A COMBINED LIDAR CAMERA AND COMPTON CAMERA SYSTEM FOR VISUALIZATION AND LOCALIZATION OF HOTSPOTS

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The localisation, characterisation and remediation of hotspots during a nuclear decommissioning project is an important activity to avoid unneeded dose-uptake for operators. The current practise for identifying hotspots is by performing manual radiological measurements. However, due to the high dose rate of the hotspots at some locations, special measures are necessary to protect workers and the available time to perform mapping and characterisation steps is limited. This not only introduces the risk of missing sources or performing inaccurate measurements and other specific ALARA related challenges, but it is a time consuming and inefficient way of mapping. In the ARCHER project, an (semi) autonomous robotic platform was developed. Using this robot can limit the need for human intervention and therefore also minimises human dose uptake during these measurements. However, this platform currently still uses this inefficient and time-consuming way of mapping. During this research, a Compton camera was developed and combined with a 3D camera as an alternative to the more common scanning based spectrometric approach for radiological mapping. The Compton camera was identified as being more advantageous as sources can be localised without performing many time-consuming robot manipulator manoeuvres. Furthermore, the measurements with the Compton camera are performed relatively far away from the source, thus limiting the chance of contaminating the robot platform. A measurement was made where a 137Cs source was located in front from the detector setup. A direct back projection algorithm was used for the Compton camera to retrieve the direction of the source. This radiological data was then combined with a point cloud of a Realsense L515 lidar 3D camera to visualise the measurements. After a correction was applied for the physical distance between the two detectors, the measurement of the Compton camera was superimposed with the point cloud to visualise the hotspot. The source location was accurately found and visualised in 3D.

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