

David S. Dilworth

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Education

9/86-8/89 **Rackham School of Graduate Studies**
University of Michigan, Ann Arbor, MI
Ph.D. in Electrical Engineering

Fourier Optics, Lasers and Electro-optics, Digital Signal Processing, Probability and Random Processes. Research topic: *Imaging Absorbing Structures Embedded in Thick Diffusing Media*. Graduate student research assistant for Emmett Leith.

9/80-5/83 **Rackham School of Graduate Studies**
University of Michigan, Ann Arbor, MI
M.S.E. in Electrical Engineering

Infrared System Engineering, PASCAL/Data Structures, Control Systems, Pulse Circuit Design, Analysis of Numerical Methods, Contract Law, and Technical Writing.

9/76-6/80 **School of Science and Technology**
Lake Superior State College, Sault Ste. Marie, MI
B.S. in Electrical Engineering Technology

Microcomputer Hardware and Software, Linear and Digital Electronics, Numerical Methods, Math Modeling, Accounting, and Philosophy.

Experience

Argon ST, Inc.
(Previously SenSyTech and Daedalus Enterprises Incorporated)
Ann Arbor, MI

12/91-Present **Director, Advanced Imaging Systems**

5/87-12/91 **Contract Engineer**

7/86-11/86 **Project Engineer**

5/83-6/84 **Electrical Engineer**

Daedalus was a small, publicly held, Ann Arbor business established in 1969 as a spin-off from the University of Michigan Willow Run laboratories. Daedalus merged to become SenSyTech in 1988, and SenSyTech merged to become Argon ST in 2004. The Daedalus products include hyper/multispectral airborne line scanners, high resolution airborne CCD cameras, and other specialized imaging instruments. My primary role is the development and implementation of system architectures that support real-time image acquisition and processing. This work includes some coordination with much larger technical groups located near Washington DC. My other roles have included: development work for a wide range of optical, software, and electrical

systems; technology transfer with the University of Michigan; author or co-author of 2-5 proposals per year; development of a standardized product development process, technical risk management, and presentation of an in-house object oriented software seminar. Core technical areas: hardware/software/VHDL architectures, C++, Java, OpenGL, and ODBC software development, geographic coordinate and image processing, real-time multiprocessor system synthesis and development, spectroradiometer calibration, DSP signal processing systems, near-realtime JPEG2K with sockets, systems analysis and modeling of passive/active imagers/scanners, monochromator instrumentation and integration, and IBM computer interfacing. R&D projects include:

1. **CDAS**, Win32/POSIX real-time airborne common data acquisition system
2. **MAIV**, Multi-perspective auto-stereoscopic imagers and viewer
3. **WHAM**, Whiskbroom hyperspectral airborne mapper
4. **RTM**, Real-time production of georeferenced airborne image maps
5. **ADC VIEW**, Java geocoding viewer for managing hundreds of airborne images
6. **Airborne Digital Camera (ADC)**, airborne 2Kx2K CCD camera with GPS
7. **Laser Search and Rescue**, airborne laser/retroreflector imager
8. **Large Format Multispectral Camera**, six-band ADC with attitude sensor
9. **Airborne Multispectral Polarization Imager**, three color polarization imager
10. **Doppler Imager**, high altitude, narrow band Doppler imager
11. **Infrared Spectral Imaging Radiometer**, staring multispectral IR imager
12. **Large Area Fast Spectrometer**, CCD array multispectral line scanner
13. **Holographic Depth Contouring**, pulsed laser & CCD staring 3-D imager
14. **Vibration Imager**, laser & Doppler shift staring vibration imager
15. **Acoustic Mine Detection**, acousto-mechanical detection of buried mines
16. **3-D Laser Imager**, 3-D imager for spacecraft-spacecraft docking
17. **Thermal Infrared Camera**, scanned multispectral IR camera
18. **REMIDS-II**, laser & airborne polarized scanner for surface mine detection

