Introduction

Simulations generate synthetic point cloud data that is used to train deep learning models for classifying reactor parts.

One way to obtain point cloud data is to use a scan model in a virtual environment.

This study was conducted for the purpose of selecting an optimal algorithm for improving the runtime up to real-time scanning.

Simulator Development

Simulators are commonly built by applying a ray-casting mechanism.

The ray-casting mechanism uses the functions of the pycaster library and the VCG library as shown in the figure below to find the intersection points of a mesh and a line segment.

Multiprocessing

The problem that always accompanies Python-based scripts is that they are slower than C++.

About 76% of simulators are capable of multiprocessing.

According to Amdahl's Law, the using 8-core runtime performance improvement is calculated to be approximately 3x.

Simulator Runtime Analysis

Multiprocessing Runtime per Core

In almost all cases, pure C++ code performed the best, and the results with Binded Python showed similar performance.

- Pure C++ : 6~10x time Faster than pure python
- Binded Python : 5~9x time Faster than pure python
- Pure Python : About 3x time improvement by multiprocessing

Conclusions