



LiDAR-Based Point Cloud Data Processing

December 2021

Changing the World's Energy Future

Xingyue Yang



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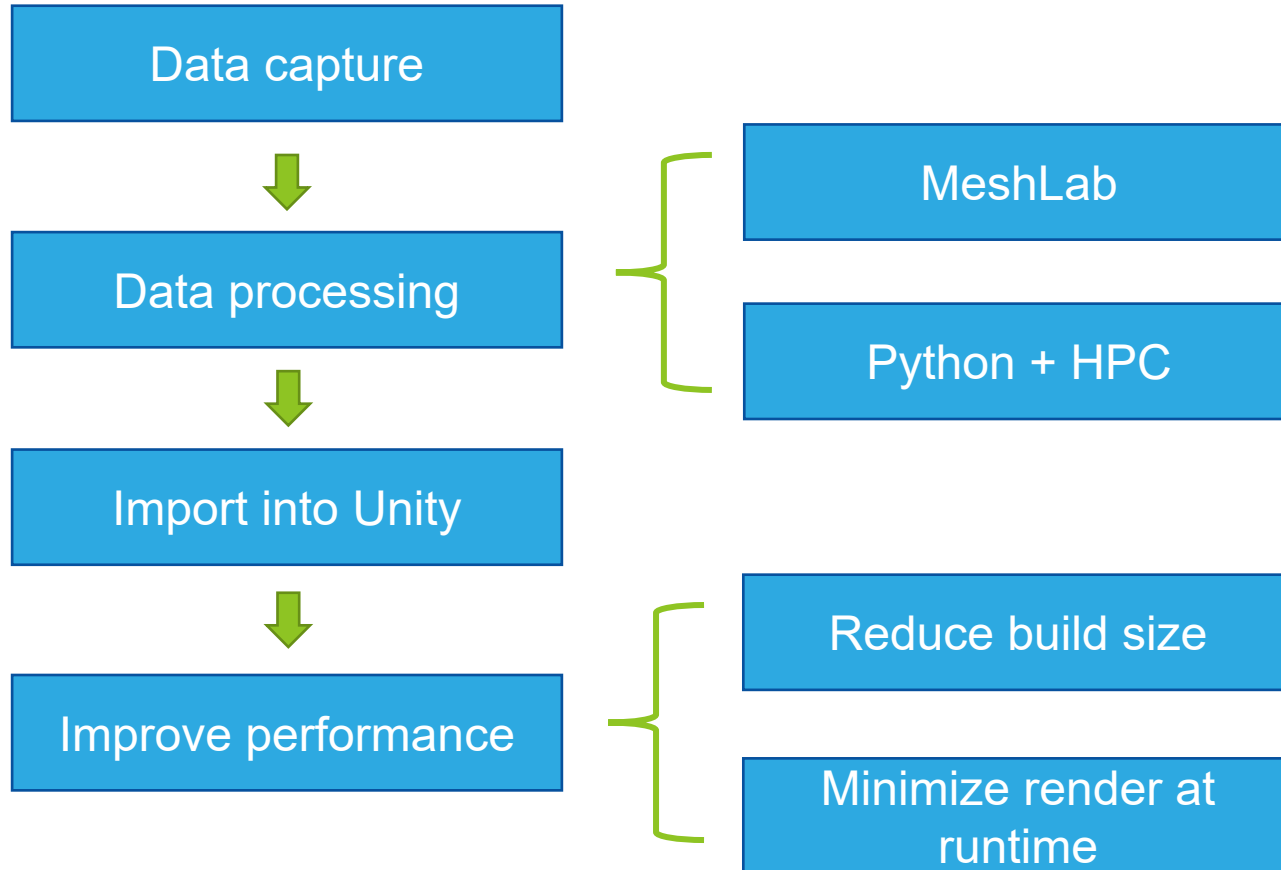
**Idaho National Laboratory
Idaho Falls, Idaho 83415**

<http://www.inl.gov>

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LiDAR-Based Point Cloud Data Processing

LiDAR Data Processing



Data Capture

- LiDAR Faro scanner
 - Point cloud data
 - Vertex render
- Scan2FX software
 - Texture render



<https://www.faro.com/en/Products/Hardware/Focus-Laser-Scanners>



Data Processing

- MeshLab
 - Filters -> Point set -> Point Cloud Simplification

Point Cloud Simplification

Create a new layer populated with a simplified version of the current point cloud.

