

Dan M. Davis

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Dan Davis focuses his research and community activities on large-scale military simulations, educational uses of computing, globally distributed computing, and the use of high performance, parallel computers. He has been in academic research for decades as a member of the technical staff at Caltech, the University of Southern California, and the University of Hawai'i and as an independent consultant. Funded for a decade by the U.S. Joint Forces Command and RDECOM, his team has produced products that have been demonstrated to the Director of Defense Research and Engineering, the Deputy Under Secretary of Defense for Science and Technology, Senator Daniel Inouye, Senator Hillary Clinton, former Speaker Newt Gingrich, numerous flag officers, and other major policy setters. He has published several peer-reviewed articles on this work (see below) and is frequently invited to speak on these and associated topics.

Educational achievements include a Bachelor of Arts in Psychology in 1973 and a Juris Doctors in 1975, both from the University of Colorado in Boulder. While at Boulder, he was a student in the Quantitative Psychology Department and participated in computational science research on intelligent agents and computer-assisted learning. It was here that he first wrote programs to run on high-performance computers, conceiving and programming an experimental Ops Research program in Fortran on one of Seymour Cray's early machines, a CDC 6500. The program was designed to analyze and quantify the impact of various employment selection criteria with subsequent performance. Later work in the Graduate School of Business Administration at CU focused on Organizational Behavior and the quantification and computer analysis of management topics. His studies in Law School there were capped by a study on the impact of tax policy on social behavior.

He has taught at both the undergraduate and graduate levels. He taught primarily Introduction to Psychology and Business Law at Blair College, Colorado Springs, from 1980 to 1985, where he was once selected as Instructor of the Term. In 1986 he also taught a course in Negotiations to Masters candidates in Denver for the

University of Phoenix. He is certified to teach Psychology, Business Law, Corporations, Statistics, and Personnel Management by the State of Colorado.

As a researcher, he has been active in High Performance Computing (HPC), focusing on agent-based models, since 1988. His professional career includes practicing law with his father for 10 years (admitted to Colorado State, Federal and the US Supreme Courts), after which he was recruited by Martin Marietta to act as counsel and subcontracts manager on a large DoD classified contract. In 1988 he was transferred to JPL in Pasadena as Classification Manager, to lead security training, and was qualified as a Software Engineer. In 1993, he was appointed as the Assistant Director of the Center for Advanced Computing Research at the California Institute of Technology (Caltech), where he directed research proposals, external relations, administrative and executive activities for a \$15M/year supercomputer center. In 1999, he assumed the position of Associate Director for Strategic Development at the Information Sciences Institute, a 350-person research division of the University of Southern California (USC). He then was the Director for Finance and Contracts at the Maui Supercomputing Center, University of Hawai'i. In 2002, he returned to USC to become the Director of the JESPP Project, a DoD simulation project using HPC. his project provided scalable code to the U.S. Joint Forces Command allowing more than ten million individual vehicle and pedestrian independent agents to be simulated in a global-scale terrain database.

Over the last two decades, he has led or participated in proposal efforts up to \$600M and was a section-lead on a proposal that won a \$181M award in 2001. He has extensive experience with government, industry and foundation relations. He currently is an independent consultant retained by the Computational Sciences Division at the Information Sciences Institute, University of Southern California. T

He has been active in design rule checking algorithm research, large-scale distributed DoD simulations and in researching HPC uses in education. He was the Chairman of the Coalition of Academic Supercomputing Centers for 1998 and Chaired the Coalition for Academic Scientific Computation in 1999. He is on several committees at the University of Southern California and various professional conferences.

He has served as a cryptologist and linguist on active duty in the USMC, including two combat-zone tours in Southeast Asia in 1969 and 1970, and retired in 2002 with the rank of Commander, US Naval Reserve, where he served in the Cryptologic Specialty area, doing tours in San Diego, Pensacola, Washington DC, Fort Meade, Japan, London, and Naples.

Journal Articles

- Davis, D. M., Wagenbreth, G., Lucas, R. F. & Gregory, P. C., (2011), "The Test and Evaluation Uses of Heterogeneous Computing: GPGPUs and Other Approaches", *The ITEA Journal of Test and Evaluation*, Fairfax, Virginia
- Yao, K-T., Ward, C. E. & Davis, D. M., (2011), "Data Fusion of Geographically Dispersed Information: Experience with the Scalable Data Grid", *The ITEA Journal of Test and Evaluation*, Fairfax Virginia
- Yao, K-T., Davis, D. & Lucas, R., (2006), "Supercomputing's Role in Data Problems and Its Contribution to Solutions," *The ITEA Journal of Test and Evaluation*, Fairfax, Virginia, Sep-Oct, 2006.
- Lucas, R., Davis, D. & Yao, K-T., (2006), "High Performance Computing Facilities for Joint Military Simulation Data Management," *The ITEA Journal of Test and Evaluation*, Fairfax, Virginia.
- Gottschalk, T., Amburn, P. & Davis, D., (2005), "Advanced Message Routing for Scalable Distributed Simulations," *The Journal of Defense Modeling and Simulation*, San Diego, California
- Davis, D., Lucas, R., Amburn, P. & Gottschalk, T., (2005), "Joint Experimentation on Scalable Parallel Processors," *The ITEA Journal of Test and Evaluation*, Fairfax, Virginia, 2005

