

Steve Bryson

Curriculum Vitae

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Education

- 2004 Ph.D., Scientific Computation and Computational Mathematics program, Stanford University. Advisor: Doron Levy, thesis: *High-Order Central Schemes for Balance Laws and Hamilton-Jacobi Equations*.
- 2001 M.S. in Computer Science, Stanford University.
- 1981-82 Student in the Mathematics Ph.D. Program at the University of California Berkeley.
- 1975-81 Undergraduate study at the University of Illinois, Chicago. Major: mathematics, minors: physics, philosophy.

Professional Experience

- 1997 - present Computer engineer, AST, Data Systems for the National Aeronautics and Space Administration at NASA Ames Research Center, Mountain View, CA. Recent duties involve research in numerical methods for solving non-linear evolution equations. Earlier duties involved research into the development and use of virtual reality technology to explore the results of complex scientific simulations.
- 1999 - 2000 Group Lead, Data Analysis Group in the NASA Advanced Supercomputing (NAS) division at NASA Ames Research Center. Primary responsibilities include: maintaining group research activities; facilities and equipment management; identification of new research directions.
- 1990 - 1997 Contractor working in the Research Branch of the NAS division at NASA Ames Research Center, under contract first to Computer Sciences Corporation, then MRJ Inc. Principal investigator on the Virtual Windtunnel Project, an application of virtual reality technology to the visualization of the results of computational fluid dynamics computations.
- 1987 - 1990 Member of Technical Staff, Sterling Software as a contractor to NASA Ames Research Center. Project member of the Virtual Interactive Environment Workstation, performing system integration, human factors experiment and design, application development.
- 1984 - 1987 Researcher at VPL research Inc, Redwood City, CA. Developed prototype visual programming language and the Dataglove hand-gesture input device.
- 1983 - 1984 Programmer in the Connelley Group, Mountain View, CA, developing various computer games in 6502 assembly language.

Professional Experience (continued)

- 1983 - 1984 Programmer at Epyx, Inc., Sunnyvale, CA, developing various computer games for 6502-based systems.
- 1977 - 1981 Show operator, instructor, telescope operator and in-house music composer at the Adler Planetarium, Chicago, IL.

Teaching Experience

- 2002 - 2003 Teaching assistant for graduate course *Computational Methods for Fronts and Waves* taught by Doron Levy at Stanford University.
- 1985 - 2004 Adult education instructor at the California Academy of Sciences, San Francisco, CA, teaching classes in various aspects of modern physics to adult lay students. Classes include: relativity, quantum mechanics and particle physics.
- 1992 - 1998 Speaker in 15 tutorials on virtual reality technology at various professional conferences, including ACM SIGGRAPH, IEEE Visualization and IEEE Virtual Reality. Organized several of these tutorials.
- 1981 - 1982 Teaching Assistant in the UC Berkeley mathematics department, covering both first and second year calculus.
- 1981 Instructor of astronomy classes for high school students at the Adler Planetarium, Chicago, IL.

Bibliography

Journal Publications

- Bryson S., Levit, C., *The Virtual Windtunnel: An Environment for the Visualization of Three-Dimensional Unsteady Fluid Flows*, IEEE Computer Graphics and Applications , **12**(4) (1992), pp.25–34.
- Bryson S., Freedman, M., Wang, Z., *Mobius Invariance of Knot Energy*, Bull. Amer. Math. Soc. (N.S.), **28** (1993), pp.99–103.
- Bryson S., *Virtual Environments in Scientific Visualization*, Comm. of the ACM, **39**(5) (1996), pp.62–71.
- Bryson S., Levy D., *High-order central WENO schemes for 1D Hamilton-Jacobi equations*, in F. Brezzi *et al.* (Eds.), “Numerical Mathematics and Advanced Applications”, Proceedings of ENU-MATH 2001, Ischia, Italy; Springer-Verlag, Italy, 2003, pp.45–54.
- Bryson S., Levy D., *Central schemes for multidimensional Hamilton-Jacobi equations*, SIAM J. Sci. Comput., **25** (2003), pp.767–791.
- Bryson S., Levy D., *High-order central WENO schemes for multi-dimensional Hamilton-Jacobi equations*, SIAM J. Numer. Anal., **41** (2003), pp.1339–1369.

Bibliography (continued)

Bryson S., Levy D., *High-order semi-discrete central-upwind schemes for multi-dimensional Hamilton-Jacobi equations*, J. Comput. Phys., **189** (2003), pp.63–87.

Bryson S., Levy D., *Balanced central schemes for the shallow water equations on unstructured grids*, SIAM J. Sci. Comput., to appear.

Bryson S., Kurganov A., Levy D., Petrova G., *Compressed Semi-Discrete Central-Upwind Schemes for Hamilton-Jacobi Equations*, IMA Journal of Numerical Analysis, to appear.

Bryson S., Kosovichev, A., Levy D., *High-order shock-capturing methods for modeling dynamics of the solar atmosphere*, Physca D, to appear.

Submitted Publications

Bryson S., Levy D., *On the Total Variation of High-Order Semi-Discrete Central Schemes for Conservation Laws*, Submitted (2004).

Bryson S., Levy D., *Mapped WENO and Weighted Power ENO Reconstructions in Semi-Discrete Central Schemes for Hamilton-Jacobi Equations*, Submitted (2005).

Peer-Reviewed Conference Proceedings

Bryson S., Fisher, S., *Defining, Modeling, and Measuring System Lag in Virtual Environments*, 1990 SPIE conference on Stereoscopic Displays and Applications, San Jose, CA.

Bryson S., *Interaction of Objects in a Virtual Environment: A Two Point Paradigm*, 1991 SPIE conference on Stereoscopic Displays and Applications, San Jose, CA.

Bryson S., Levit, C., *A Virtual Environment for the Visualization of Three-Dimensional Steady Fluid Flows*, 1991 SPIE conference on Stereoscopic Displays and Applications, San Jose, CA.

Bryson S., Levit, C., *The Virtual Windtunnel: An Environment for the Visualization of Three-Dimensional Unsteady Fluid Flows*, IEEE Visualization 91, San Diego, CA.

Bryson S., *Measurement and Calibration of Static Error for Three-Dimensional Electromagnetic Trackers*, 1992 SPIE conference on Stereoscopic Displays and Applications, San Jose, CA.

Bryson S., *Paradigms for the Shaping of Surfaces in Virtual Environments*, 25th Hawaii International Conference on System Science, 1992 Poipu Beach, HI.

Bryson S., *Virtual Spacetime: An Environment for the Visualization of Curved Spacetimes via Geodesic Flows*, IEEE Visualization 92, Boston, MA.

Bryson S., Gerald-Yamasaki, M., *The Distributed Virtual Windtunnel*, Supercomputing 92, Minneapolis, MN.

Bryson S., *The Virtual Windtunnel: A High-Performance Application of Virtual Reality*, 1993 Virtual Reality Annual International Symposium, Seattle, WA.

Bryson S., *Impact of Lag and Frame Rate on Various Tracking Tasks*, 1993 SPIE conference on Stereoscopic Displays and Applications, San Jose, CA.

Bibliography (continued)

Bryson S., Kenwright, D., Gerald-Yamasaki, M., *FEL: the Field Encapsulation Library*, IEEE Visualization 96, San Francisco, CA.

Bryson S., Johan, S., *Time Management, Simultaneity and Time-Critical Computation in Interactive Unsteady Visualization Environments*, IEEE Visualization 96, San Francisco, CA.

Bryson S., Johan, S., Schlecht, L., *An Extensible Interactive Framework for the Virtual Windtunnel*, 1997 Virtual Reality Annual International Symposium, Albuquerque, NM.

Bryson S., *Time-Critical Computational algorithms for Particle Advection in Flow Visualization*, IEEE Visualization 98, Raleigh-Durham, NC.

Book Contributions

Bryson S., Levit, C., *A Virtual Environment for the Visualization of Three-Dimensional Steady Fluid Flows*, Virtual Worlds, Real Challenges, Meckler Publishers (1992).

Bryson S., *Real-Time Exploratory Scientific Visualization and Virtual Reality*, Scientific Visualization, Advances and Challenges, Rosenblum, L. et. al., (Eds.), Academic Press, London (1994).

Bryson S., *Virtual Environments in Scientific Visualization*, Animation and Scientific Visualization: Tools and Applications, Earnshaw, R. A., and Watson, D., (Eds.), Academic Press, London (1994).

Member of Author Committee, *Virtual Reality: Scientific and Technological Challenges*, Durlach, N., and Mavor, A., (Eds.), The National Academies Press, (1995).

Gerald-Yamasaki, M., Hultquist, J., Bryson, S., Kenwright, D., Lane, D., Walatka, P., Watson, V., *Visualization of Computational Fluid Dynamics*, Computational Fluid Dynamics Review 1995, Hafez, M., Oshima, K., (Eds.), Wiley and Sons, (1995).

Bryson S., *Approaches to the Successful Design and Implementation of VR Applications*, Virtual Reality Applications, Earnshaw, R. A., Vince, J. A., Jones, H., (Eds.), Academic Press, London (1995).

Bryson S., *Visualizing Aircraft Design*, Frontiers of Engineering, The National Academies Press, (1996).

Bryson S., *Virtual Reality*, The Computer Science and Engineering Handbook, Tucker, A., (ed.), CRC Press, (1997).

Bryson S., *The Virtual Windtunnel*, Computational Fluid Dynamics Review 1998, Hafez, M., Oshima, K., (Eds.), Wiley and Sons, (1998).

Bryson S., *Information Visualization in Virtual Environments*, Handbook of Virtual Environments, Stanney, K., (ed.), LEA Associates, (2002).

Bryson S., *Direct Manipulation in Virtual Reality*, Visualization Handbook, Hansen, C. and Johnson, C., (Eds.), Elsevier (2004).