Number of samples

Explicit Radius (abs and %) world unit perc on(0 .. 15.8606)

☒ Best Sample Heuristic

Best Sample Pool Size

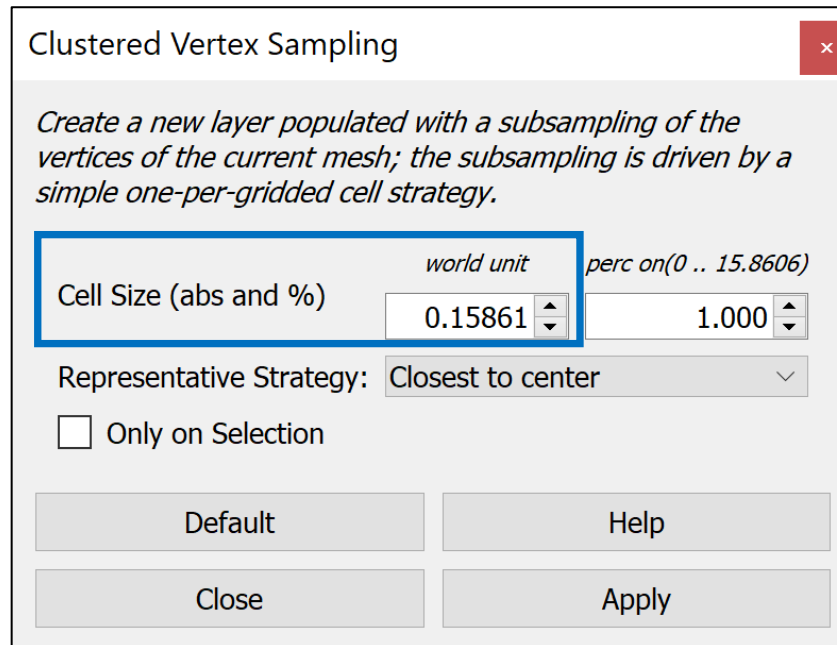
☐ Exact number of samples

Default Help

Close Apply

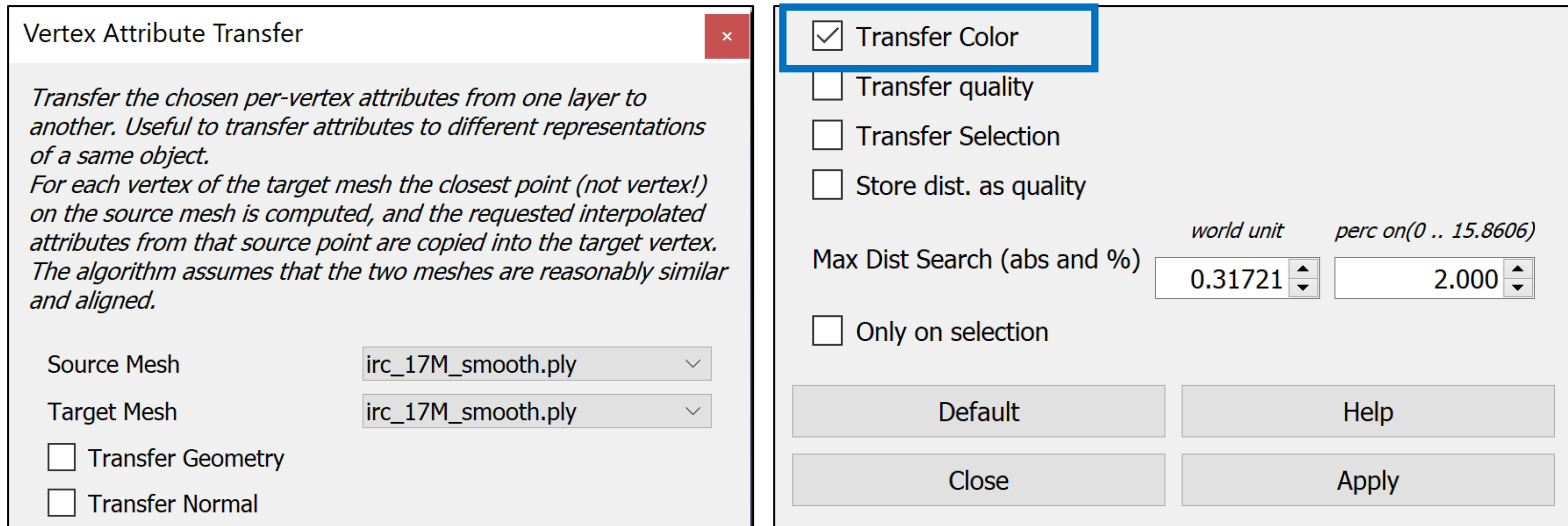
Data Processing

- MeshLab
 - Filters -> Sampling -> Cluster Vertex Sampling
 - Filters -> Sampling -> Vertex Attribute Transfer



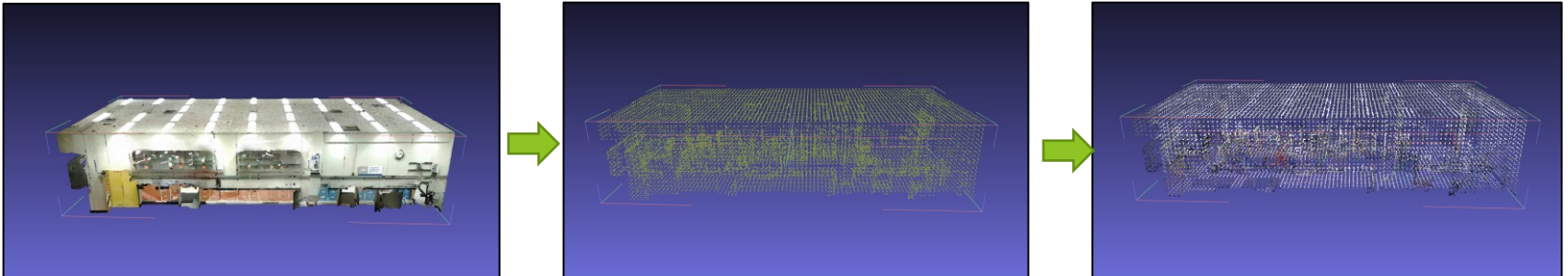
Data Processing

- MeshLab
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Data Processing

