INL/CON-21-65363-Revision-0

LiDAR-Based Point Cloud Data Processing

December 2021

Xingyue Yang

Changing the World's Energy Future

INL is a U.S. Department of Energy National Laboratory operated by Battelle Energy Alliance, LLC

INL/CON-21-65363-Revision-0

LiDAR-Based Point Cloud Data Processing

Xingyue Yang

December 2021

Idaho National Laboratory
Idaho Falls, Idaho 83415

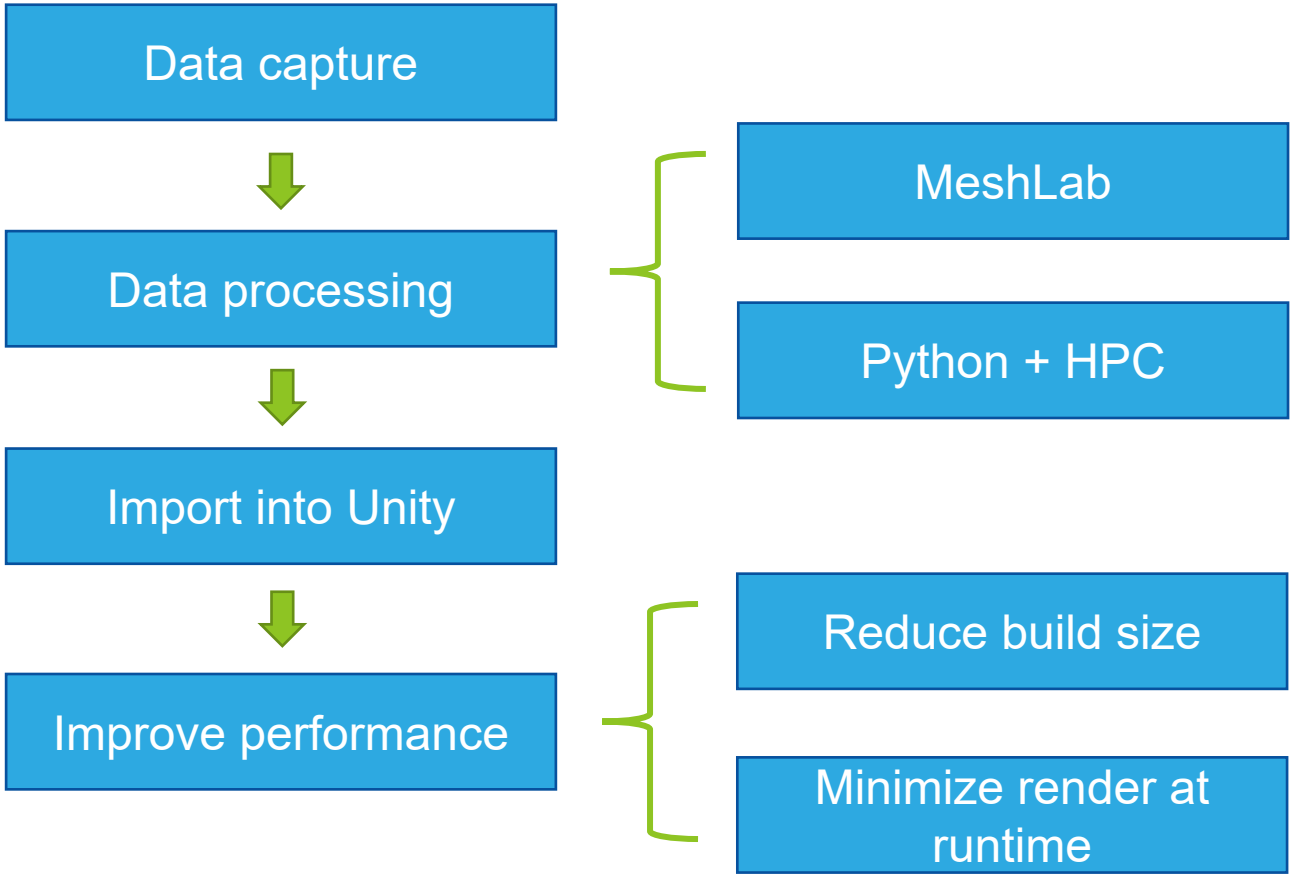
http://www.inl.gov

Prepared for the
U.S. Department of Energy
Under DOE Idaho Operations Office
Contract DE-AC07-05ID14517

