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3D Indoor / Real-time Topographical and Radiological Mapping (ITRM), with Visual Simultaneous Localization And Mapping (SLAM): methods and uncertainties estimations.

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New developments in the field of robotics and computer vision enables to merge sensors to allow fast real-time localization of radiological measurements in the space/volume with near-real time radioactive sources identification and characterization, especially when premises statements are unknown. These capabilities lead nuclear investigations to a more efficient way for operators'dosimetry evaluation, intervention scenarii and risks mitigation and simulations, such as accidents in unknown potentially contaminated areas or during dismantling operations.

The main aim of the device we developed is to build a 3D model containing the device pose estimations in volume, in real time with a RGB-D sensor using "Simultaneous Localization And Mapping"methods.

This Poster will present a new way for radiological and topographic mapping of the environment by merging out coming data from RGB-D sensors, dose rate meters and spectrometers on a mobile handheld device. Two phases are considered while using this instrument. The first step concerns data acquisitions merged and processed in real-time and the second step concerns post processing used for advanced surveys (e.g. 3D reconstruction point cloud processing, radioactivity source terms accurate localization and calculations, dismantling scenarii).

In order to quantify the processing hardware and sensors performances, to evaluate the process chain and results accuracies, the current R&D program is progressing towards measurement's errors evaluation and uncertainties propagation along the acquisition and process chain. The main aim is to give objective criteria concerning the quality of the used methods at each step of the acquisition and post-processing, such as macroscopic sensitivity study. Secondly, this uncertainty study will provide objective accurate data about the acquisition processing, 3D reconstruction, trajectory computation and measurements and intensities. Furthermore, it could provide feedbacks on employed methods for investigations or intervention processes. The objective is to implement uncertainty propagation, computed in real-time for each acquisition and providing a reliable index value.

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