Electronic Systems By Henry W Ott


Mit der Quellenverschiebung stellen die Autoren erstmals in deutscher Sprache eine überaus prismatische und verblüffend einfache grafische Methode zur Signal- und Rauschanalyse elektronischer Schaltungen vor. Sie führen kompetent, und praxisnah in das Rauschen elektronischer Bauelemente ein und stellen dessen Wirkungsweise in unterschiedlichen Schaltungen exemplarisch dar. Die Methode der Quellenverschiebung ermöglicht hierbei eine schnelle Abschätzung der wesentlichen Rauschanteile sowie eine Optimierung der Dimensionierung Embedded Microcomputer Systems: Real Time Interfacing provides an in-depth discussion of the design of real-time embedded systems using 9512 microcontrollers. This book covers the hardware aspects of interfacing, advanced software topics (including interrupts), and a systems approach to typical embedded applications. This text stands out from other microcomputer system books because it provides an integrated, in-depth treatment of both hardware and software important in real time embedded systems design. It features a wealth of detailed case studies that demonstrate basic concepts in the context of actual working examples of systems. It also features a unique simulation software package on the bound-in CD-ROM (called Test Execute and Simulate, or TExaS, for short) that provides a self-contained software environment for designing, writing, implementing both the hardware and software components of embedded systems. The content referenced within the product description or the product text may not be available in the ebook version. These Proceedings, consisting of Parts A and B, contain the edited versions of most of the papers presented at the annual Review of Progress in Quantitative Nondestructive Evaluation held at the University of California San Diego, in La Jolla, Calif., during the week of May 18-22, 1992. They were published by the Lawrence Livermore National Laboratory and the Laboratory of the USDOE in cooperation with a number of organizations including the Air Force Wright Laboratory Materials Directorate, the American Society for Nondestructive Testing, the Center for NDE at Johns Hopkins University, the Department of Energy, the Federal Aviation Administration, the National Institute of Standards and Technology, the National Science Foundation IndustryUniversity Cooperative Research Centers, and the Working Group in Quantitative NDE. This Review of Progress is a comprehensive and highly 47th participant countries who presented over 380 papers. With such a large volume of work to review, the meeting was divided into 36 sessions with as many as four sessions running concurrently. The Review covered all phases of NDE research and development from fundamental investigations to engineering applications or inspection systems, and it included all methods of inspection science from acoustic to X-rays. During the last twenty years, the Review of Progress of Quantitative NDE has contributed to its steady growth. Thanks to their efforts, the Review is today one of the largest and most significant gatherings of NDE researchers and engineers anywhere in the world. Audio Electronics provides information pertinent to the fundamental aspects of audio electronics. This book discusses the parallel development in the various transducers and interface devices used to generate and reproduce electrical signals. Organized into nine chapters, this book offers a comprehensive overview of the technology and the science of audio electronics. The book begins with an overview of the basic method of digitally encoding an analog signal that entails repetitively sampling the input signal at sufficiently brief intervals. This text then examines the major attraction of the FM broadcasting system to allow the transmission of a high quality stereo signal without significant degradation of audio quality. Other chapters consider the conventional practice to interpose a versatile pre-amplifier unit between the power amplifier and the signal input to provide the required driving voltage capability of both audio amplifiers and integrated-circuit operational amplifiers. The final chapter deals with the significance of the power supply unit. This book is a valuable resource for professional recording and audio engineers. Top-down approach to practical, tool-independent, digital circuit design, reflecting how circuits are designed. The sheer quantity of widely diversified results from a single point problem and a full-scale investigation has led to finding it impossible to cope with the ever-increasing flow of material. This has potentially serious consequences for the quality of decisions and operational processes in areas such as counterterrorism and security. This book presents the papers delivered at the NATO Advanced Research Workshop (ARW) ‘Meeting Security Challenges through Data Analytics and Decision Support’, held in Aghveran, Armenia, in June 2015. The aim of the conference was to promote and enhance cooperation and dialogue between NATO and Partner countries on the subject of effective decision support for security applications. The attendance of many leading scientists from a variety of backgrounds and disciplines provided the opportunity to improve mutual understanding, as well as cognizance of the specific requirements and issues of Cyber Physical Social Systems (CPSS) and the technical advances pertinent to all collaborative human-centric information support systems in a variety of applications. The book is divided into 3 sections: counter terrorism; methodology and applications; maritime and border security; and cyber security, and will be of interest to all those involved in decision-making processes based on the analysis of big data. This Tutorial