Conference Papers

(Most on-line via his web site: <http://www.hpc-educ.org/Papers.html>)

- Yao, K-T., Tran, J. J., Lucas, & Davis, D. M., (2015, Pending), "Effective Data Logging and Display of Small Unit Simulations," in the *Proceedings of the Interservice/Industry Simulation, Training and Education Conference*, Orlando, Florida, November, 2015
- Davis, D. M., Chambless, R.M, Lucas, R.F., & Davis, L.M., (2015, Pending), "Improving Intergenerational Education: Strategies for Mentoring Military Personnel," in the *Proceedings of the Interservice/Industry Simulation, Training and Education Conference*, Orlando, Florida, November, 2015
- Tran, J. J., Castello, B. R., Lucas, D. W. H. R. F., Yao, K. T., & Davis, D. M. Employing High Performance Computing to Realize a Cyber Quick-Reaction Training Environment." in the *Proceedings of ModSIM World*, Norfolk, Virginia, March, 2015
- Lucas, R.F., Tran, John. J. J., Wagenbreth, G., Pratt, D. & Davis, D. M., (2013), "Practical Adiabatic Quantum Computing: Implications for the Simulation Community," in the *Proceedings of the Interservice/Industry Simulation, Training and Education Conference*, Orlando, Florida, November, 2013
- Lucas, R.F., Pratt, D. R., Davis, D.M., & Lucas, T.W., (2013) "Evading Moore's Law: Quantum Computing for Operations Research", INFORMS Conference, Minneapolis, Minnesota, October, 2013
- Davis, D. M., Ward, C. E. & Davis, L.K., (2013, Pending), "Developing a Research Administration Course for Academics: A Need Too Long Ignored", in the *Proceedings of the SISO Fall 2010 Simulation Interoperability Workshop*, Orlando, Florida
- R.F. Lucas, G. Wagenbreth, D.M. Davis, and R.G. Grimes, (2012), "Multifrontal Factorization on Heterogeneous Multicore Systems", SIAM Conference on Applied Linear Algebra, Valencia, Spain, June 22, 2012
- Gottschalk, T. D., Yao, K-T., Wagenbreth, G. & Davis, D. M., (2010), "Implementing Emerging High Performance Computing and Data Management Technologies in Agent Based Simulations", in the *Proceedings of the WinterSim2010 Conference*, Baltimore, Maryland
- Gottschalk, T. D., Yao, K-T., Wagenbreth, G. & Davis, D. M., (2010), "Distributed and Interactive Simulations Operating at Large Scale for Transcontinental Experimentation", in the *Proceedings of the IEEE/ACM Distributed Simulations and Real Time Applications 2010 Conference*, Fairfax, Virginia
- Davis, D. M., Roberts, D. W. & Baer, G. D., (2010), "Developing a Research Administration Course for Academics: A Need Too Long Ignored", in the *Proceedings of the SISO Fall 2010 Simulation Interoperability Workshop*, Orlando, Florida

