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An Estimation Method of Fragmentation in Blast Muckpiles using Local and Global Modules of Deep Learning Based on 3D Point Clouds

Kohei YOSHINO[1], Taiga SATO[2], Hisatoshi TORIYA[3], Hidehiko SHISHIDO[4], Jang HYONGDOO[5], Youhei KAWAMURA[6,7] and Itaru KITAHARA[4]

[1]Degree Programs in Systems and Information Engineering, University of Tsukuba, Ibaraki 305-8577, Japan
[2]Graduate School of International Resource Sciences, Akita University, Akita 010-8502, Japan
[3]Faculty of International Resource Sciences, Akita University, Akita 010-8502, Japan
[4]Center for Computational Sciences, University of Tsukuba, Ibaraki 305-8577, Japan
[5]Western Australian School of Mines: Minerals, Energy and Chemical Engineering, Curtin University
[6]Division of Sustainable Resources Engineering, Faculty of Engineering, Hokkaido University, Sapporo 060-8628, Japan
[7]North China Institute of Science and Technology, China
E-mail:yoshino.kohei@image.iit.tsukuba.ac.jp

This paper proposes a method to estimate the particle (rock) size distribution of a muckpile using Deep Learning based on 3D shape information given by 3D photogrammetry. Optimization of blasting is crucial to increase the productivity of mining operations. However, since the internal structure of the ground (bedrock) is usually unknown, it is difficult to set the appropriate parameters, amounts of explosives, blasting location and timing. In order to solve the problem, research has been carried out to design and analyze the blasting procedures by measuring the particle size distribution after the blast. Ordinary works focus on developing accurate measurement methods of particle size distribution for the analysis. We aim to increase the measurement accuracy by combining 3D photogrammetry and Deep Learning for 3D shape data. The 3D muckpile model is generated using Structure from Motion (SfM), which is a reconstruction method that can generate 3D point clouds of the target object from multi-view images. The particle size distribution of muckpiles is estimated by using Deep Learning. The proposed network consists of "Local Module" that learns the local shape of rock and "Global Module" that learns the shape of the entire muckpile. From the experiments, it can be said that the fragmentation of the actual muckpiles can be effectively estimated by using the proposed method.

Keywords : 3D point cloud, Deep Learning, Estimation of fragmentation