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Data Processing



- Python: pyntcloud package (<https://github.com/daavoo/pyntcloud>)

```
# Process point cloud data with pyntcloud package and hpc computing power
from pyntcloud import PyntCloud

cloud = PyntCloud.from_file("test.ply")

cloud
cloud_sample = cloud.get_sample("points_random", n=20000000, as_PyntCloud=True)
cloud_sample.to_file("test_out.ply")
```

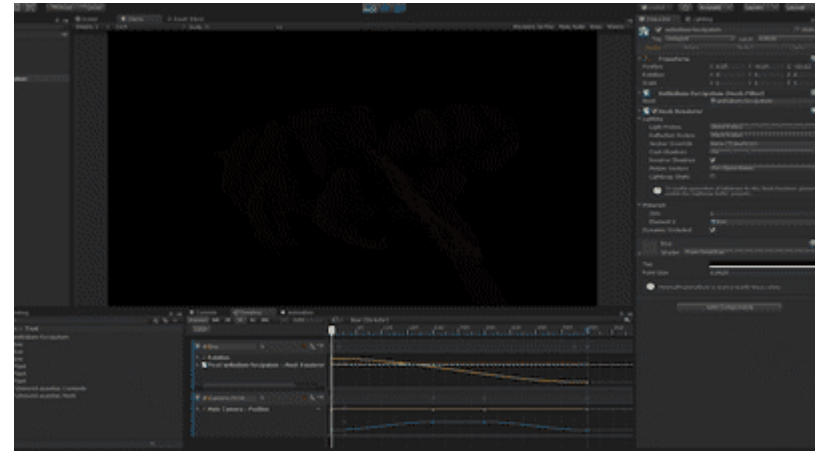
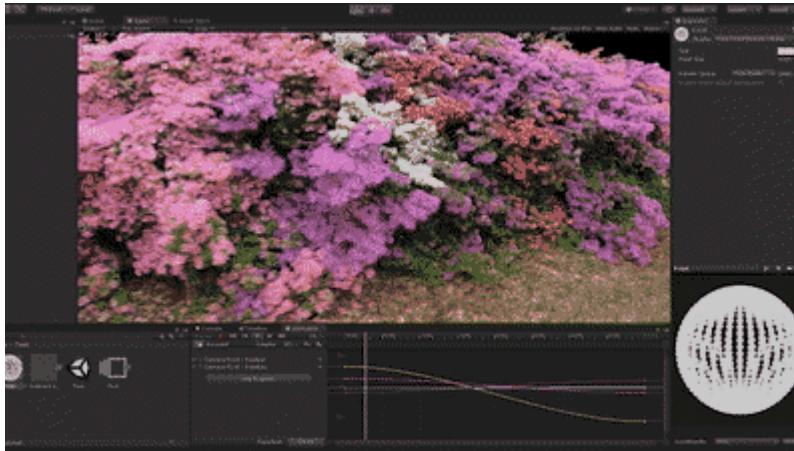
sampling method

