Advanced Data Interoperability: LiDAR, 3D, and BIM

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ArcGIS Data Interoperability Extension

- Convert and transform data in 100+ formats
- Graphical workflow authoring
LiDAR
Overview of point cloud scenarios
Converting point cloud formats

Import point clouds and automatically generate .lasd for quick LAS use in ArcGIS.

- ASPRS Lidar Data Exchange Format (LAS)
- Point Cloud XYZ
- RIEGL Laser Scan Database (RDB)
- Mojang Minecraft
- ASTM E57
- Oracle Spatial Point Cloud
- Terrasolid TerraScan
- Z+F LaserControl ZFS
Demo
Convert TerraScan directory to LAS
Transforming point clouds

• Thinning
• Drape to create a surface model
• Slicing/profiling to divide along a line
• Update extents
• Combine
• Set components manually
• Point-by-point calculations
• Point-by-point filtering
• …
Reprojection

- Change a point cloud’s coordinate system
- Support for geocentric coordinates and orthometric heights
Clipping

- Toss away points outside a defined area
- Cubic clipping: clip to a 3D solid
- Clip to just the area you need
- Data becomes more manageable to work with
Tiling

- Chop points into a series of tiles
- Speed up processing time using parallel processing on tiles
- Easier delivery for large point clouds
Splitting

• Extract points based on the value of any component
• E.g. color, classification, intensity
• Can split based on exact value or range
Demo
Split a point cloud
Colorization

• Automatically set color components
• Overlay point cloud on raster
Demo
Colorize point cloud with orthophoto
3D GIS

Working with 3D data
Working with 3D data

- Converting 2D building outlines to 3D
  - FeatureMerger joins outlines with tabular data containing building heights
  - Extruder adds 3rd dimension to create 3D solids
  - 3DForcer to set base heights for 3D
- TINGenerator creates TIN from a point cloud
- AppearanceSetter defines details of 3D surface
Demo

- Convert Shapefile to Sketchup
- Create surface model TIN using height information from a point cloud
BIM and GIS
Working with BIM data
Working with BIM

- File size and complexity make BIM data hard to repurpose
- BIM exports IFC (too complex) or DWG (too simple)
- Key: keep what you need, discard what you don’t
BIM to GIS: Mount Vernon

- George Washington’s home laser scanned to create high quality BIM in Revit
- Data Interoperability extension used to convert BIM to GIS
  - Export Revit data (plus added georeferencing) with FME Revit Exporter
  - Import to ArcGIS with Data Interoperability extension
  - Reconnect attribution
- Browser delivery – easy sharing
- Rich detail of BIM with spatial context of GIS
BIM to GIS Scenarios

- Translate Revit floorplan to Geodatabase
- Extract/use BIM georeferencing
- Complete control over IFC hierarchies
- Reduce BIM data volumes
- Update BIM from Excel tables
- Webinar: GIS and BIM Interoperability - fme.ly/gisbim
Exporting to Minecraft
Working with Minecraft

- A Minecraft world is a point cloud
- blockID and blockData components
- Convert any data to Minecraft
  - Vector
  - Raster
  - LiDAR
  - BIM
  - etc.
Example
Bowen Island: GIS + DEM to Minecraft
Workspace summary

1. Read road lines (Shapefile), forest polygons (MapInfo), and raster DEM
2. Buffer and clip vectors to avoid overlap
3. Rasterize vector layers
   • Make numeric rasters for Z, blockID, blockData
4. Convert raster pixels to points
   • Set Z value and point cloud components
Minecraft and the real world

• Hypothetical scenarios
  - Lava flow
  - Forest fires
  - Rising sea levels

• Geodesign
  - Sweden used Minecraft for public urban planning

• Fun: fme.ly/MazeGenerator
Resources

- Download a trial at esri.com/datainteroperability
- Esri Virtual Campus – search “Spatial ETL” on training.esri.com
  - Transforming Data Using Extract, Transform, and Load Processes
  - Controlling Data Translations Using Extract, Transform, and Load Processes
- Webinar: GIS and BIM Interoperability - fme.ly/gisbim
- Webinar: LiDAR and ArcGIS - fme.ly/interoplidar
- Tutorial: How to make Minecraft worlds in FME - fme.ly/minecraft
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