Text provides an overview of design principles for receivers used in optical communication systems, intended for practicing engineers. The author reviews technologies used to construct optical links and illustrates the system performance specifications into receiver requirements. Photodetector fundamentals, associated statistics, characteristics and performance issues are presented, together with a tutorial on noise analysis and the specific techniques needed to model optical receivers. Discusses Uses for the Microcomputer, Including Projects & Methods for Interfacing the Personal Computer with Its EnvironmentThis book provides the knowledge and good design practice for the design or test engineer to take the necessary measures to improve EMC and thereby regain the lost performance. Here are many advantages for both the component supplier and consumer, of looking at EMC at component and PCB level. For the suppliers, not only will their products have the competitive edge because they have known EMC performance, but they will be prepared should EMC compliance become mandatory in the future. For consumers it is a distinct advantage to know how a product will behave within a system with regard to EMC. Shows how to achieve EMC compliance early on in the design process Provides the knowledge to trace system EMC performance problems Follows best design practicesPractical Audio Electronics is a comprehensive introduction to basic audio electronics and the fundamentals of sound circuit building, providing the reader with the necessary knowledge and skills to undertake projects from scratch. Imparting a thorough foundation of theory along with the practical skills needed to understand, build, modify, and test audio circuits, this book equips the reader with the tools to explore the sonic possibilities that emerge when electronics technology is applied innovatively to the making of music. Suitable for all levels of technical proficiency, this book encourages a
deeper understanding through highlighted sections of advanced material and example projects including circuits to make, alter, and amplify audio, providing a snapshot of the wide range of possibilities of practical audio electronics. An ideal text for students, hobbyists, musicians, and those interested in the possibilities of hardware-based sound and music creation. Sampled Data Systems - ADCs for DSP Applications - DACs for DSP Applications - Fast Fourier Transforms - Filters - DSP Hardware - Interfacing to DSPs - DSP Applications - Hardware Design Techniques. The CRC Principles and Applications in Engineering series is a library of convenient, accessible, sharply focused texts and subparts. Each volume comprises chapters carefully selected from CRC's bestselling handbooks, logically organized for optimum convenience, and thankfully priced to fit. The superb organization of The Electronics Handbook means that it is not only a comprehensive and fascinating resource, but also a pleasure to use. Some of these organizational features include: Engineers and scientists frequently find themselves having to get involved in electronic circuit design even though this may not be the core of their work. This book is particularly helpful to experienced designers: it assumes little prior knowledge of electronics and it takes a modular approach, so you can find what you need without looking through a whole chapter. The first three parts of the book start by refreshing the basic mathematics and physics needed to understand circuit design. Part four discusses individual components (resistors, capacitors etc.), while the final and largest section describes commonly encountered circuit elements such as differentiators, oscillators, filters and couplers. A major bonus and learning aid is the inclusion of a CD-ROM with the student edition of the PSpice simulation software, together with models of most of the circuits described in the book. Electronic Measurement Systems: Theory and Practice, Second Edition is designed for those who require a thorough grounding in electronic measurement techniques. The second edition of this popular text is organized into three parts: Part one of the book discusses basic concepts such as system specification, architectures, structures, and components. Later chapters cover topics important for the proper functioning of systems including reliability, guarding/shielding, and noise. Finally, an unusual chapter treats the problems of the human aspects of the design of measurement systems. The book also includes problems and exercises. New to the Second Edition Extended section about signal structures, I/O bus structures, and the use of intelligent devices (IPUs/IPC). User-friendly, easy-to-follow principles in instrumentation Novel approaches on reliability due to built-in testability becoming a major design feature A brief introduction to the related physics of each transducer energy domain to understand what the principle of operation is Discussion of the ADM method for drift elimination Introduction to the European Electro Magnetic Compatibility Directive and the latest noise calculation techniques Noise in analog and digital systems Chapter on autozeroing transducers and sensor interfacing, paying particular attention to bridge circuits for modulating transducersPrinciples of Semiconductor Network Testing gathers together comprehensive information which test and process professionals will find invaluable. The techniques outlined will help ensure that test methods and data collected reflect device performance, not 'testing the tester' or being lost in the noise floor. It addresses the fundamental issues underlying the semiconductor test discipline. The test engineer must understand the basic principles of semiconductor fabrication