United States Patent: Karl Wesolowicz, David Dilworth, Randall Zywicki, Keith More, James Lehotsky, Frederick Osterwisch; *Target Detection System Utilizing Multiple Optical Criteria*; 5,793,034; 1998

NASA Certificate of Recognition: *Range sensor using modulated laser diode with demodulation performed by modulating the gate voltage of an image intensifier tube receiver*; July 13, 1993; Daedalus Enterprises

UNIVERSITY OF TOLEDO, Toledo, Ohio
Department of Electrical Engineering and Computer Science

8/06-7/07 **Visiting Professor**
8/05-7/06 **Visiting Associate Professor**

Courses taught:

1. **EECS 2340, *Electric Circuits for Nonmajors*:** For students not majoring in EECS. An introduction to electrical circuit components and laws, resistive circuit analysis, AC circuit analysis, phasors, three phase circuits, digital circuits, and computer aided circuit analysis.

2. **EECS 3420, *Electronics II***: Analog transistor, diode and integrated circuit analysis and design. Incremental analysis techniques, frequency response and feedback techniques
3. **EECS 3460, *Electrical Energy Conversion***: Traditional and renewable electrical energy sources, principles of electromechanical energy conversion, magnetic circuits and transformers, steady state performance of synchronous machines, do machines, single phase and three phase induction motors.
4. **EECS 4200, *Feedback Control Systems***: Feedback methods for the control of dynamic systems. Topics include: modeling, characteristics and performance of feedback systems, stability, root locus and frequency response methods, and MATLAB.
5. **EECS 4260, *Control Systems Design***: A general study of computer aided design of control systems. Topics include: stability, compensation, pole placement, digital systems, student projects, and SIMULINK.

**8/80-Present DILWORTH ELECTRICAL, OPTICAL, AND COMPUTER SYSTEMS
System Engineer/Developer and Small Business Owner**

Various R&D hardware and software systems for industry and academia.

1. **Glaucoma Imaging**: in-vivo imaging of the human optic disc for the detection and management of glaucoma. The effort includes instrument development, image processing tool to estimate disc condition, 2D and 3D visualization tools. (2006-present)
2. **America's Cup Yacht Instrumentation**: real-time sail shape measurement under racing conditions, radar tracking, wireless communications, sensor systems, analysis algorithms, and shore processing tools. Teams: Kookaburra, Team Dennis Conner, BMW/Oracle, Desafío Español (1985-2007)
3. **GIDEN**: Graphical Implementation Development Environment for Networks (GIDEN), Northwestern University, JAVA and C++, (1993-2004). This effort includes working with Ph.D. graduate students in a role that parallels my work at the University of Michigan.
4. **Autonomous Guided Vehicle**: System engineering and tag reader signal processing design. The tag reader design uses an on-board DSP to interrogate passive tags embedded in a factory floor. The wireless signal broadcast from the tag is digitized and processed by the DSP to recover a unique ID and compute the current location of the robot relative to the tag. (2000-2004).
5. **Graph and Related Data Structures**: Optimization Technology Center, Northwestern University and Argonne National Laboratory (1995-96)
6. **Electronic holography**: Image processing systems, see *University of Michigan* below(1990-2006)
7. **Control system for snow making**: Spinning temperature sensor optically linked to proportional controller adjusting water flow, Nubs Nob Ski Area. (1980-82)

UNIVERSITY OF MICHIGAN, Ann Arbor, MI
Department of Electrical Engineering and Computer Science
Adjunct Research Scientist
Adjunct Associate Professor
Visiting Assistant Professor

12/04-4/06
5/93-12/04
1/90-5/93

Basic R&D related to electronic holography systems for imaging objects embedded in scattering media, including biological and microscopic samples. My primary responsibilities include: modeling, simulation, analysis, and image processing of holographic and other types of images, system architecture, software design and development, and integration of various electro-optical, DSP, and CPU subsystems. This role includes attending weekly laboratory meetings where recent results are reviewed and new approaches are developed.

