Visualization with ArcGlobe

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Contents

• What is ArcGlobe?
• 3D Mapping and ArcGlobe
• Displaying data in ArcGlobe
• ArcGlobe tools
• Tips for constructing ArcGlobe documents
• New at ArcGIS 9.3
• ArcGIS integration
• Caching and optimization – Best Practices
• Publishing 3D content to the web
What is ArcGlobe?

- An ArcGIS desktop application that provides interactive 3D visualization of large amounts of geographic data
- Supports 3D analysis of spatial data
- Allows seamless transitions between global, local and street-level scales
- Uses standard ArcGIS data sources and layers
- It is a 3D Mapping front-end to a GIS system
What is 3D Mapping?

- A Solution for viewing spatial data and performing analysis in a 3D visualization environment using GIS.

- 3D GIS has applicability in fields such as Geography, Geology, Environment Modeling, Meteorology, Climatology, Hydrology, Utility Management, Disaster Management, Real estate, Location Based Services etc...
What can 3D GIS Do for you?

- Accurately represent geographic entities as they are in the real world.
- Can be easily used to create realistic models (e.g. city models) and allows visualization of ‘what if’ scenarios (for planning and decision support systems (DSS)).
- Transforms your 2D maps into 3D scenes (and globes) which allows you to extract more information from your data in regards to scale, visibility, line of sight etc...
What do I need to run ArcGlobe?

- **Software:**
  - 3D Analyst Extension with ArcView, ArcEditor or ArcInfo
  - 9.0, 9.1, 9.2, 9.3 latest Service Packs recommended

- **Hardware:**
  - CPU at least 1.5 GHz
  - Additional disk space for data cache, depending on need
  - OpenGL 1.2 compatible video card with minimum 32 MB of memory (64 MB or greater preferred)

- **Data:**
  - Most ArcGIS-supported datasets
  - ArcGIS Online
  - ArcGIS’ Data and Maps DVD
DEMO 1
Getting started with your 3D document
Displaying data in ArcGlobe

Layer categories

• Draped
  – On the globe surface
• Elevation
  – Defining globe surface
• Floating
  – Above or below globe surface

Note - Drawing order of overlapping draped and elevation layers is set via ‘Type’ tab on TOC and not on ‘Display’ tab.
Layer Draw Order (Draped)

- *Draped layers* are overlaid following their order in the *Type* tab of the Table of Contents.
- Order is important for transparency to work correctly.
Floating Layers

- Draped layers (images, features) can be made floating at a constant height or on their own surface.
- Can be used to show data (e.g. chemical concentration) as overlaid surface, to add features with own elevation above or below globe.

![Layer Properties](image)
Layer Draw Order (Floating)

• When using floating layers use transparency, the correct see-through position must be set

Example: If layers with transparency are to be watched from the top:
ArcGlobe tools

• How to get around quickly in ArcGlobe?
  – Standard navigation tools
    • Navigate, Fly, Walk and Orbital Fly tool
    • Zoom to layer(s) extent, full extent
    • Zoom to selected features
  – Bookmarks and Find tool
  – Animation Toolbar
  – 3D Graphics Toolbar
  – KML Toolbar
  – Publisher Toolbar
Layer Transparency

- Transparency can be changed interactively in the 3D Effects toolbar
- Can also be set in the Display property page of the layer
Layer Visibility Ranges

- Important to display large sets of 3D features
- Can be used to manage multiple representations
- Units are defined in Globe properties (compare with distance in status bar)
- Tile based visibility

ArcGlobe tools
ArcGlobe tools

- Use bookmarks, like in ArcMap, to store interesting views
- These can be used later to create animations
ArcGlobe tools

- Use the Find tool to zoom to locations
- ArcWeb Place Finder uses ESRI’s ArcWeb Service to find locations (requires internet connection)
ArcGlobe tools

• Animation tools
  – Capture views and create quickly a presentation
  – Create flybys from a path feature
  – Animate groups of layers
  – Export videos
ArcGlobe tools

- **Pause data caching tool -F9**
  - Similar to Pause tool in ArcMap
  - Pauses all data preparation processes, but data already in memory is still displayed
  - Allows for easier navigation and option setting until user is ready for full display

