Machine Learning Segmentation and Classification Algorithm to Support Simulated Point Cloud As-Built Model Applications

Junzhe Shen,[1] Ran Ren,[2] H. Nicholas Dib[3], Tim McGraw[4] and Ayman Habib[5]

[1]Department of Computer Graphics Technology, West Lafayette, Indiana 47907; e-mail: shen433@purdue.edu
[2]School of Construction Management Technology, West Lafayette, Indiana 47907; e-mail: ren153@purdue.edu
[3]School of Construction Management Technology, Knoy 445, 401 N grant St, Knoy Hall of Technology, West Lafayette, Indiana 47907; e-mail: hdib@purdue.edu
[4]Department of Computer Graphics Technology, Knoy 313, 401 N Grant St, West Lafayette, Indiana 47907; e-mail: tmcgraw@purdue.edu
[5]Lyles School of Civil Engineering, Hamp 4108, 550 Stadium Mall Drive, West Lafayette, Indiana 47907; e-mail: ahabib@purdue.edu

ABSTRACT

Management and maintenance of existing buildings remains a major problem due to the lack of existing 3-Dimensional (3D) models and accurate As Built representation. In this paper the authors propose to use 3D scanner technology to capture the As Built and existing conditions of the buildings combined with Building Information Modeling (BIM) as the underlying technology, which is a 3D semantic representation of all the life cycle phases of a building. This paper presents the results from creating as-built BIM models of existing buildings, using point cloud (a set of points in 3D space) and machine learning as an intermediate medium. Machine learning methodologies are used to speed up the computation of segmentation and classification of point clouds from a 3D virtual indoor environment using procedural modeling which focused on two attributes, point density and the level of random errors. In this paper we will present findings on the evaluation of the performance of machine learning segmentation and classification algorithm based on the comparison of ten different point cloud datasets. Different sets of segmentation and classification models with comparison between models and within themselves were provided, which included the mean loss and accuracy between models with different point density.