Contribution ID: **45** Type: **not specified**

Geometry Design of Complex Entities into the PHITS Computational Space by using 3D-CAD/CG and Solid meshing/3D-CAD/CG 及びソリッドメッシングを用いた PHITS 計算空間への複雑なエンティティに対する体系設計

Radiation and particle transport calculations based on the Monte Carlo method have been effectively used in various fields and are also now indispensable tools for the researchers and engineers involved. We have utilized the PHITS code mainly for medical applications, radiation protection, radiation activation evaluation for medical accelerator, and next generation fusion reactor development. One of the most important issues of Monte Carlo simulation calculations, including PHITS, is to set up a highly accurate and precise model of human bodies and structures equivalent to a real entity in a three-dimensional virtual space, i.e., a complex topology in which the real entities do not have to be actually constructed (manufactured or built). To fulfill this issues, it had been impossible to reproduce such complex topology groups in the 3D virtual calculation space due to very low software performance associated with older computer hardware performance (poor CPU and GPU performance and data transfer hardware) and insufficient 3D-CAD processing performance such as pre-post processing and solver processing using the finite element method, which is essential for 3D processing, and algorithms with slow code compilation processing. Recently, however, the drastic improvement in computer performance combined with the growing needs of general-purpose industries in the automotive, aerospace, shipbuilding, and creator industries has led to remarkable techno- logical progress in 3D-CG production, an integrated simulation environment that includes pre-post processing, solver processing, and 3D-CAD (Computer Aided Design)/CAE (Computer Aided Engineering). In the PHITS calculation code, which should be positioned as a solver processing for radiation and particle transport behavior, it has been now possible to export Nastran bulk data (.bdf format as solid meshing typical in use) corresponding to its code by integrating the latest methods for pre-post processing of complex entities (human body, structures, etc.), namely, integrating MSC Apex modeler with a design development platform with general-purpose 3D-CAD/CG functionality, and we will introduce on these technical workflows at this meeting. Our presentation has provided the workflow from capturing the 3D-CG outer complex entities with a 3D scanner to building them into Nastran bulk data. And also, the results of exporting the T-track data obtained from the PHITS calculation to openFOAM format and then using the data to create a 3D display of the tetrahedral discrete mesh bins in Paraview.

Appendix: The press release article is titled as “Tokushima University and Helical Fusion Co., Ltd. Utilize MSC Apex in 3D Neutron Transport Monte Carlo Simulation Calculations for Next Generation Helical-type Fusion Reactor ”. Please check the URL link “https://hexagon.com/ja/com- pany/newsroom/press-releases/2023/tokushima-university-and-helical-fusion”.

Primary author: SAKAMA/阪間, Minoru/稔 (Tokushima University/徳島大学)

Co-authors: SAZE/佐瀬, Takuya/卓也 (NIFS/核融合科学研究所); YANO/矢野, Syunki/隼輝 (Tokushima University/徳島大学); YOKOTA/横田, Kento/健斗 (National Cancer Center Hospital East/国立がん研究センター東病院)

Presenter: SAKAMA/阪間, Minoru/稔 (Tokushima University/徳島大学)

Session Classification: Geometry Design of Complex Entities into the PHITS Computational Space by using 3D-CAD/CG and Solid Meshing/3D-CAD/CG 及びソリッドメッシングを用いた PHITS 計算空間への複雑なエンティティに対する体系設計