

CONTENTS

Preface <i>Thomas H. Killion</i>	v
Keywords	xi
Chapter 1: Sensors and Information Processing	1
Kernel-Based Anomaly Detection in Hyperspectral Imagery <i>H. Kwon and N. M. Nasrabadi</i>	3
Ground-Tracking for On and Off-Road Detection of Landmines with Ground Penetrating Radar <i>W.-H. Lee, P. D. Gader, J. N. Wilson, R. Weaver, S. Bishop, P. Gugino and P. Howard</i>	11
Vehicle Tracking using Acoustic and Video Sensors <i>A. C. Sankaranayanan, Q. Zheng, R. Chellappa, V. Cevher, J. H. McClellan and G. Qian</i>	16
Minimizing $1/f$ Noise in Magnetic Sensors with a MEMS Flux Concentrator <i>A. S. Edelstein, G. Fischer, J. Pulskamp, M. Pedersen, W. Bernard and S. F. Cheng</i>	24
Real-Time, Laser-Based Sensors for Military and Civilian Applications <i>R. C. Sausa and J. Cabalo</i>	30
Chapter 2: IT/C4ISR	39
Antenna Optimization Study on Stryker Vehicle Using FDTD Technique <i>J. Hoppe, D. Duvak and G. Palafox</i>	41
Cross-Analysis of Data Collected on Knowledge Management Practices in Canadian Forces Environments <i>R. Lecocq and M. Gauvin</i>	48
Future Force and First Responders: Building Ties for Collaboration and Leveraged Research and Development <i>W. J. O'Brien and J. Hammer</i>	56
Balancing Technology and Risk in the Future Combat Systems <i>J. N. Mait</i>	63
Improving the Speed of Dynamic Cluster Formation in MANET via Simulated Annealing <i>K. Manousakis, J. S. Baras, A. J. McAuley and R. Morera</i>	71

Chapter 3: Advanced Computing and Simulation	79
Advanced High and Low Fidelity HPC Simulations of FCS Concept Designs for Dynamic Systems	81
<i>S. S. Sandhu, R. Kanapady and K. K. Tamma</i>	
Multimillion Atom Simulations and Visualization of Hypervelocity Impact Damage and Oxidation	89
<i>P. Vashishta, R. K. Kalia and A. Nakano</i>	
Advanced Computer Simulations of Military Incinerators	95
<i>M. K. Denison, C. J. Montgomery, A. F. Sarofim, B. Sadler, M. J. Bockelie, D. Magee, F. Gouldin and J. Bozzelli</i>	
Integrated Numerical and Experimental Investigation of Actuator Performance for Guidance of Supersonic Projectiles	103
<i>S. I. Silton and K. C. Massey</i>	
Advanced Computations for Ballistic Impact Problems	111
<i>G. R. Johnson, S. R. Beissel, C. A. Gerlach, R. A. Stryk, A. A. Johnson and T. J. Holmquist</i>	
Chapter 4: Lethality Technologies	119
Design and Wind Tunnel Testing of Guidance Pins for Supersonic Projectiles	121
<i>K. C. Massey, J. McMichael, T. Warnock and F. Hay</i>	
Failure of Tungsten Heavy Alloys Subjected to Dynamic Transverse Loading	129
<i>K. Tarcza, S. J. Bless and E. Taleff</i>	
Molecular Simulations of Dynamic Processes of Solid Explosives	137
<i>B. M. Rice, D. C. Sorescu, V. Kabadi, P. M. Agrawal and D. L. Thompson</i>	
Development of Advanced Rocket Engine Technology for Precision Guided Missiles	145
<i>M. J. Nusca and R. S. Michaels</i>	
Advanced Optical Fuzing Technology	153
<i>C. M. von der Lippe, J. J. Liu, K. Aliberti, G. Dang, W. Chang, P. Shen and G. Simonis</i>	
Chapter 5: Unmanned Systems	159
Finding Organized Structures in 3-D LADAR Data	161
<i>N. Vandapel and M. Hebert</i>	

