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Rapid Modelling of Novel Nuclear Scenarios for Response Guidance and Training

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Within the nuclear security landscape, threats can exist within a variety of challenging environments. Developing the most appropriate procedure for a chaotic scenario can be difficult without having an appropriate model to work with, and uncertainty in the expected activity and shielding of a radioactive source can lead to sub-optimal containment and unnecessarily high irradiation.

Whilst several advancements have been made in the field of nuclear instrumentation to aid in the localisation of radioactive sources, these localisations are typically constrained to surfaces which fail to account for self-shielding effects and provide accurate dose estimates. In order to fully quantify the activity and the accurately estimate dose more intensive modelling is required which comes with significant time requirements.

Within this work we demonstrate the use of a novel frontend interface for the modelling of challenging radioactive environments. *NuClearVision* provides an intuitive frontend to MCNP, GEANT4 and OpenMC with a unified GUI capable of producing industry standard simulations from scratch with minimal user input in a shortened timeframe. Our software fully handles the geometric initialisation, transforms, variance reduction and material assignments automatically through transcription layers, allowing for the end user to quickly make representative simulations of their scenario for a variety of applications. Support for LIDAR point clouds and CAD models allows for accurate modelling of complex objects, whilst macrobodies are available for approximations. The results of these simulations feed into a full-scale digital twin of the scenario, allowing for complex path planning, dosimetry and training within a virtual reality simulation.

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