Lecture Notes, Module 4

GEOG 319/658 **Chapters 5 and 6** **Fall 2014**

Slide 1: Intro slide for chapters 5 and 6 in Peterson

- As we have indicated, Peterson alternates cartography/GIS chapters with coding chapters. Chapter 5 is a cartography/GIS chapter focusing on the history of cartography, while chapter 6 is a "coding" chapter focusing on the online street map

Slide 2: Chapter 5

- We now cover some key points pertaining to the history of cartography

Slide 3: You may recall that we talked about the short-lived nature of maps on the Web. In this quote Peterson stresses this short-lived nature.

- Why is he saying this?
  - He initially is writing about historical maps, maps that were published hundreds of years ago; many of these are now gone, but some were preserved.
  - Peterson indicates that as societies advance, the medium on which they choose to convey their info becomes less "substantial" (less permanent)

- For today's situation, we can think about maps in two ways
  - Individual maps that are created and stored (a png or jpg file you create)
  - Maps associated with interactive mapping applications (e.g. Google Maps or an interactive thematic mapping program)
- Regardless of which we consider, will these maps be available 10 to 20 years from now?
  - Have them comment.
  - Individual maps maybe, but what about software and the nature of the interface?

Slide 4: Peterson's quote regarding a "A new medium…"

- Who initially designs and builds things like Google Maps and Google Earth?
  - Are they geographers or cartographers?
    - Probably not, at least initially
    - Have them discuss what impact these initial people will have on the development of mapping systems

Slides 5-7: Search for Longitude

- This is an entertaining story that Peterson summarized rather nicely, but he doesn't really explain the basics of how we use the chronometer (or clock). I want to spend a couple of minutes on this and point you to an entertaining book.
  - Longitude could be determined by comparing… (slide 5)

    Imagine that you are located at 75 degrees W longitude, but you don't know that you are there. You want to know where you are. When the sun reaches its highest spot in the sky, you look at the ship's chronometer (a clock) and notice that the time is 5 PM. Since the clock was set to 12 noon when it was solar noon in Greenwich, you know that you are five hours earlier than Greenwich. Furthermore, since each hour corresponds to 15 degrees of longitude, you know that you must be 5*15=75 degrees West of Greenwich.
- BUT the problem was the chronometers did not always keep accurate time (slide 6)
  - Problems of temperature, pressure, humidity changes, and the movement of the ship
- John Harrison solved the problem (slide 7)

  Yes, Harrison's chronometer still ran on gears, but it made an amazing advancement that compensated for temperature change, using what is now called a bi-metallic strip. Wherever temperature could prove to be a problem, he introduced this innovation of brass and steel welded back to back. This would prevent metallic parts from expanding or contracting unduly. He also invented the ball bearing to deal with friction for one of his prototypes and the movement of the ship was compensated for by making the chronometer in the manner of a watch. (From http://www.indepthinfo.com/clocks/chronometers.shtml How Clocks Work)

Slide 8: Dava Sobel's book – for those who would like more detail on this topic

Slide 9: Chapter 6 – The Online Street Map

Slide 10: Prepare for in-class debate on the pluses and minuses of creating Google Street View images. Should Google (or anyone) be able to do this?

Slide 11: Views Provided in the Online Street Map

- Peterson summarizes the basic views provided in the online street map
- Of course the basic view provides symbology focusing on the streets, as shown here for Fairbanks, AK; as many of you know, I have been spending a fair amount of time in Fairbanks and so I may be inclined to show some things from Alaska

Slide 12: Some questions we can ask about the basic street view
1) How are basic map design parameters selected?
    Do you find the map attractive? Why? Who is making these decisions?
2) What information is shown at various scales and who decides this?
    Show zooming in for Fairbanks…
3) How frequently is the design updated and what drives these updates?

Other questions?

Slide 13: Satellite view of Fairbanks

Slide 14: Key points about satellite images

- Not current (generally few months to few years old)
    - As technology changes, will this always be true?
- Why the various sources?
    - Need different imagery for different LODs; When viewing all of North America, it makes no sense to use high-resolution orthophotos that show city street detail, but when you zoom in, you want the detail
- Think about where security might be a concern
    - Do we want everyone to know what a nuclear power plant looks like from the air
        - Arguments for and against?

Slide 15-16: Terrain View (cont.)

