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P2.3: Advapix TPX3 detector with Realsense L515 Lidar Camera for Localization and Characterization of Hotspots.

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In nuclear decommissioning projects, localising and characterizing hotspots is critical to prevent risks to workers and the environment, especially in the presence of high dose rates. Manual radiological measurements are commonly used for hotspot identification, but they can be time-consuming, inefficient, and pose potential risks to operators. Compared to using classical measurement devices, a Compton camera is able to extract directional information about the hotspot, eliminating the need for repeated measurements.

In this research, a promising method for localizing and characterizing hotspots is proposed. An Advapix TPX3 detector with a 3D reconstruction algorithm was utilized, which can serve as a single-layer Compton camera. This method is similar to the one described in [1]. A Realsense L515 lidar camera was added to this Compton camera in a measuring setup to visualize the radioactive sources and measure the distance from detector to source. Tests were performed in laboratory conditions, and radiological data were projected onto the point cloud of the 3D camera to visualize the sources' locations in the environment. This combination allows for better visualization and interpretation of the hotspots.

Measurements were made using a 137Cs source, and a direct back projection algorithm was used to retrieve the source's direction. After correcting for the physical distance between the two detectors, the measurement of the Compton camera was superimposed with the point cloud to visualize the hotspot. The Advapix TPX3 detector with Realsense L515 Lidar Camera accurately located and visualized hotspots in 3D, and using the lidar camera to retrieve distance information improved the accuracy of activity estimation.

This method has several advantages over conventional hotspot identification methods, including reducing the cost and complexity of Compton cameras by eliminating the need for a second detector, and improving visualization with the lidar camera. Using this method, a measurement device could be set up in a single location and perform a 360-degree measurement of the room, limiting the need for human intervention during the measurement and therefore reducing risk. This research demonstrates the potential of this method for improving efficiency and safety in nuclear decommissioning projects.

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