Ph.D. dissertation committees I have served on:

1. Wei-Chen Chien, 2001-06, *Imaging Systems with Holographic Optical Sectioning: Coherent and Incoherent Illumination*, Ph.D. in Electrical Engineering
2. Kurt Mills, 1997-2003, *Image Plane Holography*, Ph.D. in Electrical Engineering
3. Patrick Naulleau, 1993-96, *Coherence and speckle techniques for imaging through highly scattering media and optical fibers*, Ph.D. in Electrical Engineering
4. Eric Arons, 1992-96, *Holographic spatial and temporal coherence methods for optical discrimination*, Ph.D. in Applied Physics
5. Marian Shih, 1991-95, *Electronic holography with a broad spectrum laser for time gated imaging through highly scattering media*, Ph.D. in Applied Physics
6. Ye Chen, 1989-92, *Imaging through biological tissues using electronic holographic method with short pulse and broad spectrum lasers*, Ph.D. in Electrical Engineering

Attendance in the following courses in the MBA program:

1. Leveraging Strategic Resources
2. Strategic Market Planning
3. Human Behavior and Organizations

United States Patent: Emmett Leith, David Dilworth, Hsuan Chen, Ye Chen, Joaquin Lopez, Janis Valdmanis; *Holographic Imaging Through Scattering Media*; 5,299,035; 1994

8/89-8/91 CENTRAL MICHIGAN UNIVERSITY, Mount Pleasant, MI
Assistant Professor of Industrial and Engineering Technology
TAC/ABET Coordinator

Teaching and curriculum development for baccalaureate programs in automated manufacturing and electrical/computer engineering technology. Laboratory development includes system integration of GMF industrial robots, SCORBOT educational robots, Allen-Bradley programmable logic controllers, IBM Personal System 2 computers, and SUN CAD/CAM workstations. Awarded NSF-ILI to develop a robotics artificial intelligence teaching laboratory in collaboration with the computer science department. Collaborative research in fine arts supporting display holography for sculpture.

Students under my supervision:

1. Cliff Wellman, 1990-91, Computer Programmer
2. Ben Coutts, 1990-91, Electrical/Computer Technologist
3. Matt Averill, 1989-91, Robot Technologist and Teaching Assistant
4. Gary Anderson, 1989, Dissertation for Master of Arts in Industrial Management and Technology

Course taught or developed:

6. **IET375 Robotics:** Topics included a survey of robotic and related automated manufacturing topics. The laboratory was based on SCORBOT educational robots, Allen Bradley PLC, IBM-PS2 computers, and C programming. After learning to use each component individually, students developed C programs on the PS2 computers to integrate the robots and PLCs.
7. **IET456 Computer Integrated Manufacturing:** Topics included flexible manufacturing systems, human factors, Just-In-Time manufacturing, group technology, and approaches to material transportation. The laboratory was based on two conveyor belts interconnecting four GMF robots and controlled by a central host computer. Students controlled the robots and conveyors through an interpreted language developed for the laboratory.
8. **IET592 Electronics Technology:** This course was a structured directed study course. The course met weekly and allowed students to upgrade their electricity-electronics knowledge in topic-oriented areas. Students proposed specific topics for investigation and submitted a report in a standard format.
9. **IET594 R&D Electronics:** This course was a structured projects course. The course met weekly and allowed students to integrate concepts from previous courses in a project-oriented environment. Student projects were proposed through a Statement Of Work, Work Breakdown Structure, Acceptance Test Procedure, and Schedule. Students began working on projects after their proposal was approved, and submitted User and System Manuals at the conclusion of the project.
10. **IET597 Robotic Systems:** This course was a continuation of IET375 and investigated the underlying technologies in the IET456 laboratory (above). Topics included GMF robot programming, PLC programming, and system integration with the C programming language.
11. **IET694 Problems in Management and Technology:** A special topics course for Industrial Technology students.