and process and have an in-depth knowledge of circuit functions, instrumentation and noise sources. Introduces a novel component-testing philosophy for semiconductor test, product and design engineers Best new source of information for experienced semiconductor engineers as well as entry-level personnel Eight chapters about semiconductor testingPraise for Noise Reduction Techniques IN electronic systems "Henry Ott has literally 'written the book' on the subject of EMC. . . . He not only knows the subject, but has the rare ability to communicate that knowledge to others." --EE Times Electromagnetic Compatibility Engineering is a completely revised, expanded, and updated version of Henry Ott's popular book Noise Reduction Techniques in Electronic Systems. It reflects the developments in noise reduction technology (EMC) in the dramatic changes in the way factory built systems are favored over simple modules. This second edition offers applications to the design of analog and digital circuits in computer, home entertainment, medical, telecom, industrial process control, and automotive equipment, as well as military and aerospace systems. While maintaining and updating the core information such as cabling, grounding, filtering, shielding, digital circuit grounding and layout, and ESD-that made the previous book such a wide success, this new edition includes additional coverage of: Equipment/systems grounding Switching power supplies and variable-speed motor drives Digital circuit power distribution and decoupling PCB layout and stack-up Mixed-signal PCB layout RF and transient immunity Power line disturbances Precompliance EMC measurements New appendices on dipole antennas, the theory of partial inductance, and the ten most common EMC problems The concepts presented are applicable to analog and digital circuits operating from below audio frequencies to those in the GHz range. All told, this book, an essential comprehensive EMC design tool, promises to keep the mathematics kept to the strictest minimum. Complemented with over 250 problems with answers, Electromagnetic Compatibility Engineering equips readers with the knowledge needed to design electronic equipment that is compatible with the electromagnetic environment and compliant with national and international EMC regulations. It is an essential reference for engineers involved in EMC design, installation, or test. Whether or not you are engaged with advanced or graduate level. Noise and distortion that degrade the quality of speech signals can come from any number of sources. The technology and techniques for dealing with noise are almost as numerous, but it is only recently, with the development of inexpensive digital signal processing hardware, that the implementation of such noise filters has become practical. Noise Reduction in Speech Applications provides a comprehensive introduction to modern techniques for removing or reducing background noise from a range of speech-related applications. Self-contained, it starts with a tutorial-style chapter of background material, then focuses on system aspects, digital algorithms, and implementation. The final section explores a variety of applications and demonstrates to potential users of the technology the results possible with the noise reduction techniques presented. The book technologists contributed by international experts, a practical, systems approach, and numerous references. For electrical, acoustics, signal processing, communications, and bioengineers, Noise Reduction in Speech Applications is a valuable resource that shows you how to decide whether noise reduction will solve problems in your own systems and how to make the best use of the technologies available. This book presents an overview of the physics of radiation detection and its applications. It covers such topics as properties of radiation, energetic photons and mesotrons, and the procedures used to protect people and the environment from their potentially harmful effects. It details the experimental techniques and instrumentation used in different detection systems in a very practical way without sacrificing the physics content. It provides useful formulae and explains methodologies to solve problems related to radiation measurements. With abundance of worked-out examples and end-of-chapter problems, this book enables the reader to understand the underlying physical principles and their applications. Detailed discussions on different detection media, such as gases, liquids, liquefied gases, semiconductors, and scintillators make this book an excellent source of information for students as well as professionals working in related fields. Chapters on statistics, data analysis techniques, software for data analysis, and data acquisition systems provide the reader with necessary skills to design and implement systems and programs involved in data analysis. The companion CD contains modern techniques in the measurement of radiation and the underlying physical principles. It illustrates theoretical and practical details with an abundance of practical, worked-out examples. It provides practice problems at the end of each chapterComplete PCB Design Using OrCad Capture and Layout provides instruction on how to use the OrCAD design suite to design and manufacture printed circuit boards (PCBs). The book is aimed at practicing engineers who need an in-depth practical guide for both software and the hardware. The book shows how to use the software and who need in-depth knowledge of the capabilities and limitations of the software package. There are two goals the book aims to reach: The primary goal is to show the reader how to design a PCB using OrCad Capture and OrCAD Layout. Capture is used to build the schematic diagram of the circuit, and Layout is used to design the circuit board. The second goal is to show the reader how to use the PSpice simulation capabilities of the design, and to develop custom schematic parts, footprints and PSpice models. Often times separate designs are