Market-Based Complex Task Allocation for Multirobot Teams <i>R. Zlot and A. Stentz</i>	169
Daytime Water Detection by Fusing Multiple Cues for Autonomous Off-Road Navigation <i>A. L. Rankin, L. H. Matthies and A. Huertas</i>	177
Active-Twist Rotor Control Applications for UAVs <i>M. L. Wilbur and W. K. Wilkie</i>	185
Run-Time Assessment of Vehicle-Terrain Interactions <i>R. E. Karlsen, J. L. Overholt and G. Witus</i>	193
Chapter 6: Force Protection/Survivability	201
Development of Very-High-Strength and High-Performance Concrete Materials for Improvement of Barriers Against Blast and Projectile Penetration <i>E. F. O'Neil III, T. K. Cummins, B. P. Durst, P. G. Kinnebrew, R. N. Boone and R. X. Torres</i>	203
Modeling and Mitigation of Blast Effects within Protective Structures <i>M. J. Roth, R. D. Stinson and T. L. Bevins</i>	211
Modeling Thoracic Blunt Trauma; Towards a Finite-Element-Based Design Methodology for Body Armor <i>M. N. Raftenberg</i>	219
Mechanics of Transparent Polymeric Material Assemblies Under Projectile Impact: Simulations and Experiments <i>S. Sarva, A. D. Mulliken, M. C. Boyce and A. J. Hsieh</i>	227
Toxic Effects of a Whole-Body Inhalation Sarin (GB) Vapor Exposure in the Gottingen Minipig <i>S. W. Hulet, E. M. Jakubowski, P. A. Dabisch, J. S. Forster, D. B. Miller, B. J. Benton, W. T. Muse, R. A. Way, J. L. Edwards, J. M. McGuire, J. A. Scotto, D. C. Burnett, B. I. Gaviola, J. R. Jarvis, R. A. Evans, K. L. Matson, C. L. Crouse, J. H. Manthei, S. A. Reutter, R. J. Mioduszewski and S. A. Thomson</i>	235
Chapter 7: Advanced Materials and Manufacturing Technology	241
Novel Simulations of Energetic Materials: Circumventing Limitations in Existing Methodologies <i>J. K. Brennan and B. M. Rice</i>	243

Fabrication of Active Thin Films for Vibration Damping in MEMS Devices for the Next Generation Army Munition Systems <i>E. Ngo, W. D. Nothwang, M. W. Cole, C. Hubbard, G. Hirsch, K. P. Mohanchandra and G. P. Carman</i>	251
Hafnium-Based Bulk Metallic Glasses for Kinetic Energy Penetrators <i>L. J. Kecskes, B. T. Edwards and R. H. Woodman</i>	257
Stab Resistance of Shear Thickening Fluid (STF)–Kevlar Composites for Body Armor Applications <i>R. G. Egres, Jr., M. J. Decker, C. J. Halbach, Y. S. Lee, J. E. Kirkwood, K. M. Kirkwood, N. J. Wagner and E. D. Wetzel</i>	264
Low Cost, Broadband Tunable Ferroelectric Filters for JTRS Cluster 5 Applications <i>S. Sarraf and L. Rulli</i>	272
Chapter 8: Power and Energy	281
Advanced Thermal Management for Military Application <i>D. Allen, M. Lasecki, W. Hnatzuk and R. Chalgren</i>	283
Determination of Laminar Flame Speed of Diesel Fuel for use in a Turbulent Flame Spread Premixed Combustion Model <i>P. Schihl, J. Tasdemir and W. Bryzik</i>	291
Portable Power Generation via Integrated Catalytic Microcombustion-Thermoelectric Devices <i>D. G. Norton, K. W. Voit, T. Brüggemann, D. G. Vlachos and E. D. Wetzel</i>	299
Chapter 9: Immersive Technology	307
Embedded Training Display Technology for the Army’s Future Combat Vehicles <i>J. Rolland, R. Martins, Y. Ha, M. Foglia, M. Bablani and A. Rubel</i>	309
Embedded Training for Future Force Warriors: An Assessment of Wearable Virtual Simulators <i>B. W. Knerr, P. J. Garrity and D. R. Lampton</i>	315
The Evaluation of a Motion Base Driving Simulator in a Cave at TACOM <i>M. A. Mollenhauer, R. A. Romano and B. Brumm</i>	323
First Steps Toward Linking Dialogues: Mediating Between Free-Text Questions and Pre-Recorded Video Answers <i>S. Gandhe, A. Gordon, A. Leuski, D. R. Traum and D. W. Oard</i>	331