6/84-7/87 PARRY BOAT BUILDERS, Perth, Western Australia
Task Force 1987 Defense (Australian defender of the 1987 America's Cup)
Computer Consultant

3-D computer vision, system integration, and modeling for 12 meter sailboat instrumentation; three-axis closed-loop control and instrumentation system for model tank testing facilities in Tasmania. On location in Perth, Sydney, and Launceston from 6/85 through 12/85.

1/86-6/86 LAKE SUPERIOR STATE UNIVERSITY, Sault Ste. Marie, MI
8/84-6/85 Assistant Professor of Engineering Technology
Coordinator for the Robotics Program

Teaching and curriculum development for a baccalaureate program in robot system integration. Program was approved for TAC/ABET accreditation on first visit. Development of laboratory including two vision guided robots based on PUMA 560 and PUMA 762 robots.

Course taught or developed:

1. **RB310 Introduction to Robotics:** A general survey of robotics topics taught at the engineering technology level.
2. **RB320 Robot Manipulators:** An engineering technology course. This course focused on the mathematical description of robot movements from trigonometric and programming perspectives. Students solved the kinematic equations for the five-axis SCORBOT educational robot and implemented straight line motion algorithms in the BASIC programming language in the laboratory.
3. **RB400 Robot Programming:** This course investigated robot programming by introducing the C programming language and an in-depth investigation of the PUMA 560/762 robots. The laboratory included robot safety, robot operations, teach pendant, PUMA language structure, and various student written programs.
4. **RB410 Robot Control Systems:** A traditional Laplace transform control systems course taught at the engineering technology level.
5. **RB420 Robot Vision:** This course focused on robot vision systems, survey of image processing, and integration strategies for robots and vision systems. The laboratory included the development of C programs that integrated a Pulnix camera, with a Datacube frame grabber, in an IBM-PC computer, that controlled at PUMA robot over a serial port. Each student individually developed the "Blobs and Pens" experiment where the vision system differentiates small round objects (blobs) from long skinny objects (pens), transforms vision coordinates to robot coordinates, and directs the robot to pick-up the objects and place them in an appropriate container. This course completed the foundations for the *Senior Projects* course (below).
6. **RB480 Senior Projects:** This course was a structured team project course. Student projects were proposed through a Statement Of Work, Work Breakdown Structure, Acceptance Test Procedure, and Schedule. Students began working on projects after their proposal was formally approved (department head, professor, and technical expert), and submitted User and System Manuals at the conclusion of the project. Student projects were demonstrated the day before graduation to the public and included media coverage by local TV stations.

10/80-1/83 CYBERON CORPORATION, Ann Arbor, MI
Design Engineer (part time)

Design of microcomputer speech products, RS-232 interface, APPLE II computer hardware and software, and documentation procedures.

5/76-8/80 OFFSHORE RACING ELECTRONICS
Partner

Design, investment, and marketing of sailboat instruments. Products include: boat speed, wind speed, wind direction, timer, log, compass, and dead reckoning.

COURTER INCORPORATED DIVISION OF BENDIX CORPORATION,
Boyne City, MI
9/76-9/80 Associate Engineer
7/73-9/76 Engineering Laboratory Technician

Design and maintenance of linear, digital, and microcomputer test equipment for aircraft

pressure transducers and missile gyros. Analysis of various products: moment of inertia and nutation frequency for Hellfire gyro, failure analysis for Boeing 757/767 pressure transmitter. Hand building and testing of prototype electromagnetic subassemblies for gyros and servo-systems, training of assembly line personnel, certified for military specification soldering.

