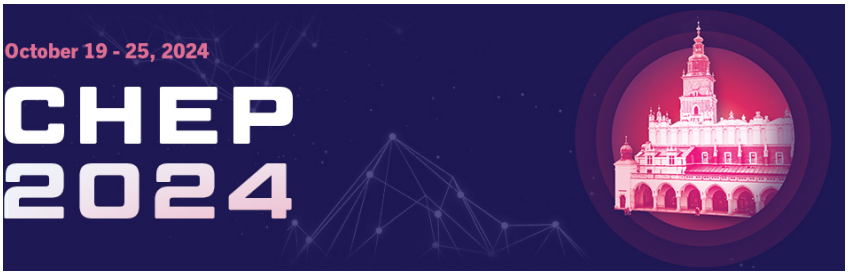

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The Multi-Threaded Detector Simulation in JUNO

Thursday 24 October 2024 14:24 (18 minutes)

The Jiangmen Underground Neutrino Observatory (JUNO) is a multi-purpose experiment under construction in southern China. JUNO is designed to determine the mass ordering of neutrinos and precisely measure neutrino oscillation parameters by detecting reactor neutrinos from the Yangjiang and Taishan Nuclear Power Plants. Atmospheric neutrinos, solar neutrinos, geo-neutrinos, supernova burst neutrinos and DSNB(Diffuse Supernova Neutrino Background), nucleon decay can also be studied with JUNO. The main detector of JUNO is a 20,000-ton liquid scintillator detector. The JUNO detector simulation software is a key component of the JUNO offline software (JUNOSW), developed based on the SNiPER framework. Due to the large size of the detector and broad range of energies of interest, detector simulation poses challenges in terms of CPU time and memory consumption. With computing nodes gradually incorporating multiple integrated CPU cores, traditional single-threaded computing models may result in significant memory usage and inefficient system resource utilization. Implementing multithreading processing on many-core architectures can significantly improve system resource utilization efficiency. This report will introduce the design and implementation status of multi-threaded detector simulation in JUNOSW.

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