number of points

Import Point Cloud in Unity



- Pcx: Point cloud importer/renderer for Unity
- Pcx: Display the point cloud on WebGL



<https://github.com/keijiro/Pcx>

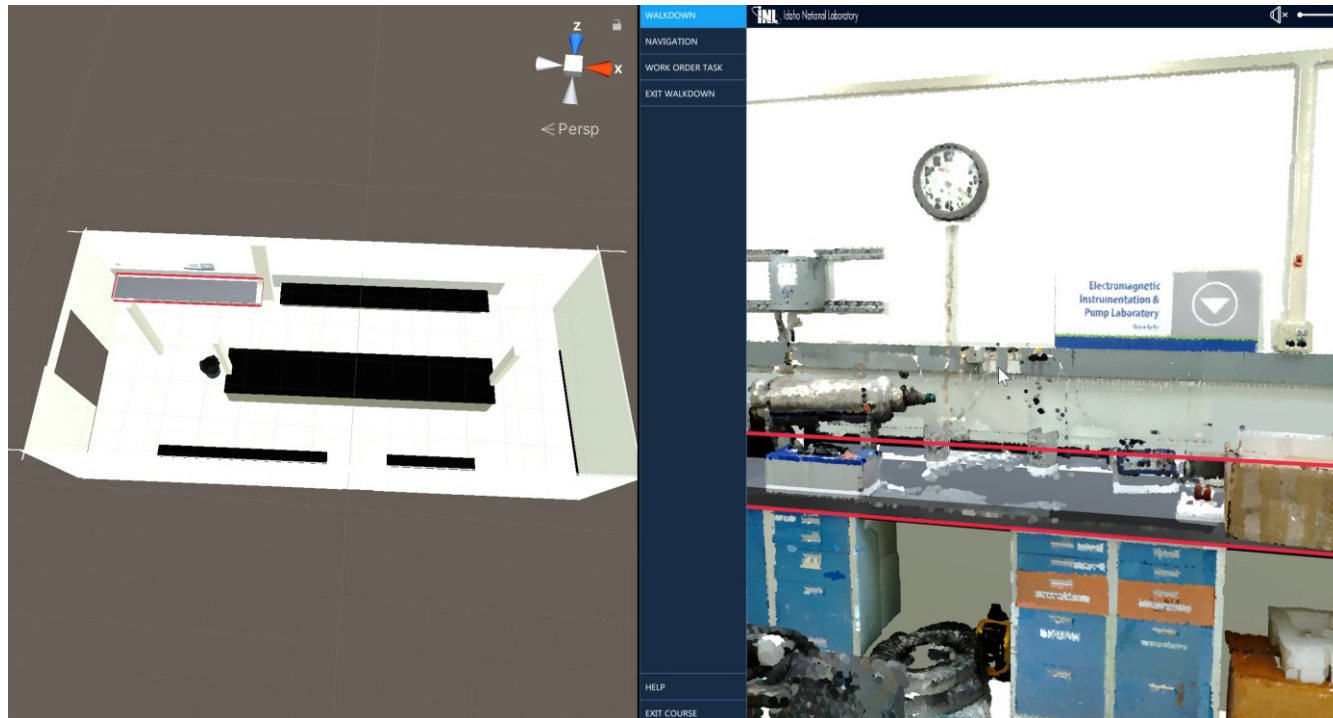
Improve Application Performance - WebGL

- Reduce the build size
 - Remove replaced sections: walls, ceiling, floor, etc.
 - Compress point cloud in Unity
 - Compress the build project in Player settings



