Getting the Most out of Google Earth

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Materials for this Session are Available Here:

- http://worldmap.harvard.edu/data/workshop/Google_Earth.zip
Outline

• Introduction to Google Earth
• User interface
• Highlights of available content
• Creating simple content
• Creating advanced content
• Moving data between ArcMap and Google Earth
Preparations

• Create student directory
• Install Jing
• Check access to ArcMap
• Install ExportToKML from T drive
Intro to Google Earth

• A browser for the earth with it’s own “ML”
  – Client / server
  – Smart compressed data streaming
  – Markup language for earth

• Other Earth Viewers
Other Earth Browsers

• WorldWind: Similar but Open Source
  – Developed by NASA
  – Also speaks KML

• ESRI ArcGIS Explorer: Integrates with ArcGIS Server
  – Also speaks KML
Impact of Earth Browsers

• 100 million new geographers

• New discoveries
  • Roman Villa
    - [http://konquest.org/roman-villa-discovered-via-google-earth](http://konquest.org/roman-villa-discovered-via-google-earth)
    - Unexplored Forest
      - [http://www.dailymail.co.uk/sciencetech/article-1100323/Lost-World-discovered-thanks-Google-Earth.html](http://www.dailymail.co.uk/sciencetech/article-1100323/Lost-World-discovered-thanks-Google-Earth.html)

• Map-based communication
  – 14 million KML files (filetype:kml)
GE as Editor for KML

- Google Earth basic KML editor
- But a great view of KML
- Fancier KML needs to be created outside of Google Earth
- Good platform for creating KML: ArcMap
KML Meant to be Shared

• KML a flavor of XML
• De facto (and formal) standard for describing geospatial information, text-based, easily indexed.
  – Example: to find all KML files which describe Boston, type “boston filetype:kml” into Google.
http://www.google.com/search?hl=en&lr=&as_qdr=all&q=boston+filetype%3Akml&btnG=Search
Navigating a 3D World

- Control panel at upper right
- Scale, Grid, Elevation (terrain), Eye Altitude
- Imagery date and copyright (Historic option)
- Rotate north/south with grid
- Turn on Terrain
- Pan, Zoom, Tilt, Rotate
- Turning on buildings
- 3d Warehouse
Map Readouts

• Lat long, scale bar, stream progress, map credits
• Customizing readout
• Modifying elevation exaggeration
Tools -> Options Panel

- 3D View
- Cache
- Touring
- Navigation
- General
Finding Places

- Place name or address
- Lat long
  - Decimal degrees:
    42.375644, -71.113210
  - Degrees/Minutes/Seconds:
    42° 22′ 32.25″ N 71° 6′ 47.57″ W
- Pan and Zoom
- Gazetteers
  - Many names not in Google Earth: Example Wemou
Core Google Earth Reference Data Layers

- Satellite Imagery
- Roads
- Buildings
- Boundaries and Place Names
- Terrain
Other Data Layers (samples)

- Wikipedia (Geographic Web)
- Geonames
- Google Book Search (Gallery)
- Gigapixl photos (Gallery)
- Rumsey historical maps (Gallery)
- Tracks for Africa (Gallery), Open Street Maps
Note on Imagery

• Major asset worth many millions of $
• Most of it available nowhere else
• To use it outside of GE three options:
  – Build machup using Google Maps API
  – Digitize features in GE, then export them to GIS
  – Save out GE imagery and georeference in GIS
Imagery from GE to GIS

1) Create map features in GE and import to GIS

2) Save imagery out of GE and georeference in GIS
GE as KML Editor (make your own maps)

- Create Placemarks
  - Adding photos, video, html
    \KML\Sample_Placemarks.kml
- Create Paths
- Create polygons
- Creating Image Overlays
  \Georeferencing\1885_Webster.jpg
Getting georeferenced imagery out of Google Earth

• Use a large screen if available
• Turn on Grid: View->Grid
• Systematically save your area of interest: Edit->Copy Image, paste to image editor.
• Mosaic using MS Image Composite Editor
• Georeference using a GIS package
Creating and Saving a Tour

- Load photos to Picasa and georeference them, add comments
- Generate KML of them and load to GE
- Play Tour then start Tour Recording
- Add your own voice and manipulate the map
- Save KML of Tour
Creating a Movie

• Does not require internet connection when shown
• For highest quality use Google Earth Pro or for lesser quality…
• Screen capture utility such as Jing
  – http://www.jingproject.com/
Using ArcMap to Create Content

• Open ArcMap

• Install “Export to KML” app
  – Double click ExportKML_INSTALL.bat
  – In ArcMap enable extension:
    • Tools->Extensions->Export to KML (toggle on)
Options in Export to KML

- Symbology
- Extrusion
- Attributes
- Time
Exporting Symbolized Map to KML

• Open ArcMap
• Open census_block_all.shp
• Create color gradient on field – “inc_med_h2”
• Export to census.kml in your directory
Creating a Legend

• In ArcMap click View -> Layout view
• Insert -> Legend -> All defaults
  – Will build legend, insert to Layout view
• Select Legend -> right click -> copy
• Open paint program -> paste
• Crop image
• Save as PNG or JPG under KML directory
Add Legend to KML

• Add legend to map as “screen overlay” KML tag
• Open census.kml in text editor
• At top file under document name write:

```xml
<ScreenOverlay>
    <name>Income Legend</name>
    <Icon>
        <href>census_legend.png</href>
    </Icon>
    <overlayXY x="0" y="1" xunits="fraction" yunits="fraction"/>
    <screenXY x="0" y="1" xunits="fraction" yunits="fraction"/>
    <rotationXY x="0" y="0" xunits="fraction" yunits="fraction"/>
    <size x="0" y="0" xunits="fraction" yunits="fraction"/>
</ScreenOverlay>
```
Exporting Time Enabled Map to KML

