

Internship (Praxissemester) / Bachelor Thesis

Automated Conversion of GATE Macro Files to Python

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Motivation

Complex physical machines and experimental devices are often tested through Monte Carlo simulations before they are built in reality. One of these systems is the digital tracking calorimeter which is currently being built by the Bergen pCT collaboration [1] for the purposes of proton-CT imaging. The SIVERT research group [2] at HS Worms and TU Kaiserslautern is part of this international team and maintains the simulation environment among other things. The current setup of the SIVERT project is visualized in Figure 1.

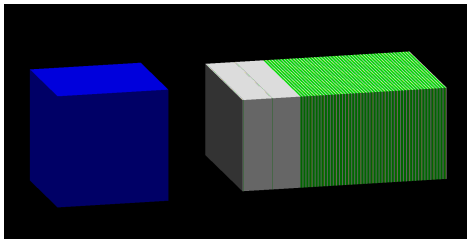


Figure 1: GATE Geometry Visualization

The physics simulation framework GATE/Geant4 [3] uses its own macro file format to describe the parameters of the world and the processes to be simulated. These files are used to place objects into the world, but also for the specification of physical interaction sources, such as particle beams.

This format is error-prone and difficult to read, write and maintain. Therefore, the openGATE collaboration has decided to move toward a Python implementation for the simulation description in the future.

Task

To support the migration from GATE/Geant4 macro files to the new GATE Python code, a converter will be implemented. This converter needs to be able to parse Macro files with all supported features and compile the simulation geometry into the upcoming Python syntax.

The converter will be written in Python.

The focus of this work is on clean code and software engineering best practices.

Requirements

- Programming language: Python
- Proficiency in spoken and written English

Thesis Profile

Analysis ●●●○○
Programming ●●●●●
Literature ●●○○○

References

- [1] <https://www.uib.no/en/ift/142356/medical-physics-bergen-pct-project>.
- [2] <http://sivert.info>.
- [3] <http://www.opengatecollaboration.org/>.