LiDAR-Based Point Cloud Data Processing

CAES Center for Advanced Energy Studies
INL Idaho National Laboratory

LiDAR Data Processing



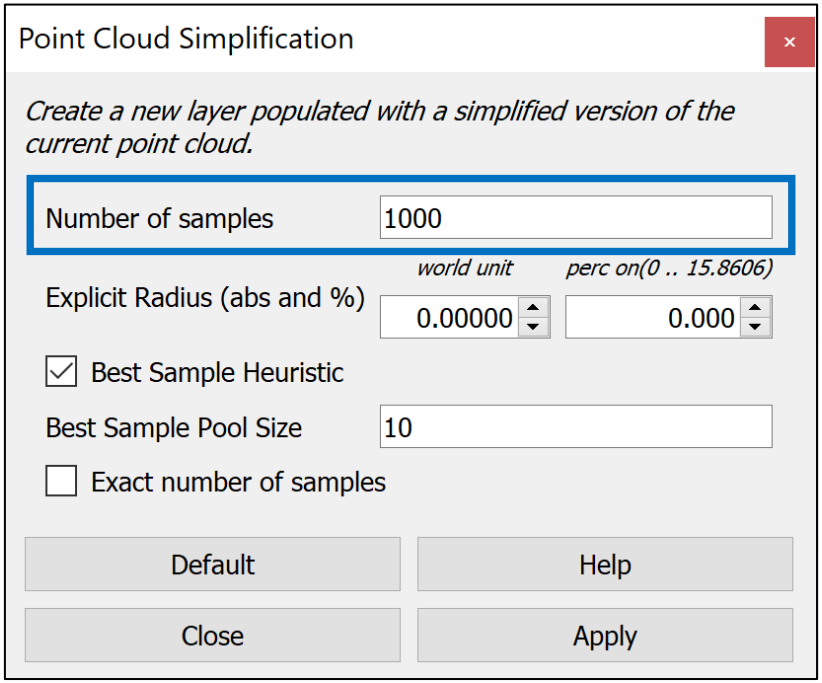
Data Capture

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

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

