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A dynamic point-kernel dose assessment method for the dismantling activities during nuclear facility decommissioning

There is an increasing international focus on the need to optimize decommissioning strategies of nuclear facilities, especially considering the radiological impacts on workers, the general public, and the environment. Assessing and optimizing occupational radiation exposure during the decommissioning of nuclear facilities is important to ensure the safety and health of workers. A major effort has been spent on the development of Virtual Reality (VR) tools for radiological characterization, dose estimation, and work management.
With the dismantling processes of source terms, new challenges emerged since the radiation field was dynamically changed. Combing the Computer-Aided Design (CAD) technique and the Point-Kernel method, this study aimed at dynamically assessing the radiological doses of workers during the dismantling of radiological components of nuclear facilities. The CAD-based cutting technology was introduced to meet the geometrical splitting of source terms. To accurately simulate the movement of cutting pieces, adaptive grid mapping technology was adopted to track the source terms. The results compared with Monte Carlo calculations in this study indicated that the dynamic changing of the radiation field can be accurately simulated in the phase of nuclear decommissioning. This study will help carry out the occupational safety and health management of decommissioning workers.

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