- Lucas, R. F., Wagenbreth, G., Yao, K-T., Davis, D. M., & Jeong, J. H., (2010), "Equation-Based Models in Discrete-Element and Agent-Based Simulations", in the *Proceedings of the SISO Fall 2010 Simulation Interoperability Workshop*, Orlando, Florida
- Davis, L. K., Curiel, J., & Davis, D. M., (2010), "HITL and Metacognition: Self Analysis and Leadership Enhancement During Simulations", in the *Proceedings of the SISO Fall 2010 Simulation Interoperability Workshop*, Orlando, Florida
- Wagenbreth, G., Lucas, R. F., Yao, K-T., Davis, D. M. & Ward, C. E., (2010), "Nondisruptive Data Logging: Tools for JFCOM Large-scale Simulations", in the *Proceedings of the SISO Fall 2010 Simulation Interoperability Workshop*, Orlando, Florida
- Davis, D. M., Wagenbreth, G., Lucas, R. F. & Gregory, P. C., (2010), "The Test and Evaluation Uses of Heterogeneous Computing: GPGPUs and Other Approaches", in the *Proceedings of the ITEA Annual Technology Review*, Charleston, South Carolina
- Wagenbreth, G., Davis, D. M. & Lucas, R. F., (2010), "GPGPU Programming Courses: Getting the Word Out to the Test and Evaluation Community", in the *Proceedings of the ITEA Annual Technology Review*, Charleston, South Carolina
- Lucas, R. F., Wagenbreth, G. & Davis, D. M., (2010), "System Analyses and Algorithmic Considerations in CUDA Implementations for Complex Simulations", in the *Proceedings of the ITEA Annual Technology Review*, Charleston, South Carolina
- Yao, K-T., Ward, C. E. & Davis, D. M., (2010), "Data Fusion of Geographically Dispersed Information: Experience with the Scalable Data Grid", in the *Proceedings of the ITEA Annual Technology Review*, Charleston, South Carolina
- Lucas, R. F., Wagenbreth, G., Davis, D. M. & Yao, K-T. (2010), "Potential Uses of GPGPU-Enhanced Cluster Computing in MCAE Simulations for Non-linear Mechanical Dynamics", in the *Proceedings of the HPCMP Users Group Conference*, Schaumburg, Illinois
- Davis, D. M., Lucas, R. F., Wagenbreth, G., Roberts, D. W. & Brewton, C., (2010), "The Future Uses for the GPGPU-Enhanced Cluster at JFCOM", in the *Proceedings of the HPCMP Users Group Conference*, Schaumburg, Illinois
- Lucas, R. F., Wagenbreth, G., Davis, D. M. & Grimes, R. G., (2010), "Multifrontal Computations on GPUs and Their Multi-core Hosts", In the *Proceedings of VECPAR'10*, Berkeley, California
- Davis, D. M., Baer, A.M., Davis, L. M., & Gottschalk, T. D., (2010), "Applying HPC Technology to Systemic Diversity Dilemmas," in the *Proceedings of the Australian Computers in Education Conference*, Melbourne, Australia, April 2010
- Davis, D. M., Lucas, R. F., Gottschalk, T. D., Wagenbreth, G., & Agaloff, J., (2009), "FLOPS per Watt: Heterogeneous-Computing's Approach to DoD Imperatives," in the *Proceedings of the Interservice/ Industry Simulation, Training and Education Conference*, Orlando, Florida, 2009
- Lucas, R. F., Davis, D. M., Wagenbreth, G., & Tran, J. J., (2009), "Operational Use of a Large GPGPU-Enhanced Linux Cluster" in the *Proceedings of the High Performance Computing Modernization Program Users' Group Conference*, San Diego, California, 2009
- Davis, D. M., Lucas, R. F., Wagenbreth, G., & Tran, J. J., (2008), "Effectively using a Large GPGPU-Enhanced Linux Cluster" in the *Proceedings of the High Performance Computing Modernization Program Users' Group Conference*, Seattle, WA, 2008
- Tran, J. J., Lucas, R. F., Yao, K-T, Wagenbreth, G., Davis, D. M., & Bakeman, D. J., (2008), "A High Performance Route-Planning Technique for Dense Urban Simulations", in the *Proceedings of the Interservice/ Industry Simulation, Training and Education Conference*, Orlando, Florida, 2008
- Davis, D. & Moore, J., (2007), "FPGA and GPUs as Accelerators for Linux Clusters," in the *Proceedings of the International Test and Evaluation Association Me&S Conference*, Las Cruces, New Mexico, 2007
- Davis, D., Gottschalk, T. & Davis, L., (2007), "High Performance Computing Allows Simulation to Transform Education," in the *Proceedings of the Winter Simulation Conference*, Washington, DC, 2007