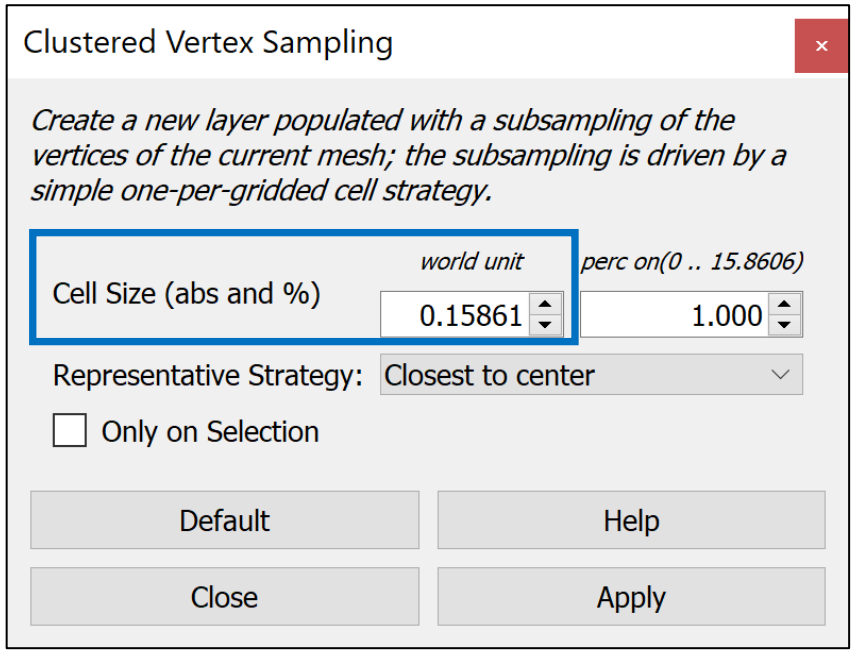
Data Processing

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



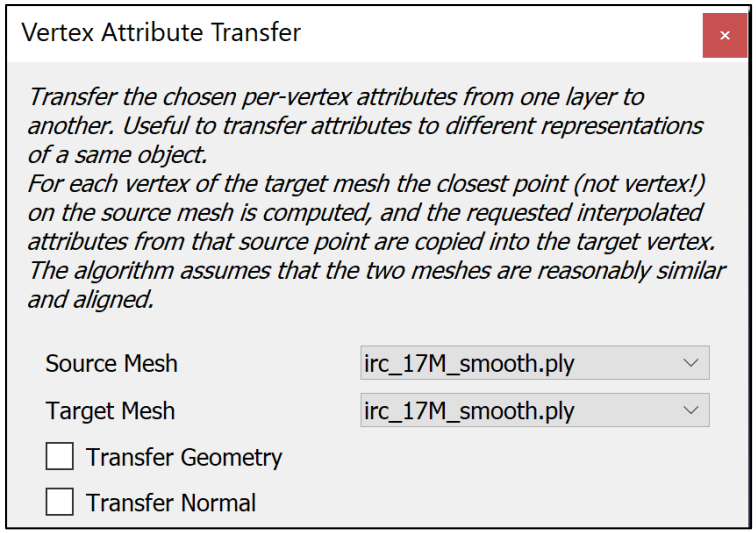
Data Processing

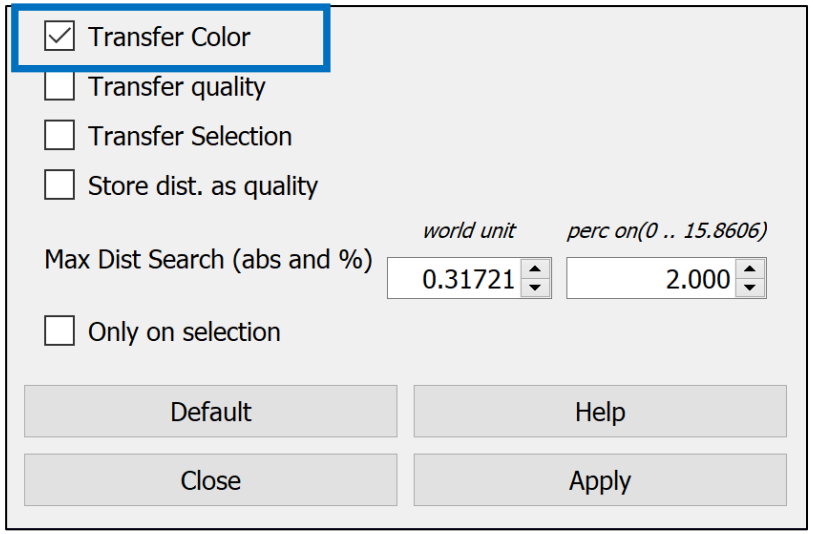
- MeshLab
  - Filters -> Sampling -> Cluster Vertex Sampling
  - Filters -> Sampling -> Vertex Attribute Transfer



