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Environmental considerations and mitigation have become increasingly... The battlespace is expected to be an engineer challenge due to unexploded ordnance, mines, and damaged road networks.

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At least 52 people were killed when a  
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Army is delaying plans to roll out a  
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The chapters in this volume were presented at the July – August 2008 NATO Advanced Study Institute on Unexploded Ordnance Detection and Mitigation. The conference was held at the beautiful Il Ciocco resort near Lucca, in the glorious Tuscany region

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of northern Italy. For the ninth time we gathered at this idyllic spot to explore and extend the reciprocity between mathematics and engineering. The dynamic interaction between world-renowned scientists from the usually disparate communities of pure mathematicians and applied scientists which occurred at our eight previous ASI 's

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continued at this meeting. The detection and neutralization of unexploded ordnance (UXO) has been of major concern for very many decades; at least since the First World war. UXO continues to be the subject of intensive research in many fields of science, including mathematics, signal processing (mainly radar and sonar) and chemistry.

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While today 's headlines emphasize the mayhem resulting from the placement of improvised explosive devices (IEDs), humanitarian landmine clearing continues to draw significant global attention as well. In many countries of the world, landmines threaten the population and hinder reconstruction and fast, efficient utilization

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of large areas of the mined land in the aftermath of military conflicts.

Ground penetrating radars (GPRs), also known as subsurface radars, are used in many applications including detection of land mines and unexploded ordnance (UXO). Despite significant long-term

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investment in GPRs for mine and UXO detection, it remains true that no GPR system that meets operational requirements has yet been fielded; however, recent advances in several mine detection radars under development have produced significant improvements in detection performance and false-alarm mitigation over

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what was achievable only a few years ago.

This research examines the suitability of modeling helical antennas to achieve a broadband characteristic for GPR

implementation. Although the two-arm counter-wound helix provides the required spot illumination, it is expected that more arms may have to be added to reduce the

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radiation in the back direction and to match the input impedance to the feed line. Microwave Design Studio (MDS) has been used extensively to simulate the broadband characteristics of the helical antenna. An overall design strategy is outlined, together with a more detailed treatment of the ground penetrating radar subsystems and

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topics that are relevant to effective subsurface radar operation. These include soil characterization, the choice of the frequency of operation, as well as the design and construction of suitable helical antennas. Finally, a new antenna structure called the counter-wound quadrifilar helical antenna (CQHA), which is suitable for

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subsurface radar applications, is examined.

The counter-wound quadrifilar helical antenna has a broad bandwidth and a linear polarization with a controllable plane of polarization from a planar geometry.

Use of electromagnetic (EM) methods to discriminate frag and geology from

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unexploded ordnance (UXO) has shown steady improvement over time as demonstrated by test site results.

Performance of off-the-shelf and customized EM sensors have increased both in terms of UXO probability of detection and false alarm rate. Parallel with the increase in capabilities of UXO detection

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and discrimination is the Increasing use of digital geophysical techniques on live sites. However, a significant gap exists in capabilities for UXO detection and discrimination between prove-out / test sites and actual UXO contaminated sites. In addition, the future deployment of more sophisticated sensors with discrimination

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capabilities is limited by the requirement for greater data fidelity for wide application on most sites. One issue of importance for improving data quality is the need for improved spatial representation of the geophysical signature of subsurface UXO. Presently, survey data are inadequately spatially quantified with simple XY sensor

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Locations and an assumed constant Z elevation. To accurately represent the geophysical signature of subsurface UXO, more complete and accurate information is required, including sensor elevation information, orientation data (yaw, pitch and roll), and sensor velocity and acceleration data. Therefore, Strategic

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Environmental Research and Development  
Program (SERDP) Project UX- 1310  
"Sensor Orientation Effects on UXO  
Geophysical Target Discrimination" was  
designed to research how the response of  
geophysical sensors is affected by variations  
in sensor orientation and motion, to  
develop an approach to measure these

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effects in the field, and to develop modeling and analysis techniques to mitigate the effects of sensor orientation and motion.

Attacks in London, Madrid, Bali, Oklahoma City and other places indicate that improvised explosive devices (IEDs) are among the weapons of choice of terrorists

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throughout the world. Scientists and engineers have developed various technologies that have been used to counter individual IED attacks, but events in Iraq and elsewhere indicate that the effectiveness of IEDs as weapons of asymmetric warfare remains. The Office of Naval Research has asked The National Research Council to

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examine the current state of knowledge and practice in the prevention, detection, and mitigation of the effects of IEDs and make recommendations for avenues of research toward the goal of making these devices an ineffective tool of asymmetric warfare. The book includes recommendations such as identifying the most important and most

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vulnerable elements in the chain of events leading up to an IED attack, determining how resources can be controlled in order to prevent the construction of IEDs, new analytical methods and data modeling to predict the ever-changing behavior of insurgents/terrorists, a deeper understanding of social divisions in

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societies, enhanced capabilities for persistent surveillance, and improved IED detection capabilities.