- NW light source
    - I did a search on this and ran across a discussion of this on CartoTalk; the following statement was from Brian Moran (http://www.cartotalk.com/index.php?showtopic=3967)
        - Google Maps uses a style of relief shading in the "terrain" mode that works pretty well, I think. It seems to use a blend of regular 45-degree, northwest lighting, and a top-lit lighting that highlights the ridge tops and valley floors (anywhere where the slope = 0). The latter can be achieved using either a 90-degree "altitude" in the ArcMap hillshade dialogue (light coming straight down from above), or doing a slope analysis in Spatial Analyst and symbolizing it such that color value decreases with slope value. The two hillshades seem to be blended at about 50-50.
        - See the forum for other thoughts… (the method is something for carto junkies to crack)

Slide 17: Example from Kennelly and Stewart showing how the look of the landscape changes depending on the light sources used

- NE
    - Intermediate slopes with aspects facing NE brightest; areas of steep slope facing SW darkest
    - Useful for showing overall terrain structure and aspect
- Uniform
    - Brightest areas are either mountain ridge lines or relatively large, flat areas, whereas narrow valley bottoms are darkest
    - Helps us visualize subtle terrain differences: note the detail shown in the north-south trending valley in the SE

    - Useful for showing subtle detail and relative elevation differences
- Need both!

Slide 18: Overlays

- This is what we will be doing, creating overlays on top of Google Maps.
- This example is from the Peterson text; in this case, he has overlaid something related to transportation on top of the Google street base. The bulk of the image is transparent (we can see the Google image beneath). We'll be accomplishing this with something called the Google API.

Slide 19: Street View

- Google Image of where I lived in a dry cabin in Alaska…note that we can't see the cabin because Google chose not to drive to the end of the street?
    - Have students talk about their personal experiences with StreetView and related technologies
- Stress that other services provide Street Views, but they don't seem as thorough or as detailed as Google.

Slide 20: the Google Street View Car

- This image is available online, but I am crediting the PowerPoint that I took this from
- Uses multiple cameras (sensing systems) that produce multiple images that are stitched together
- Uses GPS, wheel speed sensor and inertial navigation sensor data.
    - Wikipedia provides a link to a Computer article by the Google folks
        - http://en.wikipedia.org/wiki/Google_Street_View
        - "Google Street View: Capturing the world at street level". *Computer* **43** (6): 32–38. June 2010.
- Uses laser range scanners to record the dimensions of the space photographed

Slide 21: Google is Capturing more than Roads

Slide 22: Creating your own Photo Sphere is a possibility

Slide 23: Trekker Loan Program

- Suggest that students could consider trying to borrow systems from Google

Slide 24: Google Street View Debate

Slide 25: Sources of Data

- Traditionally, governments attempted to provide digital street info; the classic one for the U.S. was the TIGER system developed jointly by the Census Bureau (urban) and USGS (rural)
    - Not really intended for online street maps, but rather for decennial census mapping
- With the development of digital maps in cars, several companies realized the potential of creating their own systems that would include not only the location of roads, but also images
    - One of those was TeleAtlas (now TomTom)
    - I show the TeleAtlas car here to stress that Google is not the only one recording the landscape

Slide 26: Sources of Data

- Another major company that is doing this is HERE; on their website they say that they are a Nokia company; this was formerly NavTek
    - One of our former students and the head of our Alumni Board, David Stearns works for this company. These are images that Xingong shot of their car and associated computer…

Slide 27: Google..

- Just to emphasize again that Google now has its own system

Slide 28: Sources of Data

- Crowdsourcing
    - Idea is that we let the general public capture the data as opposed to having either the government or the private sector create the database
    - OpenStreetMap as an example

        - Developed by Steve Coast in 2004
            - In the UK where the Ordnance Survey did not make data freely available
        - Based on the idea that folks have access to GPS devices
            - Essentially this gives us a second reason for developing OpenStreetMap
    - Lots of folks collecting data, but only a small fraction create the bulk of the data
    - You might think there would be errors, but evaluations have shown that such crowdsourced info is actually quite accurate

Who in the class has been involved in such collection?

Slide 29: Rendering and the Mercator Projection

- We will focus on this issue in a subsequent chapter and read a related article
- At this point, we just want to emphasize that the major map providers all use a variation of the Mercator projection as shown here
- The key problem is that when viewing a large portion of the Earth’s surface areal relationships are grossly distorted
    - Africa is actually 14 times larger than Greenland
    - On an equal area projection, area relationships are shown correctly, but there is shape distortion.
    - The problem of area distortion is minimal, however, when the map is used at a large scale, as is typical of most users.