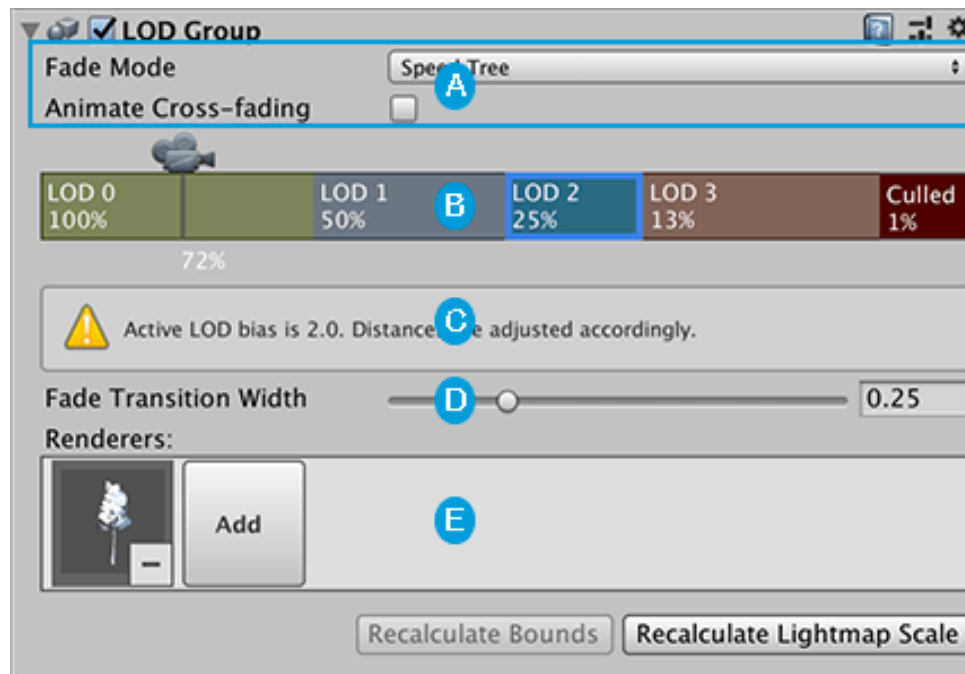
Improve Application Performance - WebGL

- Camera visibility
- Level of details (LOD) : LOD group



Improve Application Performance - WebGL

- Camera visibility
- Level of details (LOD) : LOD group



<https://docs.unity3d.com/Manual/class-LODGroup.html>

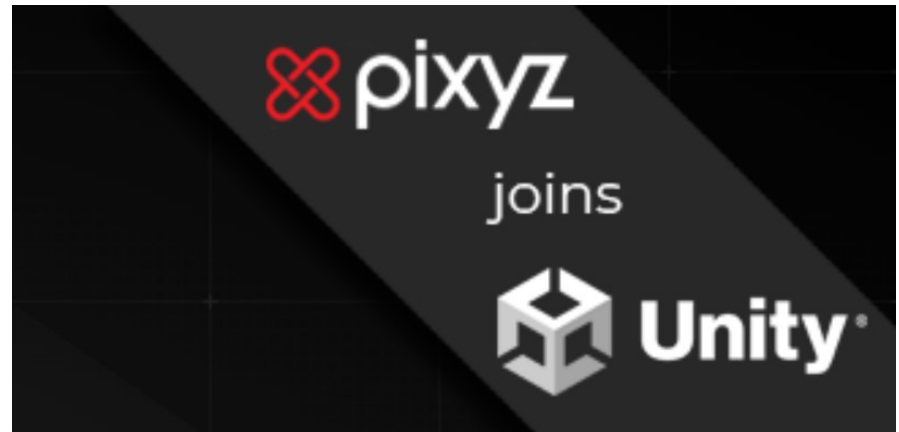
Improve Application Performance - WebGL

- Level of details (LOD) : LOD group



Future Work

- Split the scan into cells with Python
- PiXYZ plugin for Unity
- Other meshing options



<https://www.pixyz-software.com/>



Thank You

Contacts: Xingyue.Yang@inl.gov

Applied Visualization Laboratory (AVL)

<https://caesenergy.org/caes-lab/applied-visualization-laboratory/>