16 - Application of X-Ray CT and QEMSCAN in Geometallurgical study of gold: A Case study of the Witwatersrand gold ore

Oral Presentation - Tuesday 24 September 2013 09:50

Presenter: Mr. NWAILA, Glen (Minerals to Metals Initiative, Department of Chemical Engineering, University of Cape Town, Private Bag, Rondebosch 7701, South Africa)

A quartz-pebble auriferous conglomerate from the Witwatersrand gold Province (Carletonville, South Africa) prepared by high pressure grind rolls (HPGR) have been investigated by using three different Micro-focus X-ray tomography systems located in three geographically different places (i.e. NECSA: Radiation Science MIXRAD laboratory, SUN: Central Analytical Facilities CT Scan laboratory and Technikon University of Munich (TUM): Physics department, Germany) and QEMSCAN. Application of X-Ray Micro-CT technology combined with QEMSCAN to the field of geometallurgy is being explored for ore characterisation and generation of geostatistical data. Using these two analytical tools, as well as appropriate reconstruction algorithms, a palpable amount of information concerning gold morphology, liberation characteristics, degree of mineralisation, association with other minerals and quantitative HPGR induced crack network data were obtained. The reconstructed sequential slices show much minutiae of the gold in both two and three-dimensional representation which brands X-Ray Micro-CT an appropriate useful tool for geometallurgical studies. Assimilated X-Ray CT data was validated by comparing the findings with data obtained using QEMSCAN. Ability of X-Rays to permit rapid evaluation of gold mineral brings an innovative technology to the gold mining industry which minimise ore characterisation time, cost and assist in geostatistical distribution of gold interpretation.

Keywords: HPGR, X-Ray CT and Gold deportment

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Oral Presentation - Tuesday 24 September 2013 11:30

Presenter:

10 - Automatic segmentation of 3D high-resolution image by deformable models

Oral Presentation - Tuesday 24 September 2013 11:50

Presenter: Dr. SUBSOL, Gérard (LIRMM-CNRS)

“Image segmentation” which consists in delineating a Region of Interest is in general a requirement before any analysis of image data. This step is all the more critical as its accuracy may impact the validity of the entire processing pipeline. However, commercial image processing software proposes few tools and most of them are based on quite basic principles as thresholding, region growing or mathematical morphology. Accordingly, segmentation is often performed interactively with much manual intervention. This process is long and overall user-dependent.

In the case of micro-CT data where the size of the image becomes huge (e.g. 2000 slices of 2000 x 2000 pixels), manual segmentation can take days which prevents from analyzing large sets of data. Moreover, at a resolution of 10 to 100 microns, so many details are visible that it may be difficult to follow a boundary of Region of Interest along the slices. Automatic segmentation methods are then required to be able to process the ever-increasing number of high-resolution 3D images acquired for biomedical, geoscience or palaeoscience applications.

One of the most efficient methods is called “deformable model”. Deformable models are surfaces (or curves) which are plunged in the 3D image and deform under the influence of internal forces, which are defined within the surface itself, and external forces, which are based on features which are extracted in the image. The internal forces are designed to keep the model smooth or near a given reference shape during deformation. The external forces are in general defied to attract the model toward image discontinuities. By integrating a-priori information about the shape and global image data in a consistent mathematical description, deformable models offer robustness to image noise, low contrasted boundaries or partial volume artifact.

We will show some examples in medical and paleo-anthropological applications as automatic segmentation of endocast or musculoskeletal structures.

This work was supported by the HOPE ("Human Origins and Past Environments") French-South African Research Programme and by the INLOO (“3D information and engineering technologies for analysis of the Homo genus in South Africa”) International Project for Scientific Cooperation of the French Center for Scientific Research (CNRS).