

Keith Bledsoe
Radiation Transport Group
Reactor & Nuclear Systems Division
Oak Ridge National Laboratory
P.O. Box 2008
Bldg. 5700, Rm. I307, MS 6170
Oak Ridge, TN 37831-6170
(865) 574-8602
bledsoekc@ornl.gov

Specialty

Nuclear Engineering

- Inverse Problems
- Sensitivity/Uncertainty Analysis
- Perturbation Theory
- Particle Transport
- Reactor Physics

Summary of Achievements

- Outstanding Presentation in Engineering, 2009 Los Alamos National Laboratory Student Symposium
- American Nuclear Society – Alpha Nu Sigma National Honor Society
- Outreach Award, The Ohio State University Nuclear Engineering Graduate Program, 2007
- Excellence in Research Award, The Ohio State University Nuclear Engineering Graduate Program, 2006
- Excellence in Academics Award, The Ohio State University Nuclear Engineering Graduate Program, 2005
- BS/MS Award (Early entry into graduate school for outstanding undergraduates), The Ohio State University, 2004

Employment

2010-Present: *Research and Development Staff; Radiation Transport Group; Oak Ridge National Laboratory, Oak Ridge, TN.* Worked on perturbation theory and sensitivity/uncertainty analysis for fixed-source radiation transport problems. Applied first-order perturbation theory approach for sensitivity/uncertainty analysis of a weapon detonation in a large urban environment. Integrated fixed-source S/U analysis into the SCALE code system. Applied sensitivity analysis for choosing benchmark experiments to validate proposed nuclear reactor systems.

2006 - 2010: *Graduate Research Associate; Los Alamos National Laboratory, Los Alamos, NM.* Worked on solving various inverse transport problems (i.e. using data from external measurements to reconstruct unknown parameters in the interior of geometries) in single and multidimensional systems using a variety of inverse methods, including perturbation

methods, gradient-based methods, and stochastic algorithms. Developed and optimized these algorithms for improved speed and performance. Studied multidimensional ray-trace techniques and developed a method to use ray-tracing to evaluate surface and volume integrals of uncollided adjoint fluxes and forward-adjoint flux products in general geometries. Investigated first-order perturbation theory as applied to the sensitivity of critical assemblies to perturbations in physical parameters.

Publications

- Jeffrey A. Favorite and Keith C. Bledsoe, "Identification of an Unknown Material in a Radiation Shield Using the Schwinger Inverse Method," *Trans. Am. Nucl. Soc.*, **91**, 125-126 (2004).
- Jeffrey A. Favorite and Keith C. Bledsoe, "Identification of an Unknown Material in a Radiation Shield Using the Schwinger Inverse Method," *Nucl. Sci. Eng.*, **152**, 106-117 (2006).
- Jeffrey A. Favorite and Keith C. Bledsoe, "Using the Levenberg-Marquardt Method for the Solution of Inverse Transport Problems with Scattering," *Joint International Topical Meeting on Mathematics & Computations and Supercomputing in Nuclear Applications*, Monterey, California, April 15-19, 2007 (CD-ROM).
- Keith C. Bledsoe, Jeffrey A. Favorite, and Tunc Aldemir, "Material Identification in Finite Cylindrical Geometries Using the Schwinger Inverse Method," *Trans. Am. Nucl. Soc.*, **96**, 545-547 (2007).
- Keith C. Bledsoe and Jeffrey A. Favorite, "Using the Marquardt Method for Solutions of Inverse Transport Problems in Two-Dimensional Cylinders," *Trans. Am. Nucl. Soc.*, **98**, 591-593 (2008).
- Jeffrey A. Favorite, Keith C. Bledsoe, and David I Ketcheson, "Surface and Volume Integrals of Uncollided Adjoint Fluxes and Forward-Adjoint Flux Products," *Nucl. Sci. Eng.*, **163**, 73-84 (2009).
- Keith C. Bledsoe, Jeffrey A. Favorite, and Tunc Aldemir, "Solutions of Inverse Transport Problems in Finite Cylindrical Geometries Using the Schwinger Inverse Method," *Ann. Nucl. Energy*, **36**, 966-973 (2009).
- Keith C. Bledsoe and Jeffrey A. Favorite, "A Comparison of the Differential Evolution and Levenberg-Marquardt Methods for Solving Inverse Transport Problems with Several Unknowns in Cylindrical Geometries," *Trans. Am. Nucl. Soc.*, **101**, 411-413 (2009).
- Jeffrey A. Favorite and Keith C. Bledsoe, "Eigenvalue Sensitivity to System Dimensions," *Ann. Nucl. Energy*, **37**, 4, 522-528 (2010).

