3D Virtual Particles for Geometallurgy

Pratama Istriadi Guntoro
pratama.istiadi.guntoro@ltu.se

Current Work: Characterize drill core sample using X-ray Tomography to obtain mineralogical and textural data in 3D

Step 1. X-ray tomography to obtain 3D image of the drill core sample

Step 2. Image processing and segmentation algorithms to get textural and mineralogical data

Step 3. Texture simulation using the obtained data and validation with the original 3D image

Step 4. Breakage modelling of the simulated volume to generate virtual particles

Step 5. Mineral processing simulation of the generated particles

Background:
- Geometallurgy is a powerful tool for predicting the variability within the ore, and their behavior in a mineral processing circuit.
- Virtual particles are the key element in geometallurgy where they transfer the information from orebody to process simulation.
- Conventional method to generate these particles is based on 2D microscopy analysis of ore sample.
- This project explores the use X-ray tomography to obtain a 3D analysis of a drill core sample
- Extending the dimensionality of the data will lead to a new information that can be used in Geometallurgy

Future Work: Simulate a 3D texture using the obtained data and perform breakage modelling on to generate virtual particles for process simulation

Future Highlights:
1. Determination of suitable methods for texture simulation and breakage modelling.
2. Determination of essential information contained within the virtual particles that could accurately represent the original properties of the drill core sample.
3. Track each particles in a mineral processing simulation.

Result Highlights:
1. Machine-learning segmentation of minerals in the 3D dataset
2. A reference mineral map as a “training data”, obtained from energy dispersive spectroscopy (EDS)
3. Association index between minerals as an indication of (micro)-texture in the sample

References used: