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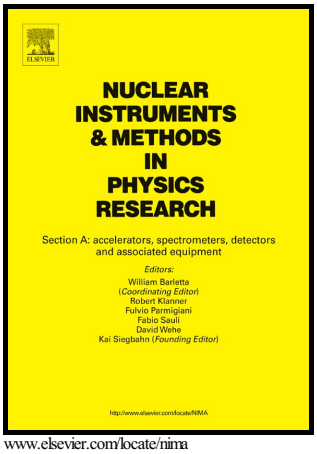

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Handheld Real-time Volumetric 3-D Gamma-ray Imaging

Andrew Haefner[a], Ross Barnowski[b], Paul Luke[a], Mark Amman[a], Kai Vetter[b,a]

[a] *Lawrence Berkeley National Lab - Applied Nuclear Physics, 1 Cyclotron Road, Berkeley CA, 94720, United States of America*
[b] *Department of Nuclear Engineering, UC Berkeley, 4155 Etcheverry Hall, MC 1730, Berkeley CA 94720, United States of America*

Abstract

This paper presents the concept of real-time fusion of gamma-ray imaging and visual scene data for a hand-held mobile Compton imaging system in 3-D. The ability to obtain and integrate both gamma-ray and scene data from a mobile platform enables improved capabilities in the localization and mapping of radioactive materials. This not only enhances the ability to localize these materials, it provides important contextual information of the scene, which once acquired, can be reviewed and further analyzed subsequently. To demonstrate these concepts, the High-Efficiency Multimode Imager (HEMI) is used in a hand-portable implementation in combination with a Microsoft Kinect sensor. This sensor, in conjunction with open-source software, provides the ability to create a 3-D model of the scene and to track the position and orientation of HEMI in real-time. By combining the gamma-ray data and visual data, accurate 3-D maps of gamma-ray sources are produced in real-time. This approach is extended to map the location of radioactive materials within objects with unknown geometry.

Keywords: Compton imaging, Gamma-ray imaging, SLAM, 3-D Imaging, Volumetric Imaging, Data Fusion