produced for documentation, simulation and board fabrication. This book shows how to perform all three functions from the same schematic design. This approach saves time and money and ensures continuity between the design and the manufactured product. Informative and clear, this circuit and design workbench offers real-world, realistic examples present the how and why the designs work, providing a comprehensive toolset for understanding the OrCAD software Introduction to the IPC, JEDIC, and IEEE standards relating to PCB design Colorful interior and extensive illustrations allow readers to learn features of the product in the most realistic manner possible. This book expounds upon the fundamentals of circuit design with a focus on signal integrity and electromagnetic compatibility. After reading the book, the designer can immediately incorporate measures like PCB design, filtering, shielding, grounding, cable routing at the design stage of the product development cycle, without worrying too much about the theory. This will save both his money and efforts that would be otherwise be required if he tries to modify a frozen design. For the sake of convenience, the book has been divided into two parts. Part I has six chapters dealing with EMC fundamentals, EMC standards and EMC test methodologies. Part II of the book has five chapters dedicated to EMC design methodologies namely filtering, shielding, PCB design, grounding and bonding and cable routing. And last but not the least, the book ends with an introduction to CE marking - a mandatory compliance mark placed on products intended for export to the European Union. 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 image sensor. Based on the verified noise calculation, the impact of the technology downsampling on the input-referred noise is also studied. Further, the thesis covers the CMOS image sensor models and presents an original design that achieves ultra-low-noise performance, while at the same time providing a comprehensive review of CMOS image sensors. Digital signal processing plays a central role in the development of modern communication and information processing systems. The theory and application of signal processing is concerned with the identification, modelling and utilisation of patterns and structures in a signal process. The observation signals are often incomplete and contain noise, and therefore, the removal of noise and the extraction of meaningful information, when present, are important parts of a signal processing system. The fourth edition of Advanced Digital Signal Processing and Noise Reduction updates and extends the chapters in the previous edition and includes two new chapters on MIMO systems, Correlation and Eigen analysis and independent component analysis. The wide range of topics covered in this book is divided into seven main sections: Signal characterisation, detection and estimation, signal separation and cancellation, removal of impulsive and transient noise, interpolation of missing data segments, speech enhancement and noise interference in mobile communication environments. This book provides a coherent and structured presentation of the theory and applications of statistical signal processing and noise reduction methods. Two new chapters on MIMO systems, correlation and Eigen analysis and independent component analysis Comprehensive coverage of advanced digital signal processing and noise reduction methods for communication and information processing systems Examples and applications in signal and information extraction from noisy data Comprehensive but accessible coverage of signal processing theory including probability models, Bayesian inference, hidden Markov models, adaptive filters and Linear prediction models Advanced Digital Signal Processing and Noise Reduction is an invaluable text for postgraduates, senior undergraduates and researchers in fields of digital signal processing, telecommunications and statistical data analysis. It will also be of interest to professional engineers in telecommunications and audio and signal processing industries and network planners and implementers in mobile and wireless communication communities. Electronic Noise and Interfering Signals is a comprehensive reference book on noise and interference in electronic circuits, with particular focus on low-noise design. The first part of the book deals with mechanisms, modelling and computation of intrinsic noise which is generated in every electronic device. The second part analyses the coupling mechanisms which can lead to a contamination by parasitic signals and provides appropriate solutions to this problem. This book contains more than 100 practical, elaborate case studies. The book requires no advanced mathematical training as it introduces the fundamental methods. Moreover, it provides insight into computational noise analysis with SPICE and HSpice, a software development tool in use by the professional research community. The book is a comprehensive guide to the practical implementation of modern and advanced signal processing methods. This updated and expanded version of the very successful first edition offers new chapters on controlling the emission from electronic systems, especially digital systems, and on low-cost techniques for providing electromagnetic compatibility (EMC) results with a minimal cost. The book is also a new chapter on the subject of low-voltage, low-power electronic systems to electrostatic discharge. There is more material on FCC