

SAM2011

A Multisensor Fusion Approach to the Model-Based Solution of Inverse Radiation Transport Problems

Concept

- **Objective:** Characterize SNM using radiation measurements – estimate isotopics, mass, and geometry
- Sandia has developed software that constructs a 1D model of a radiation source from gamma and neutron radiation measurements
- The solver applies nonlinear regression to fast deterministic radiation transport models to rapidly fit the model to the measurements
- We are developing tools to solve the inverse radiation transport problem based on the simultaneous analysis of multiple sensors

Technical Challenges

- Identifying methods that can accelerate the solution of inverse transport problems without introducing significant error in the inverse solution
- Validating methods to accelerate the inverse solution against measurements and synthetic data generated by high-fidelity simulations
- Developing a general, systematic method to correctly combine multiple correlated observables in the solution of the inverse problem

Research Team

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Planned Accomplishments

- Develop and evaluate numerical methods to accelerate the deterministic solution of inverse radiation transport problems
- Use high-fidelity Monte Carlo simulation tools to validate approximations implemented in the inverse solver
- Develop a multivariate regression error metric that accounts for covariance between multiple detector responses