Computer related

1. **Languages:** C++, Java, C, VHDL, FORTRAN, PASCAL, BASIC, VAL, PLC
2. **Assemblers:** DSP56000, DSP96000, 8051, 680X, 6502, Z-80
3. **Tools:** VisualC++, MATLAB/Simulink, MathCAD, IPP(JP2K), XILINX, Visual Café, ODBC, OpenGL, Keil
4. **Operating Systems:** Win-3.1/95/98/NT/2K/XP, MSDOS, OS/2, UNIX/Linux, iRMX
5. **Communications:** Serial, Ethernet, Wi-Fi, Apache HTTP, WebDAV, OpenSSL
6. **Machines:** PC, SUN, Macintosh, VAX

Publications

(October 2007)

Journals

1. Wei Chen Chien, D. S. Dilworth, Elson Liu, and E. N. Leith, "Synthetic-aperture chirp confocal imaging", *Appl. Opt.* 45, 501-510 (January 2006)
2. E. Leith, W. Chein, K. Mills, B. Athey, D. Dilworth, J. Beals, "Noise suppression and optical sectioning by non-phase recording interferometry", *Appl Opt*, Vol 43, Issue 23, Page 4512 (August 2004).
3. Emmett N. Leith, Wei-Chen Chien, Kurt D. Mills, Brian D. Athey, David S. Dilworth, "Optical sectioning by holographic coherence imaging: a generalized analysis," *JOSA A*, Volume 20, Issue 2, 380-387, (February 2003)
4. Emmett N. Leith, Kurt D. Mills, Shawn Grannel, David S. Dilworth, Brian D. Athey, Joaquin Lopez, "Analysis of time-gated imaging through scattering media by a Fourier optics approach," *JOSA A*, Volume 19, Issue 3, 532-536, (March 2002).
5. B. G. Hoover, L. Deslauriers, R. E. Ahmed, S. M. Grannel, D. S. Dilworth, B. D. Athey, E. N. Leith, "Correlations among angular wave component amplitudes in elastic multiple-scattering random media", *Phys. Rev. E*, 65, 026614 (2002).
6. Kurt D. Mills, Louis Deslauriers, David S. Dilworth, Shawn M. Grannel, Brian G. Hoover, Brian D. Athey, Emmett N. Leith, "Investigation of ultrafast time gating by spatial filtering," *Appl Opt*, Vol 40, No 14, (10 May 2001)
7. Emmett N. Leith, Kurt D. Mills, Patrick P Naulleau, David S. Dilworth, Ignacio Iglesias, Hsuan S. Chen, "Generalized confocal imaging and synthetic aperture imaging," *J Opt Soc Am*, Vol 16, No 12, (Dec 1999)
8. Ignacio Iglesias, Hsuan S. Chen, Kurt D. Mills, David S. Dilworth, Emmett N. Leith, "Electronic Channel Fringe Holography for Depth and Delay Measurements," *Applied Optics*, Volume 38, Issue 11, 2196-2203, (April 1999).
9. Emmett N. Leith, Brian G. Hoover, Shawn M. Grannel, Kurt D. Mills, Hsuan S. Chen, "Realization of time gating by use of spatial filtering", *App Opt*, Vol 38, No 8 (10 Mar 1999)
10. Emmett N. Leith, Brian G. Hoover, David S. Dilworth, Patrick P. Naulleau, "Ensemble-averaged Shack-Hartmann wave-front sensing for imaging through turbid media," *Appl. Opt.*, Vol 37, No 17 (10 Jun 1998)
11. E. Leith, P. Naulleau, and D. Dilworth, "Ensemble-averaged imaging through highly scattering media," *Opt. Lett.* **21**, 1691-1693 (1996)
12. P. Naulleau and D. Dilworth, "Motion resolved imaging of moving objects embedded within scattering media using time gated speckle analysis," *Appl. Opt.* **35**, 5251-5257 (1996)
13. P. Naulleau and D. Dilworth, "Noise analysis for the holographic first-arriving-light technique," *Appl. Opt.* **35**, 3841-52 (1996)
14. E. Arons and D. Dilworth, "Use of Quasi-Fourier synthesis holography for imaging through scattering materials," *Appl. Opt.* **35**, 3104-3108 (1996)
15. P. Naulleau, D. Dilworth, E. Leith, J. Lopez, "Resolution-enhanced detection of moving objects embedded within scattering media using time-gated speckle methods," *Appl. Opt.* **35**, 3065-3067 (1996)

