**Comparative Accuracy Analysis of LiDAR Data Conversion to CityJSON Models Using Open Source and Commercial Software: A Case Study.**

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**Abstract**:
This study conducts a comparative analysis of the accuracy and efficiency of converting LiDAR data into CityJSON models using Python-based tools and FME commercial software. The focus is on model similarity, accuracy variability, data utilization, and the dependency on LiDAR precision. The findings indicate that Python-based models achieve a 63.9% similarity rate in generated 3D models, highlighting significant room for refinement to enhance detail and accuracy. Larger models tend to face scaling challenges affecting their accuracy. Unlike FME, which employs a simplified approach by using fewer points from LiDAR point clouds as vertices, Python utilizes all available points, allowing for detailed but computationally intensive modeling. This comprehensive utilization of data points can lead to higher fidelity in representing physical spaces but requires substantial computational resources, potentially slowing down processing time. The accuracy of both modeling approaches heavily depends on the precision of the underlying LiDAR data. FME's simplification strategy may increase overall system efficiency and accuracy by reducing noise and computational demands. However, Python's detailed use of all LiDAR points as vertices offers the potential for greater model detail at the expense of increased system load. The study suggests that Python models could significantly benefit from simplifying point selection processes, aligning their accuracy and efficiency closer to FME's outcomes. This research enhances understanding of the practical implications of software choice in 3D city modeling, providing valuable insights that assist geospatial professionals in selecting appropriate tools based on specific project needs, thereby influencing future innovations and standard practices in the field.

Keywords: CityJSON, LiDAR to CityJSON, Open Source 3D Models, Python Based 3D model