IAF SPACE EXPLORATION SYMPOSIUM (A3)
Interactive Presentations - IAF SPACE EXPLORATION SYMPOSIUM (IP)

Author: Mr. Bo Peng
New York University Abu Dhabi, United Arab Emirates, bp1657@nyu.edu

Dr. Rotana Hay
New York University Abu Dhabi, United Arab Emirates, rh137@nyu.edu
Dr. Kemal Celik
New York University Abu Dhabi, United Arab Emirates, kemal.celik@nyu.edu

3D SHAPE ANALYSIS OF LUNAR REGOLITH SIMULANTS

Abstract

Lunar regolith simulants are instrumental for the demonstration and validation of several space technologies, and the geometry properties are essential in understanding their mechanical and geotechnical behaviors. Although some of the geometric parameters (diameters, sizes, volumes, etc.) are measured, the morphology of simulants aggregates has not been well studied in the past decades. The main purpose of this research is thus to extract the particle shape and analyze their geometric properties in 3D space. To retrieve the 3D model of lunar regolith particles, micro-CT-based reconstruction is used to extract slices of simulants samples (LHS-1) in this work. Then, image processing and deep learning-based image segmentation methods are applied to the slices and reconstruct individual particles. Finally, 3D spherical harmonic shape descriptors are used to analyze particles' surface geometry and their statistics. This study proposes a general pipeline for the reconstruction and modeling of simulants samples and the shape analysis that will be instrumental for the efficient discrete element modeling and simulation of regolith in the future.