



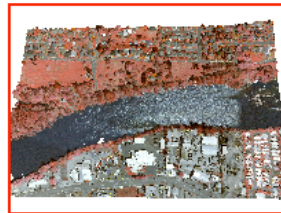
# Lidar Data Analysis and Visualization Tools

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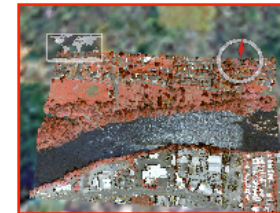
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## Lidar Data Visual Analysis and Editing



run: [LASVisEdit.jnlp](#)  
*Visualize and edit LAS files  
outside World Wind*



run: [LASVisEditWW.jnlp](#)  
*Visualize and edit LAS files within a World Wind  
application*

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Light Detection and Ranging (Lidar) is a method of producing extremely dense collections of 3D points. Lidar data are generated by capturing return signals from emitted light pulses. A pulse can produce several such return signals, each of which is captured as a point in the lidar file.

The lidar data showcased on this site comes primarily from airplane fly-overs. The raw data is post-processed to produce several per-point attributes, including the elevation of the point above sea level (stored as the z-coordinate of each point), the pulse return intensity, and several others. Further post-processing – typically involving integration of other data such as orthorectified photogrammetry – allows additional per-point information to be stored such as RGB color and classification codes. The latter are used to label points as belonging to buildings, bare earth, vegetation, water, etc.

The data set can be displayed simply by drawing the points in the point cloud with colors determined based on one or more of the attributes described above. The collection of programs described here reads lidar data in the [LAS format](#) as defined by the [American Society for Photogrammetry & Remote Sensing \(ASPRS\)](#), displays them, and allows them to be edited in various ways. In addition, the point cloud data can be used to create high-resolution elevation models and can be displayed georeferenced on a virtual globe using [NASA World Wind](#).

### Community Resources

- [goworldwind.org](#)  
The complete guide to World Wind help resources, including the main release site, forums, API documentation, and more. Two useful shortcuts:
  - [NASA World Wind Software](#)  
World Wind SDK Releases, Documentation, and Examples.
  - [Lidar discussion forum](#)  
One of the discussion forums reachable from goworldwind.org that is dedicated to all things lidar – including, of course, lidar visualization in NASA World Wind.
- [Spatial Data Infrastructure Northwest \(SDI-Now\)](#)  
An initiative to facilitate participation in the development of spatial data management tools that will service government

# Background

- Collaborative effort
  - NASA World Wind development team
  - City of Springfield, Oregon
- Lidar data
  - Large
  - Unorganized
  - Unstructured

# Goals

- Goals
  - Develop quality open source functionality that can help the Lidar community leverage Lidar data in planning and modeling contexts.
  - Encourage increased collaboration among key stakeholders to develop even better and more powerful tools.
    - Testing
    - Feedback
    - Feature and Capability Wish Lists

# Current Status

- Two applications
  - Each capable of displaying, editing, and manipulating all or part of one or more Lidar data sets.
  - LASVisEditWW – a NASA World Wind application that displays georeferenced LiDAR data in place on a globe.
  - LASVisEdit – a standalone application that displays raw Lidar data in their native (X, Y, Z) coordinate system.
    - Can display Lidar data sets when no georeferencing information is present in the file.
    - Can generally display larger data set sizes.
- Both applications are fully documented on and launchable from the web site shown above.

## Current Status (cont'd)

- Support all compliant LAS files at ASPRS Versions 1.0-1.3
- Verified in part using large numbers of LAS files from a wide variety of sources.
  - Many files have errors and/or violate specifications in various ways.
  - Usually possible to detect and correct such problems while reading the files, but you have to be looking.
  - Oregon Lidar Consortium data sets have been consistently high quality and error-free.

## Current Status (cont'd)

- In addition to  $(x,y,z)$ , per-point attributes (any or all may be 0):
  - Classification
  - Elevation
  - Intensity
  - Point Source ID
  - Return Number
  - RGB
  - Scan angle rank
  - User Data
- When running in World Wind (LASVisEditWW), we can also compute:
  - Height

# Demonstration

- LASVisEdit
  - Open and display a file
  - Filtering and Rendering Controls
- LASVisEditWW – all capabilities of LASVisEdit plus:
  - Georeferenced on globe
  - Infuse color
  - Infuse LAS codes
  - Boundary extraction
- <http://people.eecs.ku.edu/~miller/WorldWindProjects/lidar/>