- Davis, L. K. & Davis, D. M., (2007), "Implementing New Educational Technology for 21st Century DoD Leadership Development," in the *Proceedings of the Interservice/Industry Simulation, Training and Education Conference*, Orlando, Florida, 2007
- Lucas, R. F., Davis, D. M. & Wagenbreth, G., (2007), "Implementing a GPU-Enhanced Cluster for Large-Scale Simulations," in the *Proceedings of the Interservice/Industry Simulation, Training and Education Conference*, Orlando, Florida, 2007
- Gottschalk, T. & Davis, D. (2006), "Application of Proven Parallel Programming Algorithmic Design to Aggregation-Deaggregation Problems," in the *Proceedings of the Interservice/Industry Simulation, Training and Education Conference*, Orlando, Florida, 2006
- Davis, D. and Davis, L, (2006), "Educational Extensions of Large-Scale Simulations Enabled by High Performance Computing in the *Proceedings of the Interservice/Industry Simulation, Training and Education Conference*, Orlando, Florida, 2006
- Davis, D. (2006), "Large-Scale Simulations and Transcontinental Data Management and Analysis", *4th Cluster Symposium On the Use of Commodity Clusters for Large-Scale Scientific Applications 2006*, Baltimore, Maryland, July 2006
- Pratt, D.R., Amburn, P., Lucas, R.F., & Davis, D.M., (2006), "Petascale Computing for Military Operations", *Proceedings of the Simulation Interoperability Workshop*, Baltimore, Maryland, July, 2006
- Davis, D. & Lucas, R., (2006), "Joint Experimentation, Data Management and Analysis Enabled by Trans-Continentially Distributed Linux Clusters", *HPCMP Users' Group Conference*, Denver, Colorado. June, 2006
- Davis, D. & Baer, G. (2006), "Providing Scalable Simulations, Environments and Data Structures for Theatre of War Analysis and Training ," presented at *International Training and Education Conference*, London, UK
- Davis, D., & Baer, G., (2005), " High Performance Computing Facilities for Joint Military Simulation Data Management," presented at *ITEA Modeling and Simulation Conference*, Las Cruces, NM, 2005
- Wagenbreth, G., Yao, K-T., Davis, D., Lucas, R., and Gottschalk, T., (2005), "Enabling 1,000,000-Entity Simulations on Distributed Linux Clusters," *WSC05-The Winter Simulation Conference*, Orlando, Florida,
- Davis, D., Baer, G., & Gottschalk, T., (2004), "21st Century Simulation: Exploiting High Performance Parallel Computing and Advanced Data Analysis," in the *Proceedings of the Interservice/Industry Simulation, Training and Education Conference*, Orlando, Florida
- Lucas, R., & Davis, D., "Joint Experimentation on Scalable Parallel Processors," (2003), in the *Proceedings of the Interservice/Industry Simulation, Training and Education Conference*, Orlando, Florida, 2003
- Brunett, S., Davis, D., Gottschalk, T., Messina, P., & Kesselman, C., (1998) "Implementing Distributed Synthetic Forces Simulations in Metacomputing Environments," in the *Proceedings of the Seventh Heterogeneous Computing Workshop*, Orlando, Florida, March 1998
- Messina, P., Brunett, S., Davis, D., Gottschalk, T., Curkendall, D., & Seigel, H., (1997) "Distributed Interactive Simulation for Synthetic Forces," in the *Proceedings of the 11th International Parallel Processing Symposium*, Geneva, Switzerland, April 97
- Messina, P., Davis, D. et al., (1997) "Synthetic Forces Express: A New Initiative in Scalable Computing for Military Simulations.," in the *Proceedings of the Simulation Interoperability Workshop*, Orlando, March 1997

Invited Speaker

- Davis, D. M., Gottschalk, T. D., & Lucas, R. F., (2007), "Consistency between Various Abstraction Layers: Approaches to the Aggregation/De-aggregation Problem ," at the DARPA Future of Constructive Simulation Workshop, San Diego, CA, 2007
- Lucas, R. F., Gottschalk, T. D., & Davis, D. M., (2007), "Scalable Distributed Systems and Data Management: Advanced Architectures and Individual Entity Parallelization ," at the DARPA Future of Constructive Simulation Workshop, San Diego, CA, 2007

- Davis, D. M., "Interactive High Performance Computing: Lessons Learned," in the Interactive Computing Birds of a Feather, at the 4th Cluster Symposium On the Use of Commodity Clusters for Large-Scale Scientific Applications 2006, Baltimore, Maryland, July, 2006
- Davis, D., "Scoping, Specifying and Satisfying the Need for Large-Scale Distributed Data Management," at the 3rd Cluster Symposium On the Use of Commodity Clusters for Large-Scale Scientific Applications 2005, Arlington, Virginia, July, 2005
- Davis, D., "Interactive HPC for Forces Modeling and Simulation: HPCMP's Distributed Center for JFCOM's JESPP Project," at the HPCMP User Group Conference, Nashville, Tennessee, June, 2005
- Davis, D., "Joint Experimentation on Scalable Parallel Processors," at the International Test and Evaluation Association (ITEA), Modeling and Simulation Workshop, Las Cruces, New Mexico, December, 2004
- Davis, D., "Large-Scale Military Simulations on Linux Clusters: Update, Remote DCs and Interactive Ops," at the 2nd Annual Symposium on the On the Use of Commodity Clusters for Large-Scale Scientific Applications, Arlington, Virginia, July, 2004
- Davis, D., "Large-Scale Intelligent Agent Simulations on Linux Clusters: Applications, Implementations, and Implications," at the Symposium on the On the Use of Commodity Clusters for Large-Scale Scientific Applications, Arlington, Virginia, July, 2003

Technical Reports

- Lucas, R.F., Wagenbreth, G., & Davis, D., (2006) "Polymorphous Computer Architectures (PCA) Technology Transition to Joint Semi Automated Forces (JSAF) ," AFRL-IF-RS-TR-2006-255 Final Technical Report , DARPA, Arlington, Virginia