Gabrielle Germanson

Email: [gabbygermanson@gmail.com](mailto:gabbygermanson@gmail.com)

Team: Smart City Infrastructure - Road Sign LiDAR subteam

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**Purpose**: We intend for this document to serve as a source for any subteam in Smart City Infrastructure research to use whenever the need to visualize 3D data arises.

Our subteam’s purpose for investigating 3D point cloud software is to spatially visualize our LiDAR data taken from roads. We also intend to have the ability to filter out all data points except for those that pertain to a sign so that we can export this smaller set of data and simply analyze a new smaller file regarding its LiDAR values.

**Background**: None of the following software does all of the requirements our subteam is searching for. CloudCompare is the best option since it only lacks the ability to export metadata with the LiDAR and coordinate data. Some of the following software we were not able to analyze due to license restrictions. Moreover, most of the following software is not intended to import miles and miles of data but rather a large scene of data. Across the following softwares, some can’t filter out points, some can but it is an agonizing process.

Most of the following software is meant for ‘building information modeling.’ This is similar to surveyors or forensics teams for instance who have a scanner or LiDAR unit to collect data from various angles around a scene. Then they take these point cloud files and upload them into one of the following softwares or another to recreate the scene virtually. The benefits of analyzing the scene virtually is you are able to leave the scene physically and analyze dat you don’t capture with photos like the ability to measure distance between points. This scene reconstruction feature is key in Autodesk, Bentley, and Leica as described below. Note that lots of these software are finicky with the type of input data format they require. Main formats are binary and ascii. Binary format requires you to visualize the data to understand anything of the data whereas ascii gives you an idea of the data before it is visualized.

**Unverified Tools to Visualize**

* Merrick's Mars Viewer
  + [https://www.merrick.com/services/geospatial-services/software/](https://slack-redir.net/link?url=https%3A%2F%2Fwww.merrick.com%2Fservices%2Fgeospatial-services%2Fsoftware%2F)
  + Need License
* Online LiDAR point cloud viewer
  + [http://lidarview.com/](https://slack-redir.net/link?url=http%3A%2F%2Flidarview.com%2F)
  + Good light weight program for modeling smaller point clouds like for instance just for one sign. Handles around 100 points best although it is advertised to handle couple million points.
* Quick Terrain Reader
  + [https://www.idaholidar.org/tools/quick-terrain-reader/](https://slack-redir.net/link?url=https%3A%2F%2Fwww.idaholidar.org%2Ftools%2Fquick-terrain-reader%2F)
  + Need License
* **Cloud Compare**
  + **Have to upload files to visualize. More generalized 3D modeling software that can overlay different point clouds and compare. Can select points and export them. Exporting is tricky because it can not handle metadata that comes with GPS and LiDAR data. It merely rids any data it does not need and therefore when exporting a smaller data set, it will not export with the metadata that came in with it. It does this to save space for the modeling feature. Also slightly alters incoming GPS data which makes it hard to match data to original data for our purposes of retaining metadata so therefore can’t do float comparisons (bad practice anyways). Contacted software creator about this.**
* ParaView Point Cloud
  + [https://www.paraview.org/lidar/](https://slack-redir.net/link?url=https%3A%2F%2Fwww.paraview.org%2Flidar%2F)
  + Veloview is under this: <https://www.paraview.org/veloview/>
  + Both are Python plugins/packages which means you must learn the functions, and it also does not have a UI. Not a bad visualization software. Used for visualizing LiDAR data from cars, especially with veloview. Velodyne produces LiDAR units for on top of cars. It only works with data directly from Velodyne LiDAR unit.
* VisPY
  + Python package used for visualizing LiDAR for spatial modeling
  + Not sure if works. Did not investigate much
* PPTK
  + Python package does pretty well. Second choice to CloudCompare. Good tutorials. Very new. Can’t delete points to filter down to a sign. Can utilize it inside code to automatically pop up visualization rather than uploading files.

**More Established Software from Blog Link:**

<https://info.vercator.com/blog/what-are-the-most-popular-types-of-point-cloud-processing-software>

* Autodesk - ReCap, Revit, PowerInspect
  + PowerInspect only uses point clouds for pairing with parts of a greater whole and CAD drawings. Purposed for foot by foot by foot size parts like for 3D printers. Can scan in a part with their scanner and makes a CAD drawing.
  + Recap similar to CloudCompare in ability to visualize physically long data sets as from highways. Better at filtering out points but can’t export them.
  + Revit was not explored
* Bentley: Pointools
  + Makes scanners and visualizes scene recreation. Uses LiDAR data from autonomous vehicles.
  + Need License
* Leica: Cyclone
  + Need License. Uses LiDAR data from autonomous vehicles. Make LiDAR units for cars. Proprietary software to view 3D point clouds.
* Faro: Scene
  + Need License. Uses LiDAR data from autonomous vehicles. Make LiDAR units for cars. Proprietary software to view 3D point clouds.
* Rigel: RiSCAN PRO
  + Sell lidar units for scene recreation and building information modeling. Also have software.
  + Need License
* Trimble: RealWorks
  + Sell lidar units for scene recreation and building information modeling. Also have software.
  + Need License
    - Asked for free access as GT student but no response.