SAND2016-7008D

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Sandia National Laboratories

Critical Software for Assessing Radiological Threats

Technical Reachback 2016

Interns

Matthew Dugan, Iowa State University 2018, Aerospace Engineering
Arjit Misra, Monta Vista High School 2017
Kevin Ross, University of Southern California 2018, Aerospace Engineering
Shu Saechao, California Polytechnic State University 2018, Electrical Engineering
Timothy Trammel, California State University, Stanislaus 2018, Cognitive Science
Ganesh Valliappan Kathiresan, Monta Vista High School 2017
Katherine Xiang, Johns Hopkins University 2020, Biophysics

Mentors

Ken Black, Org 8137 Exploratory Systems Technologies
William Johnson, Org 8126 Rad/Nuc Detection Materials & Analysis
Janine Scott, Org 8973 Special Programs II
Heather Seipel, Org 8127 Rad/Nuc Detection Systems
Edward Walsh, Org 8954 Quantitative Modeling & Analysis

Sandia National Laboratories, CA
U.S. Department of Energy

Abstract: Technical Reachback is a Department of Homeland Security program that assists federal, state, tribal, and local law enforcement in assessing radiological threats reported within the United States and at its border by providing situational awareness. U.S. ports of entry have radiation portal monitors and handheld gamma detectors that detect radiation emissions from vehicles entering the country. Sandia produces software that is used to analyze data from radiation monitors in order to distinguish between types of radioactive cargo. These analyses provide law enforcement officials with an additional method to discriminate between benign radiation and potential threats

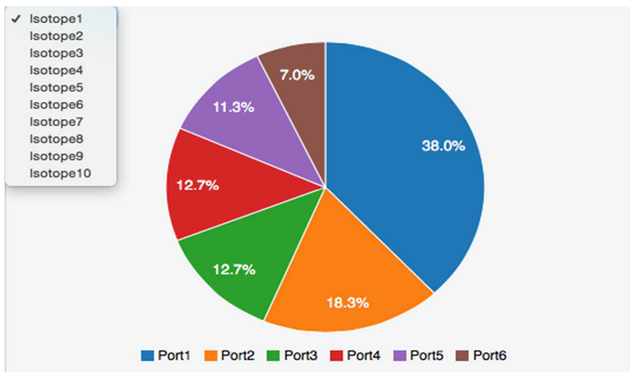
Quality Control: A major challenge of Technical Reachback is verifying the accuracy and usability of software applications. As the Quality Control Team, we help to meet this challenge through rigorous examination of each application's individual functions and overall functionality. This includes comprehensive manual field comparisons, automated test scripts, and extensive scrutiny of graphical user interfaces. Errors, findings, and general comments are submitted to a bug tracking system for the developers to examine. Our work helps to ensure software products are always in a stable, working condition. Besides quality control, time is also devoted to improving, extending, and developing software applications.

Porting Gamma Detector Classification Program from Python to C++: The specifications of a portable spectroscopic gamma radiation detector provide crucial insight for data analysts. In 2015, TRB team members wrote code designed to examine spectra data files and identify with high probability which detector was used. This year, our intern team is working to convert the Python code into a C++ version.

TRB Lost and Found Sources: The project is an interactive website that queries data on lost and found radioactive sealed sources. With this data, we are creating an interface that enables trend identifications and cursory trend analysis. Information is collected from databases maintained by regulatory agencies such as the U.S. Nuclear Regulatory Commission (NRC) and the Canadian Nuclear Safety Commission (CNSC).

Computing Effective Neutron Dose: The aim of this project is to compute the effective radioactive dose a person receives. A user can select a neutron source, distance to a source, and shielding material. We have written C++ code that calculates neutron dose by using data acquired from a detector and by modeling doses using numerical methods involving quadratic splines and matrix operations.

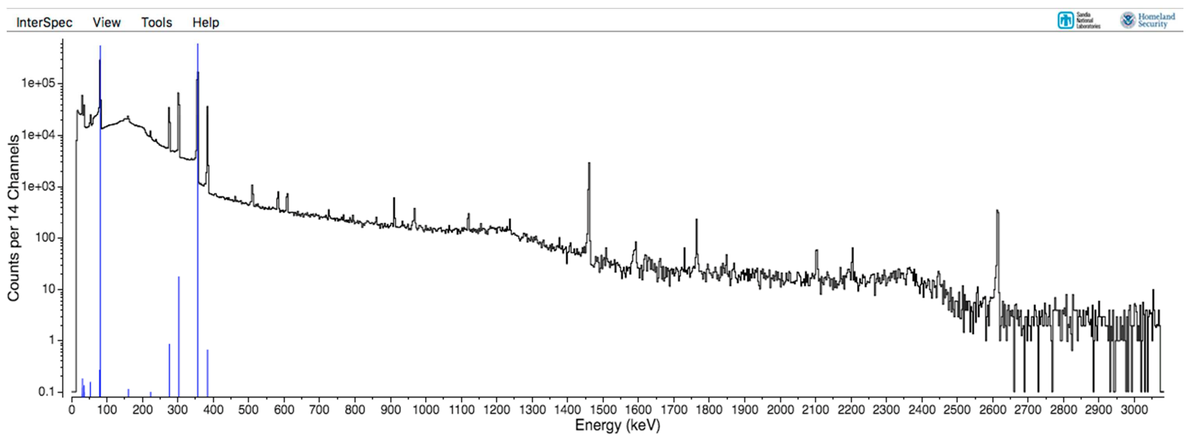
LSS Trend Report: The information used is collated from the Laboratories and Scientific Services to display graphs and charts depicting data such as the top 10 categories of materials that trigger radiation detectors. Figures are updated whenever new data becomes available. New features added by our intern team include the automatic resizing of text and graphics to accommodate mobile devices. Additionally, our team created new graphs such as pie charts of radiological events at ports of entry into the United States.



Detector Wiki: Our TRB intern team creates and maintains an informational database containing the description, specifications, and vulnerabilities of each radiation detector on the market. Research analysts and law enforcement personnel use the data to accurately assess spectroscopy samples and understand potential radiological threats.

Ports of Entry Wiki: We have created and maintained an informational database which provides research analysts with up-to-date geographical and operational information on all access points into the United States. Analysts can establish norms and compare them to identify and resolve anomalous radiation readings.

InterSpec Android File Transfer: InterSpec is a spectrum analyzer that uses peak-based analysis to identify nuclides and determine source strength as well as shielding type and thickness. To improve the user experience, the web version of InterSpec allows users to drag and drop files to quickly access spectrum files in InterSpec. We are porting this to the Android version. Additionally, the Android version will allow the user to transfer a spectrum file to and from e-mail, Google Drive, or local storage.



U.S. DEPARTMENT OF ENERGY
National Nuclear Security Administration

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SAND No. 2011-XXXXP