16. E. Arons and D. Dilworth, "Lensless imaging using spatial Fourier synthesis holography," *Appl. Opt.* **35**, 777-781 (1996)
17. E. Arons and D. Dilworth, "Analysis of Fourier synthesis holography for imaging through scattering materials," *Appl. Opt.* **34**, 1841-47 (1995)
18. P. Naulleau, D. Dilworth, "Holographic first-arriving-light signal-to-noise ratio enhancement by differential holography," *Opt. Lett.* **20**, 2354-2356 (1995)
19. P. Naulleau, D. Dilworth, E. Leith, and J. Lopez, "Detection of moving objects embedded within scattering media by use of speckle methods," *Opt. Lett.* **20**, 498-500 (1995)
20. H. Chen, M. Shih, E. Arons, E. Leith, J. Lopez, D. Dilworth, and P. Sun, "Electronic holographic imaging through living human tissue," *Appl. Opt.* **33**, 3630-32 (1994)
21. Y. Chen, H. Chen, D. Dilworth, E. Leith, J. Lopez, M. Shih, P. Sun, and G. Vossler, "Evaluation of holographic methods for imaging through biological tissue," *Appl. Opt.* **32**, 4330-36 (1993)
22. E. Arons, D. Dilworth, M. Shih, and P. Sun, "Use of Fourier synthesis holography to image through inhomogeneities," *Opt. Lett.* **18**, 1852-54 (1993)
23. E. Leith, C. Chen, H. Chen, Y. Chen, D. Dilworth, J. Lopez, J. Rudd, P. Sun, J. Valdmanis, and G. Vossler, "Imaging through scattering media with holography," *J. Opt. Soc. Am. A*, **9**, 1148-53 (1992)
24. E. Leith, H. Chen, Y. Chen, D. Dilworth, J. Lopez, R. Masri, J. Rudd, and J. Valdmanis, "Electronic holography and speckle methods for imaging through tissue using femtosecond gated pulses," *Appl. Opt.* **30**, 4204-10 (1991)
25. D. Dilworth, E. Leith, and J. Lopez, "Three-dimensional confocal imaging of objects embedded within thick diffusing media," *Appl. Opt.* **30**, 1796-803 (1991)
26. E. N. Leith, C. Chen, H. Chen, Y. Chen, J. Lopez, P. Sun, and D. Dilworth, "Imaging through scattering media using spatial incoherence techniques," *Opt. Lett.* **16**, 1820-22 (1991)
27. H. Chen, Y. Chen, D. Dilworth, E. Leith, J. Lopez, and J. Valdmanis, "Two-dimensional imaging through diffusing media using 150-fs gated electronic holography techniques," *Opt. Lett.*, **16**, 487-89 (1991)
28. D. Dilworth, E. Leith, and J. Lopez, "Imaging absorbing structures within thick diffusing media," *Appl. Opt.* **29**, 691-98 (1990)

Proceedings, Symposiums, Conferences

1. E. N. Leith, David S. Dilworth, Wei-Chen Chien, and Elson Liu, "The interaction of holography, synthetic aperture technology, and coded signal imaging", *Holography 2005 International Conference on Holography, Optical Recording, and Processing of Information*, Varna, Bulgaria (2005)
2. Emmett N. Leith, David Dilworth, Wei-Chen Chien, Kurt Mills, Brian Athey, Elson Liu, "Synthetic Aperture, Holographic, Chirped Confocal Process", *Optics Society of America, Frontiers in Optics*, Rochester, New York (October 2004)
3. Collette Coullard, David Dilworth, Jonathan Owen, "Using GIDEN in Network Optimization", *Mathematical Association of America, Upper Peninsula Regional Meeting*, Sault Sainte Marie, Michigan (October 2004)

