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## Geant4 Accelerated Ray Tracking for HUNT Simulation

The High-Energy Underwater Neutrino Telescope (HUNT), designed for deployment at depths exceeding one kilometer, will host a detector array covering an instrumented volume of approximately 30 cubic kilometers. It aims to explore the neutrino sky from TeV to 100 PeV. Traditional CPU-based simulations using Geant4 faces a major bottleneck, as optical processes dominate the computational load. To overcome this challenge, we have developed the Geant4 Accelerated Ray Tracking (G4ART), a GPU-accelerated algorithm utilizing ray-tracing techniques to efficiently track billions of Cherenkov photons generated by neutrino or muon interactions. Testing results show that our GPU-based solution achieves over 100-fold acceleration while maintaining simulation accuracy, providing robust technical support for high-statistics neutrino event simulations. And this work greatly helps the detection design of high-energy neutrino telescope.

## Collaboration(s)

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