Data Processing

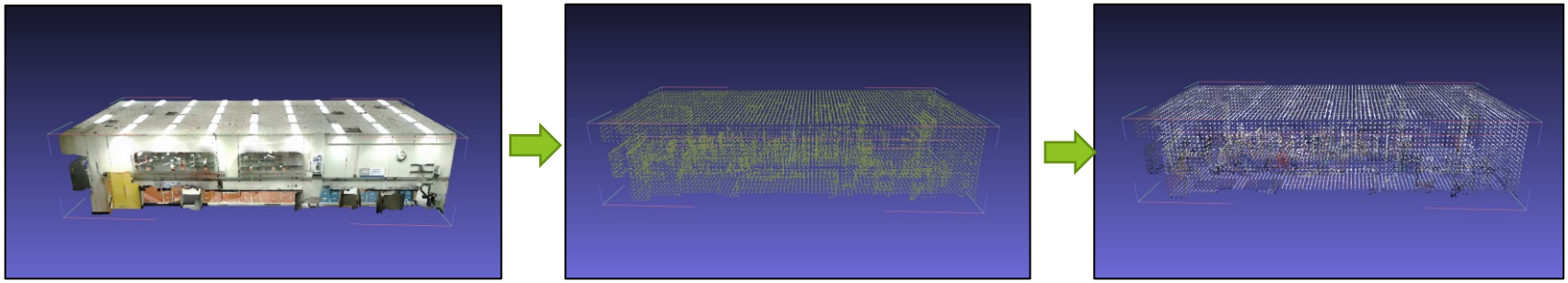
- MeshLab
  - Filters -> Sampling -> Cluster Vertex Sampling
  - Filters -> Sampling -> Vertex Attribute Transfer





Data Processing

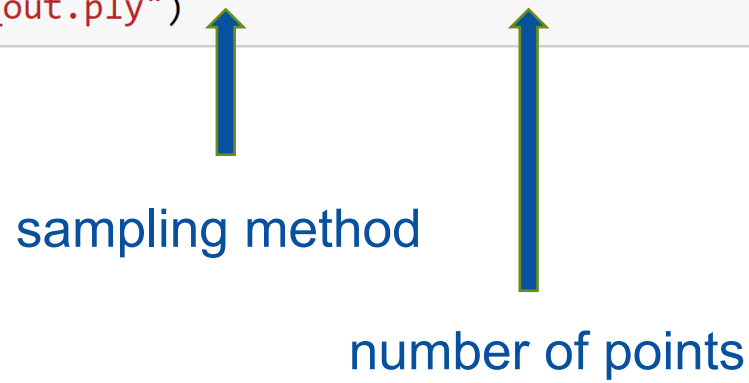
- MeshLab
  - Filters -> Sampling -> Cluster Vertex Sampling
  - Filters -> Sampling -> Vertex Attribute Transfer



Data Processing

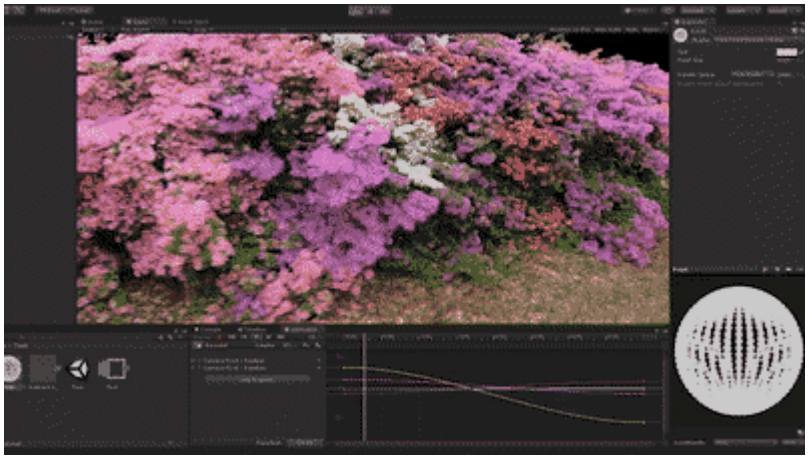
- Python: pyntcloud package (https://github.com/daavoo/pyntcloud)