regulations, digital circuit noise and layout, and digital circuit radiation. Virtually all the material in the first edition has been retained. Contains a new appendix on FCC EMC test procedures. Das Standardwerk zu Leistungselektronik stellt Aufbau, Wirkungsweise und Analyse der Schaltungen und der elektrischen Vorgänge umfassend dar. Neben den starktechnischen Aspekten der Leistungskreise und der Bauelemente werden auch die Steuerungskreise, die Rückwirkungen auf die elektrischen Netze sowie die Beeinflussung von Nachrichtensystemen behandelt. Die neuen Gebiete der Leistungselektronik sind in der 4., komplett überarbeiteten Auflage detailliert beschrieben und wurden durch ausführliche Erklärungen der Schaltungsprinzipien ergänzt. Power electronics, which is a rapidly growing area in terms of research and applications, uses modern electronics technology to convert electric power from one form to another, such as ac-dc, dc-dc, dc-ac, and ac-ac with a variable output magnitude and frequency. Power electronics has many applications in our everyday life such as air-conditioners, electric cars, sub-way trains, motor drives, renewable energy sources and power supplies for computers. This book covers all aspects of switching devices, converter circuit topologies, control techniques, analytical methods and, where relevant, their application to 3 phase and rectifier circuits and aspects * New content * Coverage of numerous applications, including uninterruptable power supplies and automotive electrical systems * New content in power generation and distribution, including solar power, fuel cells, wind turbines, and flexible transmissionBased on familiar circuit theory and basic physics, this book serves as an invaluable reference for both analog and digital engineers alike. For those who work with analog RF, this book is a must-have resource. With computers and networking equipment of the 21st century running at such high frequencies, it is now crucial for digital designers to understand electromagnetic fields, radiation and transmission lines. This knowledge is necessary for maintaining signal integrity and achieving EMC compliance. Since many digital designers are lacking in analog design skills, let alone electromagnetics, an easy-to-read but informative book on electromagnetic topics should be considered a welcome addition. The book is designed to appeal to anyone who needs to understand electromagnetic issues, whether in the manufacturing of integrated circuits, in the design of computer chips, in the design of printed circuit boards, in the design of power supplies, in the design of wireless communication systems, in the design of medical equipment, in the design of consumer electronics products, or in the design of products intended for export to the European Union. And last but not the least, the book ends with an introduction to CE marking - a mandatory compliance mark placed on products intended for export to the European Union.
resource investigates the function of RF communication in electronic warfare systems. The book provides in-depth coverage of how RF signals must be constructed to perform jamming missions, which prevent a receiver from properly extracting the desired signal. Techniques for designing and building RF circuits and systems are presented and explored. Power supplies that generate adequate power for fueling high power amplifiers are also described and their operations investigated. Oscillator basics, including principles of oscillator operation, phase locked loop synthesizers and direct digital synthesis are examined. Fundamentals of RF communications, including power supplies for RF modules that are included, are the first part of this comprehensive overview of power electronics, particularly in the explosive market for portable devices. Unfortunately, this seemingly simple mechanism is actually one of the most complex and under-estimated processes in Power Electronics. Switching power conversion involves several engineering disciplines: Semiconductor Physics, Thermal Management, Control Loop theory, Magnetic materials, these complex processes have not yet been crystallized into a practical design guide. This book, based on decades of the author’s experience designing commercial power supplies. Although his formal education was in physics, he learned the hard way what it took to succeed in designing power supplies for companies like Siemens and National Semiconductor. His passion for power supplies and his empathy for the practicing or aspiring power conversion engineer is evident on every page. * The most comprehensive study available of the theoretical and practical aspects of controlling and measuring Electromagnetic Interference in switching power supplies, including input filter instability considerations. * Step-by-step and iterative approach for calculating high-frequency losses in forward converter transformers, including Proximity losses based on Dowell’s equations. * Thorough, yet uniquely simple design flow-chart for building DC-DC converters and their magnetic components under typical wide-input supply conditions * Step-by-step, solution-based stabilizing control topologies, using all three main categories of conventional operational amplifiers, and either current-mode or voltage-mode control. This book provides instruction on how to use the OrCAD design suite to design and manufacture printed circuit boards. The primary goal is to show the reader how to design a PCB using OrCAD Capture and OrCAD Editor. Capture is used to build the schematic diagram of the circuit that can be manufactured on the PCB. The book is written for both students and practicing engineers who need in-depth instruction on how to use the software, and who need background knowledge