- **Draft Mode tool**
  - Use for faster navigation performance without editing layer properties or invalidating your existing cache.
  - Includes five configurable properties for: reducing the level of detail for elevation and raster layers; disabling 3D marker symbols; disabling object textures; disabling line densification; and showing a subset of features.
ArcGIS integration

- Layers can be copied (copy & paste) directly between ArcMap, ArcScene and ArcGlobe
- The GeoProcessing toolbox and ModelBuilder are integrated within ArcGlobe
- Results of analysis can be displayed directly
ArcGIS integration
ArcGIS integration

- ArcReader PMF files can be created from ArcGlobe, after enabling the Publisher extension
DEMO 2: Visual Analysis in 3D
What’s new in ArcGIS 9.3

• ArcGlobe usability and performance enhancements
  – Default ArcGIS Online content.
  – Globe graphics improvements
  – Improved bookmark support

• New Functionality
  – Improved support for KML 2.1 includes screen overlays, auto-refresh of KML network links, etc.
  – Improved Pan functionality.
  – Support for 3D models defined in COLLADA files.
  – Perimeter-based extrusion for lines and polygons where the line is extruded on a per-vertex basis.
  – Tracking Analyst extension supported in ArcGlobe.
  – Bill-boarded marker symbols now support images.
  – Support for HTML popups in ArcGlobe and ArcScene
What’s new in ArcGIS 9.3

• Developer Support
  – New 3D analysis/geometry operators for developers

• Improved Documentation
  – New tutorial exercise on building realistic 3D views (eg: virtual cities)
  – For more read What’s new in ArcGIS 9.3 Documentation
Using 3D Objects

• 3D (textured) Objects can be added to ArcGlobe by:
  – Symbolizing points with 3D markers
    • Out-of-the-box libraries of 3D Objects
    • Imported from VRML, .3ds, .flt, .skp and .dae files
  – Importing Multipatch features created elsewhere
  – Using custom tools like the Façade Tool

Using 3D Text

- *Annotation* layers can be created in ArcMap and displayed in ArcGlobe
- Symbol substitution can be applied in ArcGlobe
Draped Text

• Display text draped on a 3D surface

• Goals
  – Display annotation layers and labeled feature layers draped on the globe surface

Billboarded annotation  Draped annotation  Draped line layer with labels
3D Graphics and KML support

• 3D Graphics Toolbar
  – Digitize point, line, polygons and text graphics
  – Apply 3D Symbology to the graphic elements

Keyhole MarkUp Language

  – XML-based language for defining the display of 3D spatial data in Google Earth
  – Add KML data using the KML toolbar in ArcGlobe
  – Strong support for KML 2.1
Caching and Optimization

- ArcGlobe uses caching to optimize display performance
- Cache tiles are kept for each layer: in *memory* for immediate use and in *disk* for later
- Caches are preserved when saving a layer file or document
Caching and Optimization

- Consolidation creates a single cache for a group of layers
- Improve display performance when showing many images or rasterized features
Caching and Optimization

Tips

Save a document or layer file to preserve the cache

- Verify the size of the *memory cache* in the Options dialog. If it’s too small or too large, it can degrade performance

- From time to time, clean the *cache location*

To optimize interaction, *generate* the caches in advance

- You can do this with the Generate Cache command
- It can also be done by pre-visiting the area of interest, or running an animation repeatedly

- For more read technical papers on [http://support.esri.com](http://support.esri.com):
  - *Tips for Designing Interactive ArcGlobe Documents*
  - *Techniques for Consuming 3D Textured Objects in ArcGlobe and ArcScene*
DEMO 3: Authoring 3D content
Publishing 3D content to the web

• ArcGIS Server Globe Services give you the ability to publish your 3D GIS data to the Web
• Globe Services are efficient streaming of globe visualization pages, animation and ability to perform spatial queries on 3D data.
• Globe Services provide a means for generating, managing and serving optimized globe data.
• Both just in time (on-demand) and pre-cached data serving models are supported.
Who can use Globe Services

- Any globe enabled ArcGIS Clients –
  - ArcGIS Desktop Applications - ArcGlobe and ArcCatalog
  - Stand alone ArcGIS Engine Applications based on the GlobeControl
  - The Free ArcGIS clients ArcGIS Explorer and ArcReader
Set Cache Location to ArcGIS Server GlobeCache
DEMO 4:
Publishing and Consuming 3D Web Services