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# Real-Time Volumetric Gamma-Ray Imaging for General Search and Mapping Scenarios

This work explores the coupling of computer vision algorithms for real-time scene reconstruction with mobile gamma-ray imaging platforms. These algorithms, solutions to a class of problem known as simultaneous localization and mapping (SLAM), provide estimates of the location and orientation (i.e. pose) of the system, as well as a point-cloud model of the surrounding scene as the sensor traverses the environment. The SLAM package used in this work is RGBDSLAM, and open-source SLAM solver that uses data from rgb-d cameras; the most notable example of which is the Microsoft Kinect. A Microsoft Kinect and the RGBDSLAM software have been integrated into multiple gamma-ray imaging platforms; one HPGe-based and another based on CZT. An iterative algorithm based on Compton imaging has been developed to reconstruct 3D distributions of gamma-ray sources from the pose estimates and the interaction information from the position-sensitive gamma-ray detectors. The 3D model is also incorporated into the image reconstruction to decrease reconstruction time and improve image quality.

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