3D Cartographic Techniques and Examples
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A call to arms!
Types of 3D Worlds

Global Coordinate System (WGS84)
Curvature of the earth
‘Global’ context

Projected Coordinate Systems
Fishtank area-of-interest
‘Relative’ context
Styles of Scenes

- **Photo-realistic (Real-World)**
- **Cartographic (Representative)**
- **Augmented Reality**
Photo-realistic Scenes

For 3D cartographers... *they’re kind of boring*

**DESIGN REQUIREMENTS?**
- Look outside...

**USEFULNESS?**
- Changes to the status quo

**AUTHORING OPTIONS?**
- “Mood” (sun, rain, fog, shadows)
Cartographic Scenes

For 3D cartographers... **they’re interesting!!**

**DESIGN REQUIREMENTS?**
- As rich / full as for 2D maps

**USEFULNESS?**
- Communicate almost anything
- Powerful, eye-catching, immersive

**AUTHORING OPTIONS?**
- Size, Shape, Offset, Textures, Text ...
3D Advantages

- **Show vertical information**
  - Can’t even be seen in 2D
- **Familiarity**
  - Terrain and location recognition
- **Intuitive symbology**
  - Less reliance upon the legend / TOC
- **Human-centric experience**
  - It’s natural - we’ve always done it
- **It’s “cool”**
  - Make a splash, get attention
3D Challenges

• **Continuous and progressive scale**
  - Consistency in symbology across scales
  - Perspective distortion (aka “lying”)

• **Map content can be hidden**
  - Occlusion, building interiors, subsurface

• **Easy to get disoriented**
  - Restrict navigation options, provide bookmarks
  - Some interactions will be limited to skilled users

• **Performance**
  - Lots of data, which can often mean performance issues

• **Technically challenging for the author**
  - Data to obtain, options to consider, new skills to learn
The four primary elements of a 3D scene:

- **Surfaces**
  - A ground (primary) surface
  - Plus optional other surfaces

- **Textures**
  - The “cover” on top of the surfaces
    (eg: aerial imagery, cartographic maps, etc)

- **Features**
  - That live on / relative-to the ground
  - That know their own absolute z’s

- **Marginalia and effects**
  - Reference aids (eg: north arrow, TOC, …)
  - Atmospheric effects (eg: lighting, fog, rain, …)
One last point -> Delivery!

3D content (scenes) can be delivered as:

1. Screenshots  
   - View angles, shadows, ...

2. Videos  
   - Flight paths, pauses, rotating, ...
   - Narration...

3. Interactive 3D views  
   - Bookmarks, group layers, ...
JFK Crime Scene

Nathan Shephard (and KF)

Minard’s Map – 3D
Kenneth Field (and NS)

http://www.arcgis.com/home/item.html?id=2b48caaabd0e44028724c5f109f3de97
Typhoon Nabi
Nathan Shephard
Obama vs Romney

Kenneth Field
Chicago Narcotics

Nathan Shephard
Aviation Bird Strikes

Kenneth Field
Lego Sales, in Lego

Kenneth Field
Checklist for authoring better 3D scenes

- **Message** – what should the viewer see / learn?
- **Delivery** – pictures, videos, interactive scenes?
  - Occlusion, measurements, before/after, …
- **3D view type** – Global, Local?
  - Is an Axonometric / Isometric representation required?
- **Symbology** – realistic, thematic, augmented reality?
  - Size, Shape, Color, Textures, Transparency, …
- **Mood** – Scene properties, such as shadows, lighting, haze
  - Gotham versus Pasadena
- **Guide users** – bookmarks, labels, popups, fly-throughs, voice-overs, …
- **Be creative** – the z-axis does not have to be only for ‘z’ or ‘time’
3D Guidelines (review at your leisure)

- Use dictates structure - Promotional maps require less structure. Thematics require more structure
- Impact - 3D can be powerful, eye-catching and immersive. Use to support attention-grabbing needs
- Content - Simplification and Generalisation have never been more important. Clean. Simple. Functional
- Texture - Avoid flat colours…add textures
- Natural realistic not photorealistic
- Symbols - Mimetic symbols support easier recognition
- Typography - Still important but don’t overload. Rotate with scene if possible but not to be overbearing
- Projection - Use axonometric where possible to maintain scale particularly for analytical map functions
3D Guidelines (review at your leisure)

- Sky and haze – avoid sky but include haze which aids depth cue perception
- Space-Time Cubes - Good for linear data, OK for point, poor for area…try not to overload or stack (beware of ‘inner holes’)
- Z value does not have to depict height or time, use it to show ‘what’s important’
- Scene control - Avoids occlusions by supporting multiple views but avoid too much rotation
- Bookmarks - supports easy camera reposition, highlight key view points
- Interaction - Allow data to be recovered, overcomes measurement limits
- Narration - Guides and improves interpretation
Thank you...

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