First Exam

- Monday, September 26, 2016.
- Combination of multiple choice questions. Bring a #2 pencil with eraser.
- Based on class lectures and chapter 1.
- If you miss the exam, an essay style make up exam will be given.

Geographers’ Tools:
Automated Map Making

Prof. Anthony Grande
Hunter College Geography

Digitizing a Map

- A digitizer turns a printed map into electronic format by assigning \((X,Y)\) coordinates to every point on the map like a mesh. The closer the points the sharper the image.
- Attributes are added to each coordinate; these may include latitude and longitude, elevation, land use, crime stats, photos, etc.
- This is called “geocoding” – the adding of attributes or details to point locations.

Revising a Digitized Map

- We can now revise a map without redrawing it by just updating the attributes at a particular \((X,Y)\) coordinate.
  1. We go to the geocoded list and make needed changes.
  2. The mapping program will reconfigure the data as soon as “enter” is hit.
  3. A new, revised map will be produced and is ready to be viewed and/or printed.

Geocoded Entries

- X,Y coordinates are assigned to every point on the map
- Then attributes are added to the coordinates.
- (In the file information is cross-referenced by X,Y coordinates and attributes.)

Digitized Map

- A printed map is turned into electronic format \((X,Y)\) coordinates are assigned to every point) in 2 ways using vector or raster formats.
Vector and Raster Formats

**Vector:** Assigns data to X,Y coordinates. Thousands of points with different attributes can be placed very close to each other. This creates a relatively smooth image and can be enlarged without distortion.

**Raster:** Uses equal-sized coded cells (pixels) to show data. The entire cell has the same value (information). Gives a boxy appearance, esp. when zooming in on an area, because the individual pixels can be seen. When densely packed (HD) this creates a clear, sharp image.

Automated Cartography

- **Automated or computer cartography** employs a digital database and software programs to **COMPILE, DESIGN, DRAW and REVISE** maps.
  - It includes a **Digital Elevation Model (DEM):** a set of equally surfaced surface elevations keyed to latitude and longitude.
  - DEM is compiled using **global position system (GPS)** (latitude/longitude/elevation/time).

Crime Data

San Francisco crime statistics represented in an elevation model. Shows concentration by neighborhood. Crime reports are located using x,y coordinates. Studying individual crime maps can lead to selective policing.

3-D Maps and Animations

- **Many attributes can be assigned to each coordinate:** elevation, land use, crime stats, temperature, etc.
- **Now we can add information as to how that point will appear under a set of circumstances:** time of day, angle of the sun, approaching a site from a certain direction.
- We can also add time sequencing (movement).
- The result is an animated 3-D map that can be manipulated by changing variables in a time sequence that gives the illusion of movement.

3-D Animated Maps

Visualization of multiple LIDAR returns in a forest canopy, showing:
1. returns from the top of canopy,
2. returns from forest understory, and
3. returns near or on the ground.
4. The bare earth surface produced from post-processing is also shown.

LIDAR MAPPING

LIDAR - **Light Detection and Ranging** - is a remote sensing method used to examine the surface of the Earth. It can be calibrated to detect layers.

**SOURCE:** ASPRS

https://coast.noaa.gov/floodexposure/#/map

https://www.coast.noaa.gov/dataregistry/search/dataset/info/capregional: go to BASEMAP/zoom in for detail

https://www.youtube.com/watch?v=d4VEIja7Noc

3 minute Big Bend National Park, TX animation

https://www.youtube.com/watch?v=9CyGqguOhso

2 minute ARCscene 3-D landscape animation

5 minute Portland, OR 3-D city animation

https://www.youtube.com/watch?v=3BcVogquOtsq

2 minute ARD GIS landscape modeling animation with LIDAR

https://www.youtube.com/watch?v=noq3-Kg9hveU
Using LIDAR to Map Forest Hidden Archeological Site

Using LIDAR to Map a Forest-covered Area

LIDAR sees through the tree cover to locate non-vegetated objects when vegetated “echoes” are removed in processing.


Caracol, Belize LIDAR Image

Lidar technology helped produce this color topographic representation of the ancient Mayan city of Caracol. Photograph: Caracol Archaeological Project, University of Central Florida

Computer Cartography

There are many steps required to prepare images for mapping. Electronic images must be processed and corrected to make them useful.

Satellite image of Great Smoky Mts. National Park draped over a DEM.

GIS - Geographic Information Systems

- A GIS is a spatial information system that is designed for data management, mapping and analysis. It goes beyond automated cartography.

https://www.youtube.com/watch?v=xmMUGpsG65I: What is GIS (2 min)

- Four features of a GIS make it a useful tool:
  1. It allows data to be manipulated.
  2. It is interactive.
  3. It helps us to create standardized models.
  4. It helps us to create geographic simulations or “Smart GIS”.

Layered data allows a GIS to work.
GIS: Layering

Layered data allows a GIS to work.

Each data set layer is anchored by coordinates of latitude and longitude.

- Layers can be added and removed from the data base.
- Layers can be shown in any combination.

Variables within any layer can be altered to create a new map based on new data relationships.

GIS - Geographic Information Systems

A GIS is a spatial information system that is designed for data management, mapping and analysis.

I. It allows data to be manipulated.

There is a data base of location information plus instructions.

- can produce special purpose maps
- can help answer the question: WHAT IF …..?
- can analyze situations and come up with a final map

GIS - Geographic Information Systems

II. It is interactive.

When one or more variable is changed, all other data will change accordingly based on the pre-programmed instructions.

GIS - Geographic Information Systems

III. It helps us to create standardized models.

- Capability Models: Are the physical attributes of the area able to support activity "X"?
- Suitability Models: Do the socio-economic attributes make this area a good location for activity "X"?

GIS - Geographic Information Systems

IV. It helps us to create geographic simulations or “Smart GIS”.

The map of the future is an intelligent image.

a) Recognize a situation (based on a model).

b) React to it (based on another model).

c) Send out instructions (based on a third model).

Your car GPS talking to you (insisting you to make a U-turn).

Locating and isolating a water main break.

Turning traffic lights in favor of emergency vehicles.

Creating a detour route for traffic in congested areas.

Examples of GIS

- http://storymaps.esri.com/stories/ireland/
- www.google.com/maps
- http://fema.maps.arcgis.com/home/webmap/viewer.html?webmap=cbe088e7c8704564a90f3d4eb99e7f30&extent=-74.023087936646,40.59437834730017,-73.98652406335401,40.605131235247505
- https://www.youtube.com/watch?v=6AlH5TvFoLw: Intro to GIS featuring Shasta College (CA) GIS Program (10 min)
NEXT: First Exam

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