4. Emmett N. Leith, Kurt D. Mills, Wei-Chen Chien, Brian D. Athey, David S. Dilworth, "Generalization of the theory of holographic coherence confocal imaging", Proc SPIE Vol 4373, Holography: A Tribute to Yuri Denisyuk and Emmett Leith (July 2002)
5. E. N. Leith, K. D. Mills, L. Deslaurier, S. M. Grannell, D. S. Dilworth, B. Athey, "Holography as a method for imaging into volume media (Invited Paper)," Proc. SPIE Vol. 4435, Wave Optics for Optical Information Processing, (August 2001).
6. Emmett N. Leith, Kurt D Mills, Louis Deslauriers, Shawn Grannel, Brian G Hoover, David S. Dilworth, Hsuan Chen, Marian Shih, Joaquin Lopez, Brian D. Athey, "Information optics concepts to image formation in highly scattering media," Proc. SPIE Vol. 4392, p. 1-8, Optical Processing and Computing, (July 2001)
7. Jonathan H. Owen, Collette R. Coullard, and David S. Dilworth, "Visualization in GIDEN," INFORMS, Philadelphia, Pennsylvania, (1999)
8. P. Naulleau, D. Dilworth, B. Hoover, J. Lopez, and E. Leith, "Holography under adverse conditions," Proc. SPIE Vol. 3358, p. 380-387, Sixth International Symposium on Display Holography, (February 1998)
9. K. G. Wesolowicz, J. P. Lehotsky, D. S. Dilworth, and K. A. More, "Laser Search and Rescue," Third International Airborne Remote Sensing Conference and Exhibition, Copenhagen, Denmark, (1997), Awarded: *Best of Session*
10. K. G. Wesolowicz, J. P. Lehotsky, D. S. Dilworth, and K. A. More, "Airborne Multispectral Digital Camera," Third International Airborne Remote Sensing Conference and Exhibition, Copenhagen, Denmark, (1997)
11. Jonathan H. Owen, Collette R. Coullard, and David S. Dilworth, "GIDEN: A Graphical Environment for Network Optimization", 6th Industrial Engineering Research Conference Proceedings, Institute of Industrial Engineers, 507-512, Miami Beach, Florida (1997)
12. Collette R. Coullard, Jonathan H. Owen, David Dilworth, "Java-Enabled Network Optimization," INFORMS, San Diego, California (1997)
13. Jonathan H. Owen, Collette R. Coullard, David Dilworth, "Animated Combinatorial Optimization," INFORMS, Dallas, Texas (1997)
14. E. Leith, P. Naulleau, M Shih, E. Arons, D. Dilworth, H. Chen, J. Lopez, "Holographic methods for detection of objects in irregular media," SPIE, vol. 2546, 278-86 (1995)
15. E. Leith, E. Arons, H. Chen, D. Dilworth, J. Lopez, P. Naulleau, M. Shih, "Coherent optical processing methods for transillumination imaging of biological tissue," SPIE, vol. 2524, 104-13 (1995)
16. M. Shih, E. Arons, H. Chen, D. Dilworth, R. Draper, E. Leith, J. Lopez, and P. Naulleau, "Challenge of optical imaging through biological tissue," SPIE, vol. 2333, 314-20 (1994)
17. H. Chen, Y. Chen, D. Dilworth, E. Leith, J. Lopez, M. Shih, P. Sun, E. Arons, R Draper, and K Clay, "Comparison of various holographic techniques for imaging through biological tissue," SPIE, vol. 2043, 272-77 (1994)
18. R. Zywicki, D. Dilworth, B. Kennedy, E. Weber, and K. More, "A new Doppler Imager for Thermospheric Dynamics," Proceedings of the Int. Sym. on Spectral Sensing Research (1994)
19. E. Leith, E. Arons, H. Chen, Y. Chen, D. Dilworth, J. Lopez, M. Shih, P. Sun, and J. Vossler, "Use of holography for imaging through inhomogeneous media," SPIE vol. 1942, 156-65 (1993)