- Keith C. Bledsoe and Jeffrey A. Favorite, “A Hybrid Differential Evolution/Levenberg-Marquardt Method for Solving Inverse Transport Problems,” *Trans. Am. Nucl. Soc.*, **102**, 213-215 (2010).
- Keith C. Bledsoe, Jeffrey A. Favorite and Tunc Aldemir, “Using the Levenberg-Marquardt Method for Solutions of Inverse Transport Problems in One- and Two-dimensional Geometries,” *Nuc. Tech.*, accepted for publication (2011).
- Keith C Bledsoe, Jeffrey A. Favorite and Tunc Aldemir, “A Comparison of the Covariance Matrix Adaptation Evolution Strategy and the Levenberg-Marquardt Method for Solving Multidimensional Inverse Transport Problems,” *Ann. Nucl. Energy*, **38**, 4, 897-904 (2011).
- Keith C. Bledsoe, Jeffrey A. Favorite and Tunc Aldemir, “Application of the Differential Evolution Method to Solving Inverse Transport Problems,” *Nucl. Sci. Eng.*, accepted for publication (2011).
- John D. Bess, Keith C. Bledsoe and Bradley T. Rearden, “Evaluation of HEU-Beryllium Benchmark Experiments to Improve Computational Analysis of Space Reactors,” *Nuclear & Emerging Technologies for Space (NETS-2011)*, Albuquerque, NM, Feb. 7-10, 2011 (CD-ROM).

Internal Research Documents – Los Alamos National Laboratory

- Keith C. Bledsoe, “Identification of an Unknown Material in a Radiation Shield Using the Schwinger Inverse Method,” Los Alamos National Laboratory Research Note, X-5-RN(U)04-42 (2004).
- Jeffrey A. Favorite and Keith C. Bledsoe, “First-Order Perturbation Theory for the Sensitivity of Jezebel k_{eff} to ^{239}Pu ,” Los Alamos National Laboratory Research Note, X-5-RN(U)05-24 (2005).
- Jeffrey A. Favorite and Keith C. Bledsoe, “Surface and Volume Integrals of Uncollided Adjoint Fluxes and Forward-Adjoint Flux Products,” Los Alamos National Laboratory Research Note, X-1-RN(U)08-03 (LA-UR-08-4396) (2008).
- Keith C. Bledsoe, “Using Differential Evolution to Solve Inverse Transport Problems in Spherical Geometries,” Los Alamos National Laboratory Research Note, X-1-RN(U)09-12 (LA-UR-09-06202) (2009).

Presentations

- “Using the Schwinger Inverse Method for Identification of an Unknown Material in a Radiation Shield,” *American Nuclear Society Winter Meeting*, Washington, D.C. (2004).
- “Using the Levenberg-Marquardt Method for the Solution of Inverse Transport Problems with Scattering,” *Joint International Topical Meeting on Mathematics & Computation and Supercomputing in Nuclear Applications*, Monterey, California (2007).
- “Material Identification in Finite Cylindrical Geometries Using the Schwinger Inverse Method,” *American Nuclear Society Annual Meeting*, Boston, Massachusetts (2007).
- “Using the Marquardt Method for Solutions of Inverse Transport Problems in Two-Dimensional Cylinders,” *American Nuclear Society Annual Meeting*, Anaheim, California (2008).
- “A Comparison of the Differential Evolution and Levenberg-Marquardt Methods for Solving Inverse Transport Problems with Several Unknowns in Cylindrical Geometries,” *American Nuclear Society Winter Meeting*, Washington, D.C. (2009)
- “Sensitivity/Uncertainty Quantification Methods for AFIDS,” *FY11 Program Review, NA-22 Nuclear Forensics R&D Program*, Patrick Air Force Base, Cocoa Beach, Florida (2011)
- “Sensitivity/Uncertainty Quantification for Radiation Transport,” *Presentation to Defense Threat Reduction Agency/NTM Nuclear Weapons Effects Network*, Ft Belvoir, Virginia (2011).

Education

Ph.D., Nuclear Engineering, 2009

The Ohio State University, Columbus, OH

GPA: 4.00

Ph.D. Dissertation: “Inverse Methods for Radiation Transport”

M.S., Nuclear Engineering, 2006

The Ohio State University, Columbus, OH

Specialization in Reactor Physics

GPA: 3.75

Masters Thesis: “Using the Schwinger Inverse Method for Shield Material Identification in One- and Two-Dimensional Radiation Source/Shield Systems”

B.S., Engineering Physics, 2004

The Ohio State University, Columbus, OH

GPA: 3.76

Skills

- Programming Languages: Proficient with Fortran 77, Fortran 90, experience with C++
- Particle Transport Codes: Proficient with PARTISN discrete ordinates code, experience with MCNP6 and Denovo
- Other: Proficient with Microsoft Word, Microsoft Excel. Experience with LaTeX. Have worked extensively with Windows XP, Windows Vista, and Unix.

Activities

- Session Chair, 2005 American Nuclear Society Student Conference
- Instructor, Nuclear Science Workshops for Local Teachers, The Ohio State University, 2007-2008
- Food Service Volunteer, The Ohio State University Thanksgiving Dinner for International Students, 2006-2007
- Volunteer Teaching Assistant, Maiden Elementary School, Maiden, NC (Nov-Dec 2005), Blackburn Elementary School, Newton, NC (Nov-Dec 2006).
- The Ohio State University Commencement Set Design and Construction Team, 2003
- American Nuclear Society (2004-Present)
- Society of Physics Students (2002-2004)
- National Society of Collegiate Scholars (1999-2004)

Note: I have obtained a DOE Q-Clearance (November 2008).