Spatial Perception and Expectation: Factors in Acoustical Awareness for MOUT Training <i>D. E. Hughes, J. Thropp, J. Holmquist and J. M. Moshell</i>	339
The FlatWorld Simulation Control Architecture (FSCA): A Framework for Scalable Immersive Visualization Systems <i>A. Treskunov, J. Pair and B. Swartout</i>	344
Chapter 10: Behavioral Sciences and Human Performance	349
Measurement of Human Performance for Future Combat Systems Command and Control <i>C. W. Lickteig, W. R. Sanders, J. W. Lussier and P. J. Durlach</i>	351
Effects of Cognitive Workload on Decision Accuracy, Shooting Performance, and Cortical Activity of Soldiers <i>S. E. Kerick and L. E. Allender</i>	359
Performance Measures for Dismounted Warrior Encapsulation Effects <i>L. Mullins, D. Patton and L. Garrett</i>	363
Caffeinated Gum Maintains Vigilance, Marksmanship, and PVT Performance During a 55 Hour Field Trial <i>G. H. Kamimori, D. Johnson, G. Belenky, T. McLellan and D. Bell</i>	370
The Effects of Soldiers' Loads on Postural Sway <i>J. M. Schiffman, C. K. Benseal, L. Hasselquist, K. Norton and L. Piscitelle</i>	377
Chapter 11: Biomedical Technologies	385
Development of Nanofibrous Membranes Towards Biological Sensing <i>A. G. Senecal, K. J. Senecal, J. P. Magnone and P. E. Pivarnik</i>	387
Hypotensive Resuscitation of Casualties in the Far-Forward Combat Environment: Effects of Select Crystalloids and Colloids on Signal Transduction Mediators in a Swine Model of Severe Hemorrhage <i>M. A. Dubick, D. G. Cameron, J. L. Sondeen and A. P. N. Majumdar</i>	394
Whole Blood Robotic Cholinesterase Assay for Organophosphate Exposure — Testing Soldiers, First Responders, and Civilians in the Field and Laboratory <i>R. K. Gordon, J. R. Haigh, G. E. Garcia, S. R. Feaster, B. P. Doctor, M. A. Riel, L. J. Lefkowitz, D. E. Lenz, P. S. Aisen and W. Smart</i>	401
Prospective and Retrospective Testing of High Prevalence HIV-1 Serum and Blood using Rapid and Conventional Technology <i>D. E. Singer, L. Hird, J. Bulken-Hoover, G. Foglia, R. D. Royster IV, J. A. Malia, E. K. Calero, W. Sateren, M. L. Robb, D. L. Birx and N. L. Michael</i>	409