20. E. Leith, E. Arons, H. Chen, Y. Chen, D. Dilworth, J. Lopez, M. Shih, and P. Sun, "Phase conjugation, holography, and imaging through inhomogeneous media," Proceedings of LEOS '93, IEEE, Nov 15-18 (1993)
21. Baker, WT., Stanich, CG., Dilworth, DS., Parr, JT., Rodgers, TK., Chase RRP., "The MIVIS/MIDAS Hyperspectral Imaging System for Geologic and Environmental Investigations", Proceedings, Ninth Thematic Conference on Geologic Remote Sensing, Pasadena, CA, (February, 1993)
22. C. Chen, H. Chen, Y. Chen, D. Dilworth, E. Leith, J. Lopez, P. Sun, M. Shih, and G. Vossler, "Imaging through biological tissue with holography," SPIE, vol. 1779, 192-96 (1992)
23. S. Rubin and D. Dilworth "On automating goal-to-task translation in a futuristic robotic factory," Artificial Intelligence for Engineering, Design, and Manufacturing," ISA Trans, **31**, 135-50 (1992)
24. E. Leith, H. Chen, Y. Chen, D. Dilworth, J. Lopez, R. Masri, V. Rudd, and J. Valdmanis, "Imaging through tissue using femtosecond pulses and electronic holography," Optics & Photonics News, December 1991, 39-40 (1991)
25. E. Leith, H. Chen, Y. Chen, D. Dilworth, J. Lopez, V. Rudd, and J. Valdmanis, "Electronic Holography for imaging through tissue using femtosecond gated pulses," Symposium on Photon-Tissue Interactions, OSA, San Jose, CA, USA (1991)
26. E. Leith, H. Chen, Y. Chen, A. Cunha, D. Dilworth, and J. Lopez, "Reduced coherence holography and related methods for imaging through inhomogeneities," SPIE, vol. 1212, 143-48 (1990)
27. J. Valdmanis, H. Chen, E. Leith, Y. Chen, J. Lopez, N. Abramson, and D. Dilworth, "Three Dimensional Imaging with Femtosecond Optical Pulses," CLEO, Anaheim CA (1989)

Reports

1. D. Dilworth, "Multiperspective Autostereoscopic Imagers and Viewer", Final Report, Contract No. W56HZV-04-C-0143, TACOM, US Army, (2004)
2. D. Dilworth, "L-SAR, Third Small Engineering Effort: Laser Upgrades", Final Report, Contract No. N/A, NASA Goddard, (2004)
3. D. Dilworth, "L-SAR, Second Small Engineering Effort: Real-Time Signal Processing", Final Report, Contract No. N/A, NASA Goddard, (2000)
4. D. Dilworth, "L-SAR, First Small Engineering Effort: Real-time Architecture", Final Report, Contract No. N/A, NASA Goddard, (1999)
5. D. Dilworth, "L-SAR, Image Analysis from Phase II Instrument Flight Test", Final Report, Contract No. N/A, NASA Goddard, (1998)
6. D. Dilworth, "L-SAR, Phase II Final Report, Contract No. N/A, NASA Goddard, (1998)
7. Jonathan Owen, Collette Coullard, and David Dilworth, "A User Guide for GIDEN, A Graphical Environment for Network Optimization," Department of Industrial Engineering and Management Sciences, Northwestern University, (1997)
8. David Dilworth, Collette Coullard, Jonathan Owen, "Graph and Related Data Structures User's Guide," IE/MS Technical Report TR-96.09, Department of Industrial Engineering and Management Sciences, Northwestern University, (1996)

9. D. Dilworth, K. More, K. Wesolowicz, and R. Zywicki, "Holographic Depth Contouring," Phase II Final Report, Contract No. NAS13-586, NASA Stennis Space Center, MS, 39529 (1995)
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