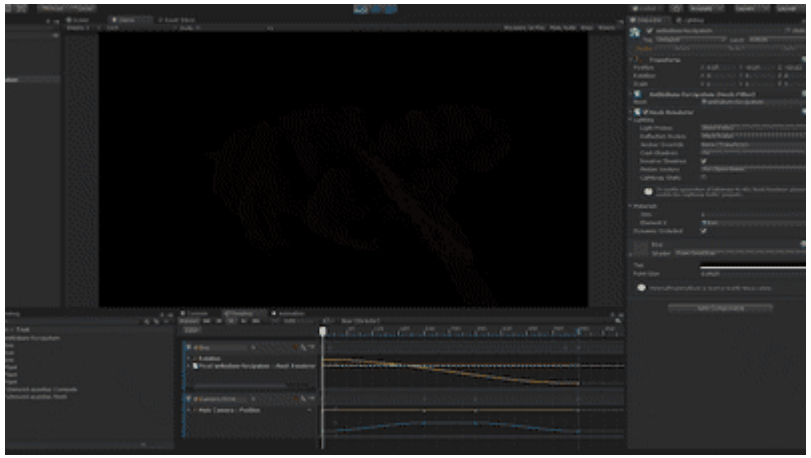
```python
# Process point cloud data with pyntcloud package and hpc computing power
from pyntcloud import PyntCloud

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")
```