- Open french_test2.shp in ArcMap
- Symbolize as desired
- Choose label field - shipname
- Choose time field – Date_dep
- Export to KML
Exporting 3D Extruded Data to KML

- Census_block_all.shp
- Color code by “total_pop” field.
- Use field “total_pop” for height.
- Export to KML to your directory
MyMaps for Organizing Google Earth Materials

http://maps.google.com

• Create, manage, share a collection of map features
• Store and organize materials over time
• Export to KML, import from KML
• Many tools – distance measure, path profiler
• Write own tools using Javascript and XML.
Questions?
References

Where can I find the Google Earth software?
• http://earth.google.com

Resources
• Overview of GE on Wikipedia
  http://en.wikipedia.org/wiki/Google_Earth
• Tutorials
• User Guide
  http://earth.google.com/userguide/v4/
• Google Earth Community
  http://bbs.keyhole.com/ubb/ubbthreads.php/Cat/0
• Google Earth Official Blog
  http://googleearthuser.blogspot.com/
• Trouble Shooting
  http://earth.google.com/support/bin/topic.py?topic=1130
• Google Earth Blog
  http://gearthblog.com/
More References

Free Google Earth tools:
• Sketchup http://sketchup.google.com/
• Utilities http://www.sgrillo.net/googleearth/
• Export to KML (from ArcMap) http://arcscripts.esri.com/details.asp?dbid=14273

Data Source Sites:
• Geohive.org - http://www.geohive.com/
• USGS - http://Geonames.usgs.gov/
• Webgis.com - http://www.webgis.com/

Geocoding Sites:
• Geocode America - http://www.geocodeamerica.com/
• Geocoder.us - http://geocoder.us/
• Alienview sightseeing - http://www.aliensview.com/
• Mgeocoder - http://brainoff.com/gmaps/mgeocoder.html
• World-gazetteer.com - http://world-gazetteer.com/
• Census.gov gazetteer - http://www.census.gov/cgi-bin/gazetteer
Additional Information
Creating Screen Overlay Images

• Windows Paint to create images of date information, titles, etc.
• Photoshop or the free Irfanview may be necessary for legends and more complex graphics. [http://www.irfanview.com/](http://www.irfanview.com/)
Positioning Screen Overlays

See screen_overlay_examples.kml

Pin the center of the image to center of the screen with:

- `<overlayXY x="0.5" y="0.5" xunits="fraction" yunits="fraction"/>
- `<screenXY x="0.5" y="0.5" xunits="fraction" yunits="fraction"/>

If you want to pin the upper left corner of your logo (overlay) NEAR the upper left corner of the screen, but leave a slight gap for framing, use:

- `<overlayXY x="0" y="1" xunits="fraction" yunits="fraction"/>
- `<screenXY x="0.05" y="0.95" xunits="fraction" yunits="fraction"/>
Time Enabling Your Content (Manual Method)

Documentation for TimeSpan tag
http://code.google.com/apis/kml/documentation/kml_tags_21.html#timespan

- Create placemarks in Google Earth for three year dates
- Create folder and add placemarks to it
- Save by right clicking on folder name and saving as KML
- Add XML to top of <Placemark> tag for each year to control display using TimeSpan tag. Change dates in tag accordingly:
  
  ```xml
  <TimeSpan>
    <begin>1940</begin>
    <end>1949-12-31</end>
  </TimeSpan>
  ```

- Test in GE
Preserving Attributes from KML in ArcMap (from Jeff Blossom)

1. Open the KML file in excel as a “read only XML workbook”.

2. Added a column called ID, put a 1 in the top data row, and calculate the next row equal to A1+1, copy this down the length of the file to establish a numeric unique identifier per row. This is to make sure that you can sort the file back to the original order.

3. Now you can sort the file based on different rows, making it easier to delete all rows and columns except those that contain Name and Description data.
4. Next sort by the ID field to re-establish the original order. Your file should now contain only the ID, Name, and Description fields. The ID's won't be sequential numbers now, as many of the rows have been deleted. So create a new ID field using the same method describe above in #2, and save the Excel file as something.xls.

5. In ArcMap, turn on Tools->Extensions->Data Interoperability and open your KML file. You will get layers you don’t need and can ignore.

6. Use “join table by attribute” to join the Excel table to the imported placemark polygon data layer on the ID field. This will bring in the right Name and Description to the correct polygons. Luckily, ArcMap Data Interoperability imports the polygons and assigns the FID in the same order as Excel does when the original KML is read in.

7. Save the data layer from ArcMap together with the joined attribute into a new shapefile or geodatabase feature class.
Creating and Placing a Model

- Creating a model in Sketchup, placing it in Google Earth
- [http://sketchup.google.com/support/bin/answer.py?hl=en&answer=36241](http://sketchup.google.com/support/bin/answer.py?hl=en&answer=36241)
teKML for Advanced Time Enabling

• teKML is powerful open source utility for converting GIS data in shape file format directly to time enabled KML. Tekml was developed by Lex Berman of the CGA:
  • https://cga-download.hmdc.harvard.edu/publish_web/Geo_Tools/teKML/
A KML Sharing Tool

• Colleague Lex Berman and Bill Hays of MIT have developed a powerful KML sharing system called GIST (Geographic Information Sharing Tool)
  http://gist.fas.harvard.edu/