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This dictionary contains 739 entries with about 1400 references to the primary literature. Details on the composition, performance, sensitivity and other pertinent

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properties of Energetic Materials such as High Explosives, Propellants, Pyrotechnics, as well as important ingredients such as Oxidizers, Fuels, Binders, and Modifiers are given and presented partly in over 180 tables with more than 240 structural formulas . In detail the dictionary gives elaborate descriptions of 460 Chemical Substances

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170 Pyrotechnic Compositions 360 High Explosive and Propellant Formulations In addition, the basic physical and thermochemical properties of 435 pure substances (elements & compounds) typically occurring as ingredients or reaction products are given too. 150 Figures, schemes and diagrams explain Applications, Test

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Individuals closely tied with the  
development and investigation of Energetic  
Materials. The book is intended for readers  
with a technical or scientific background,  
active in governmental agencies, research  
institutes, trade and industry, concerned  
with the procurement, development,

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Detection And Mitigation of Energetic Materials, such as High Explosives, Propellants, Pyrotechnics, Fireworks and Ammunition. The book serves both as a daily reference for the experienced as well as an introduction for the newcomer to the field.

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Provides complete and up-to-date coverage of the foundational principles, enabling technologies, and specific instruments of portable spectrometry Portable Spectroscopy and Spectrometry: Volume One is both a timely overview of the miniature technologies used in spectrometry, and an authoritative guide to

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the specific instruments employed in a wide range of disciplines. This much-needed resource is the first comprehensive work to describe the enabling technologies of portable spectrometry, explain how various handheld and portable instruments work, discuss their potential limitations, and provide clear guidance on optimizing their

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utility and accuracy in the field. In-depth chapters—written by a team of international authors from a wide range of disciplinary backgrounds—have been carefully reviewed both by the editors and by third-party experts to ensure their quality and completeness. Volume One begins with general discussion of portable spectrometer

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engineering before moving through the electromagnetic spectrum to cover x-ray fluorescence (XRF), UV-visible, near-infrared, mid-infrared, and Raman spectroscopies. Subsequent chapters examine microplasmas, laser induced breakdown spectroscopy (LIBS), nuclear magnetic resonance (NMR) spectroscopy,

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and a variety of portable mass spectrometry instrument types. Featuring detailed chapters on DNA instrumentation and biological analyzers—topics of intense interest in light of the global coronavirus pandemic—this timely volume: Provides comprehensive coverage of the principles and instruments central to portable

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spectroscopy Includes contributions by experienced professionals working in instrument companies, universities, research institutes, the military, and hazardous material teams Discusses special topics such as smartphone spectroscopy, optical filter technology, stand-off detection, and MEMS/MOEMS technology Covers

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elemental spectroscopy, optical molecular spectroscopy, mass spectrometry, and molecular and imaging technologies  
Portable Spectroscopy and Spectrometry: Volume One is an indispensable resource for developers of portable instruments, civilian and government purchasers and operators, and teachers and students of

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portable spectroscopy. When combined with Volume Two, which focuses on the multitude of applications of portable instrumentation, Portable Spectroscopy and Spectrometry provides the most thorough coverage of the field currently available.

The study of operations research arose

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during World War II to enhance the effectiveness of weapons and equipment used on the battlefield. Since then, operations research techniques have also been used to solve several sophisticated and complex defense-related problems.

Operations Research for Military Organizations is a critical scholarly resource

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that examines the issues that have an impact on aspects of contemporary quantitative applications of operations research methods in the military. It also addresses innovative applications, techniques, and methodologies to assist in solving defense and military-related problems. Featuring coverage on a broad range of topics such as combat

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planning, tactical decision aids, and weapon system simulations, this book is geared towards defense contractors, military consultants, military personnel, policy makers, and government departments seeking current research on defense methodologies.

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The collection of chapters in this book present the concept of matched filters: response characteristics “ matching ” the characteristics of crucially important sensory inputs, which allows detection of vital sensory stimuli while sensory inputs not necessary for the survival of the animal tend to be filtered out, or sacrificed. The

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individual contributions discuss that the evolution of sensing systems resulted from the necessity to achieve the most efficient sensing of vital information at the lowest possible energetic cost. Matched filters are found in all senses including vision, hearing, olfaction, mechanoreception, electroreception and infrared sensing and

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different cases will be referred to in detail.

This volume comprises papers dedicated to data science and the extraction of knowledge from many types of data: structural, quantitative, or statistical approaches for the analysis of data; advances in classification, clustering and pattern

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recognition methods; strategies for modeling complex data and mining large data sets; applications of advanced methods in specific domains of practice. The contributions offer interesting applications to various disciplines such as psychology, biology, medical and health sciences; economics, marketing, banking and finance;

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engineering; geography and geology; archeology, sociology, educational sciences, linguistics and musicology; library science.

The book contains the selected and peer-reviewed papers presented during the European Conference on Data Analysis (ECDA 2013) which was jointly held by the German Classification Society (GfKI) and

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the French-speaking Classification Society (SFC) in July 2013 at the University of Luxembourg.

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This book is devoted to the rapidly growing area of science dealing with structure and properties of biological surfaces in their relation to particular functions. This

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volume, written by a team of specialists from different disciplines, covers various biological surface functions: sensing, coloration, attachment, drag reduction, moisture harvesting, etc. Because biological surfaces have a virtually endless potential of technological ideas for the development of new materials and systems, inspirations from

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biology could also be interesting for a broad range of topics in surface engineering. This volume together with two previous volumes “Functional Surfaces in Biology” (vols. 1 & 2 published in 2009) taken together, present a good reference for a novice in the field. The book is intended for use by researchers who are active, or intend to

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become active, in the field. The appeal of this topic is expected to be broad, ranging from classical biology, biomechanics and physics to such applied fields as materials science and surface engineering.

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