Import Point Cloud in Unity

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





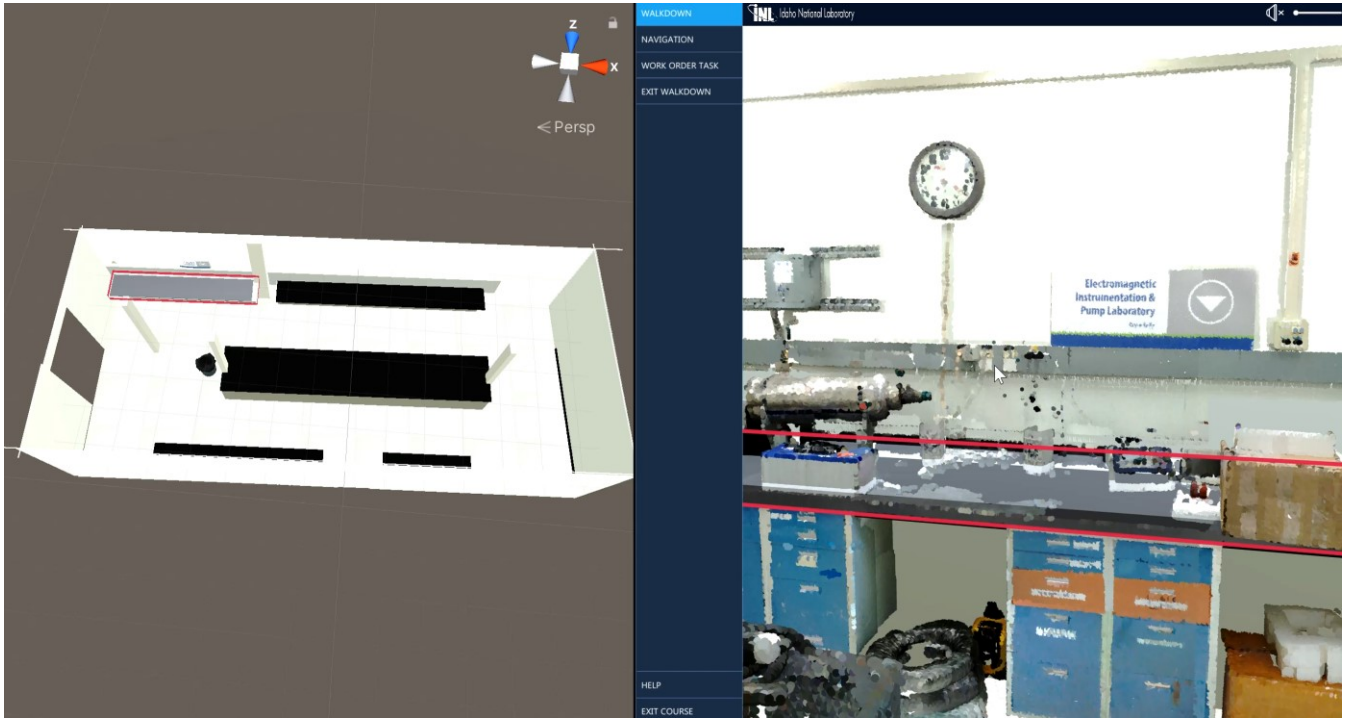
https://github.com/keijiro/Pcx

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

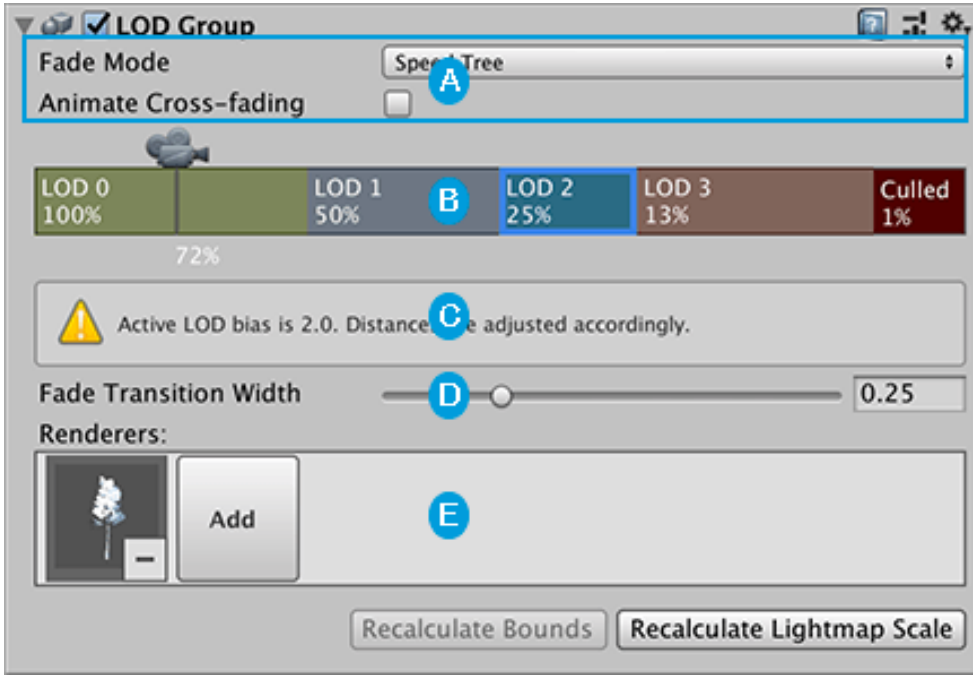
Improve Application Performance - WebGL

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



Improve Application Performance - WebGL

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



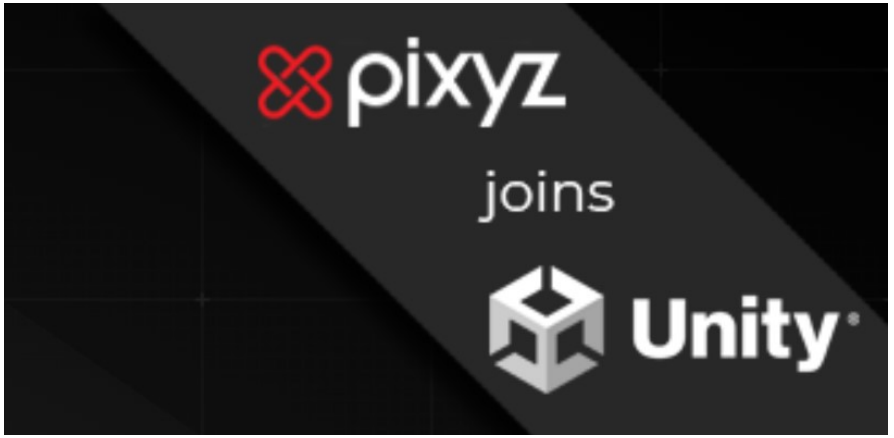
https://docs.unity3d.com/Manual/class-LODGroup.html

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/