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URANOS - a voxel engine Neutron Transport Monte Carlo Simulation

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URANOS (Ultra RAPid Neutron-Only Simulation) is a newly developed 3D neutron transport Monte Carlo from thermal to fast energy domains. Emerging from a problem solver for the CASCADE detector development in collaboration with environmental physics the project aims towards providing a fast computational workflow and an intuitive graphical user interface (GUI) for small to medium sized projects. It features a ray-casting algorithm based on a voxel engine. The simulation domain is defined layerwise, whereas the geometry is extruded from a pixel matrix of materials, identified by specific numbers. Therefore, input files are solely a stack of pictures, all other settings, including the configuration of predefined sources, can be adjusted by the GUI.

The scattering kernel features the treatment of elastic and inelastic collisions, absorption and absorption-like processes like evaporation. Cross sections and distributions are taken from the data bases ENDF/B-VII.1 and JENDL/HE-2007. In order to simulate multi-layer boron detectors it also models the charged particle transport following the conversion by computing the energy loss in the boron and its consecutive layer.

URANOS is freely available and can be used to simulate the response function of boron-lined or epithermal neutron detectors, small-scale laboratory setups and especially transport studies of cosmic-ray induced environmental neutrons.

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