Alternative Approaches to Improve Physiological Predictions <i>N. Oleg, J. Reifman, L. Berglund and R. Hoyt</i>	415
Chapter 12: Biotechnology	423
Low-Level Inhalation Exposure to Chemical Nerve Agent Vapor Induces Expression of Neuronal Apoptosis and Regeneration Genes <i>J. W. Sekowski, M. A. Orehek, J. Bucher, M. Vahey, M. Nau, M. S. Horsmon, D. Menking, C. Whalley, B. Benton, R. Mioduszewski, S. Thomson and J. J. Valdes</i>	425
Global Gene Expression Analysis to Unambiguously Identify Host Gene Responses Characteristic of Exposure to Biothreat Agents <i>R. Hammamieh and M. Jett</i>	430
Development of Biomimetic Surfaces by Vesicle Fusion <i>D. Stroumpoulis, A. Parra, J. Gliem and M. Tirrell</i>	438
Native and Engineered Simulants for DNA Virus Threat Agents <i>K. P. O'Connell, P. E. Anderson, M. S. Horsmon and J. J. Valdes</i>	446
Rapid Protein Separations in Microfluidic Devices <i>Z. H. Fan, C. Das, Z. Xia, A. V. Stoyanov and C. K. Fredrickson</i>	451
Chapter 13: Nanotechnology	457
Nanoelectronic Chemical Sensors for Chemical Agent and Explosives Detection <i>R. R. Smardzewski, N. L. Jarvis, A. W. Snow and H. Wohltjen</i>	459
Permeation Behavior and Physical Properties of Natural Rubber Nanocomposites <i>W. Zukas, M. Sennett, E. Welsh, A. Rodriguez, D. Ziegler and P. Touchet</i>	467
Nanostructured Origami™ 3D Fabrication and Self Assembly Process for Soldier Combat Systems <i>W. J. Arora, H. J. In, T. Buchner, S.-H. Yang, H. I. Smith and G. Barbastathis</i>	473
Receptor-Conjugated Nanoparticles to Detect Biological Warfare Agents <i>A. Kumar, S. Dwarakanath, J. G. Bruno and L. D. Stephenson</i>	478
Nanocomposite Barrier Fabric for Chemical and Biological Agent Resistant Tent <i>A. Giaya, A. Shah, B. Koene, E. McLaughlin, K. Donahue and J. Hampel</i>	485
Chapter 14: Microelectronics and Photonics Technology	491
Laboratory and Field Performance of a Megapixel QWIP Focal Plane Array <i>A. Goldberg</i>	493

Developing RF-Photonics Components for the Army’s Future Combat Systems <i>W. Zhou, S. Weiss and C. Fazi</i>	501
Integrated Optical Transceiver for Inertial Sensors Using Polymer Waveguide Technology <i>M. Temmen, W. Diffey and P. Ashley</i>	508
Efficient Modeling of Electromagnetic Scattering by Symmetric Lamellar Periodic Structures at Normal Incidence <i>K. M. Leung and T. Tamir</i>	514
Photonics Technology Development for Optical Fuzing <i>C. M. von der Lippe, G. A. Keeler, D. K. Serkland, K. M. Geib, G. M. Peake, A. Mar and J. J. Liu</i>	522
Chapter 15: Environmental and Engineering Geosciences	527
Rapid Soil Stabilization and Strengthening Using Electrokinetic Techniques <i>S. W. Morefield, M. K. McInerney, V. F. Hock, O. S. Marshall, Jr., P. G. Malone, C. A. Weiss, Jr. and J. Sanchez</i>	529
Analysis of Soil and Environmental Processes on Hyperspectral Infrared Signatures of Landmines <i>J. M. Cathcart, R. D. Bock and R. Campbell</i>	534
High Resolution Results and Scalability of Numerical Modeling of Wind Flow at White Sands Missile Range <i>P. A. Haines, D. J. Grove, W.-Y. Sun and W.-R. Hsu</i>	541
Employing Multiple Geophysical Sensor Systems to Enhance Buried UXO “Target Recognition” Capability <i>D. K. Butler, D. E. Yule and H. H. Bennett, Jr.</i>	549
A Framework for the Prediction of Soil Moisture <i>A. N. Flores, E. Istanbuluoglu, R. L. Bras and D. Entekhabi</i>	557
Sonic Boom Prediction: A New Empirical Formulation and Animated Graphical Model <i>A. Clare and R. Oman</i>	565