Recent Conference Presentations

- 2004 Bryson S., Levy D., *A Well-Balanced Central-Upwind Scheme for the 2D Shallow Water Equations on Triangular Meshes*, Tenth International Conference on Hyperbolic Problems Theory, Numerics, Applications, Osaka, Japan.
- 2004 Bryson S., Kosovichev, A., Levy D., *Simulation of Multiple Shocks in the Solar Atmosphere Using a High-Order Shock-Capturing Scheme*, SIAM Annual Meeting Portland, OR.
- 2004 Bryson S., Kosovichev, A., Levy D., *High-Order Simulation of Non-Linear Oscillations and Shocks in the Solar Atmosphere*, 6th International Conference on Spectral and High Order Methods, Providence, RI.
- 2002 Bryson S., Levy D., *High-Order Semi-Discrete Central-Upwind Schemes for Multi-Dimensional Hamilton-Jacobi Equations*, International Conference on Scientific Computing and Partial Differential Equations, Hong Kong.
- 2002 Bryson S., Levy D., *Efficient High-Order Central Schemes for Multi-Dimensional Hamilton-Jacobi Equations*, Ninth International Conference on Hyperbolic Problems Theory, Numerics, Applications, Pasadena CA.

Invited Talks

- 1996 Invited Speaker *Visualizing Aircraft Aerodynamic Design*, National Academy of Engineering Symposium on Frontiers of Engineering, San Diego, CA.
- Keynote Speaker *Opportunities and Challenges in Virtual Reality Applications*, Eurographics 1996, Poitiers, France.
- Invited Speaker *Virtual Environments in Scientific Visualization*, Parallel Computational Fluid Dynamics Conference, Capri, Italy.
- 1995 Keynote Speaker *Real-Time Collaborative Visualization in Virtual Reality*, 1995 VRML Workshop, San Diego, CA.
- Invited Speaker *Virtual Environments in Scientific Visualization*, 1995 Pittsburgh Conference in Chemistry and Chemical Engineering New Orleans, LA.
- Invited Speaker *Virtual Environments in Scientific Visualization*, American Institute of Physics Annual Meeting, San Jose, CA.
- Invited Speaker *Initial User Reaction to the Virtual Windtunnel*, American Institute of Aeronautics and Astronautics Meeting, Reno, NV.
- 1994 Invited Speaker *Data Management and Interaction in Computational Fluid Dynamics*, International Conference on Acoustic Displays, Santa Fe, NM.
- Invited Speaker *Virtual Environments in Scientific Visualization*, GRAPHICON '94, Nizhni Novgorod, Russia.
- Invited Speaker *Virtual Environments in Scientific Visualization*, Virtual Reality Software and Technology, Singapore.

Invited Talks (continued)

- Invited Speaker *Virtual Environments in Scientific Visualization*, Virtual Reality Applications, Leeds, England.
- 1993 Keynote Speaker *Why Virtual Reality is Hard*, Eurographics 1993 Workshop on Virtual Environments, Barcelona, Spain.
- Invited Speaker *Virtual Environments in Scientific Visualization*, Physics Computing '93, Albuquerque, NM.
- 1992 Keynote Speaker *Virtual Environments in Scientific Visualization*, British Computer Society Conference on Animation and Scientific Visualization, Winchester, England.
- Invited Speaker *Virtual Environments in Scientific Visualization*, International Conference on artificial Reality and Tele-Existence, Tokyo Japan.

Awards

- 2004 NASA Space Act Award for the Virtual Windtunnel.
- 2003 NASA Exceptional Performance Award.
- 2002 NASA Exceptional Performance Award.
- 1999 NASA Group Achievement Award for the Virtual Windtunnel Team.
- 1995 Computer Sciences Corporation Technical Excellence Award.
- 1992 Best Paper, IEEE Visualization 91 for Bryson S., Levit, C., *The Virtual Windtunnel: An Environment for the Visualization of Three-Dimensional Unsteady Fluid Flows*.

Service

- 2002 NSF Early Career Review Panel.
- 2000 Accelerated Strategic Computing Initiative (ASCI) Blue Ribbon Review Panel.
- 1993 - 1999 Vice chair for virtual reality, Technical Committee for Computer Graphics, IEEE Computer Society.
- 1999 General co-chair, IEEE Visualization '99 conference, San Francisco, CA.
- 1998 Program co-chair, IEEE Visualization '98 conference, Raleigh-Durham, NC.
- 1994 - 1998 Editor of "Practical Visualization" column, *Computers in Physics*.
- 1996 General chair, Virtual Reality Annual International Symposium, Santa Clara, CA.

Service (continued)

- 1995 Invited participant: "America in the Age of Information: A Forum" sponsored by the Committee on Information and Communications of the National Science and Technology Council. Edited report of the Virtual Environments Group.
- 1995 Program co-chair, Virtual Reality Annual International Symposium, Raleigh-Durham, NC.
- 1993 - 1994 Member, National Academy of Sciences/National Research Council Committee on Virtual Reality Research and Development. Report entitled *Virtual Reality: Scientific and Technological Challenges*, National Academy of Sciences Press, 1995
- 1993 Co-chair, IEEE Computer Society Symposium on Research Frontiers in Virtual Reality, San Jose, CA.
- 1992 Breakout group leader at the National Research Council Planning Meeting on a National Agenda for Virtual Reality Research and Development, Washington, D. C.

Professional Memberships: AAAS, AMS, SIAM