of the PCB design process. Beginning to end coverage of the printed circuit board design process. Information is presented in the exact order a circuit and PCB are designed. Over 400 full color illustrations, including extensive use from the software features of the most recent versions. The possible Straightforward, realistic examples present the how and why the designs work, providing a comprehensive toolset for understanding the OrCAD software Introduces and follows IEEE, IPC, and JDEC industry standards for PCB design. Unique chapter on Design for Manufacture covers padstack and footprint design, and component placement, for the design of manufacturable PCB's FREE CD containing the OrCAD demo version and design filesThis book includes the proceedings of the 2012 International Conference on Mechanical and Electronic Engineering(ICMEE2012), held at June 23-24, 2012 in Hefei, China. The conference provided a rare opportunity to bring together worldwide researchers who are working in the fields. This volume 3 is focusing on Electronic Engineering and Electronic Communication; Electronic Engineering and Electronic Image Processing. This book introduces low-noise and low-power design techniques for phase-locked loops and their building blocks. It summarizes the noise reduction techniques for fractional-N PLL design and introduces a novel capacitive-quadurature coupling technique for multi-phase signal generation. The capacitive-coupling technique has been validated through silicon implementation and can provide low phase-noise and accurate I-Q phase matching, with low power consumption from a super low supply voltage. Readers will be enabled to pick one of the most suitable QVCO circuit structures for their own design without additional effort to look for the optimal circuit structure and device parameters. Driven by such telecommunications, computing and consumer/multimedia and facilitated by the progress in CMOS ULSI technology, the microelectronics IC market is characterized by an ever-increasing level of integration complexity. Today complete systems, that previously occupied one or more boards, are integrated on a few chips or even on one single multi-million transistor chip - a so called System-on-Chip (SOC). Although ICs in such mixed-signal systems with digital systems also exploit the analog circuits needed at the interface between the electronic system and the continuous-valued outside world are also being integrated on the same die for reasons of cost and performance. Unfortunately, the integration of both analog & RF circuits and digital circuits on the same die not only offers many benefits, but also creates some technical difficulties. The analog circuitry has a different physics of the failure propagation process, making them more difficult and costly to design, but they are also vulnerable to any kind of noise or crosstalk signals. The higher levels of integration (moving towards 100 million transistors per chip clocked at ever higher frequencies) make the mixed-signal signal integrity problem increasingly challenging. One of the most important problems is the parasitic supply and substrate noise coupling, caused by the fast switching of the digital circuitry that then propagates to the sensitive analog circuitry via the common substrate. It is therefore important to be able to predict the impact of digital switching noise on the analog circuit performance at the design stage of the integrated system, before the chip is taped out for fabrication, and to understand how this problem can be reduced. The purpose of Substrate Noise Coupling in Mixed-Signal ASICs is to provide an overview of very recent research results in the field of substrate noise analysis and reduction techniques. Much of the reported work has been established as part of the Mixed-Signal Initiative of the European Union. It is a representative sampling of the current state of the art in this area. All the different aspects of the substrate noise coupling problem are covered. Some chapters describe techniques to model and reduce the digital switching noise injected in the substrate. Other chapters describe methods to analyse the propagation of the noise from the digital switching circuitry along the digital circuitry. Finally, the remaining chapters describe techniques to model and especially to reduce the impact of substrate noise on the analog side. It is illustrated with several practical design examples and measurement results. A complete and up-to-date op amp reference for electronics engineers from the most famous op amp guru. Advances in science and engineering have occurred at a surprisingly rapid pace since the release of the seventh edition of this encyclopedia. Large portions of the reference have required comprehensive rewriting and new illustrations. Scores of new topics have been included to create this thoroughly updated eighth edition. The appearance of this new edition in 1994 marks the continuation of a tradition commenced well over a half-century ago in 1938 Van Nostrand's Scientific Encyclopedia, First Edition, was published and welcomed by educators worldwide at a time when what we know today as science education was just emerging as a separate discipline. Today educators and educators alike during a critical time span when science became established as a major factor in shaping the progress and economy of individual nations and at the global level. A vital need existed for a permanent science reference that could be updated periodically and made conveniently available to audiences that numbered in the millions. The pioneering VNSE mission was continued today as a leading technical information source for making private and public decisions that present a backstop of technical alternatives.