Lecture Notes, Module 2

GEOG 319/658 **Peterson/Chapters 1 and 2** **SPRING 2014**

Slide 1: Title

- As we said last time, we will not lecture on everything in Peterson. Some basic introductory material we may not cover. If we feel that our perspective on cartography or GIS differs from Peterson, we may feel the need to elaborate.

Slide 2: Peterson statement on Internet as revolution

- Invention of printing in 1400s was dramatic (before this time maps had to be reproduced by hand and few existed). With printing, many more people could use maps…
- Get their thoughts on whether they agree or disagree with Peterson's statement
- Yes, they agree might use the following arguments:
    - Maps available to much wider audience
    - Maps available quickly (don't need to wait for printing)
    - Maps are interactive
    - Maps are timely (as soon as the data changes, maps can change)
    - Maps are interactive (user can select what to show and how something is shown)
- No, they do not agree might use the following arguments:
    - Not everyone has access to the Internet (60% at present do not)
        - But couldn't the same be said for printing when it first happened? Who actually had access?
    - The maps produced may be poorly designed, but does that matter?
    - Our thoughts about "Nos" don't really deal with why it is not a revolution, but rather the revolution may not be entirely desirable.

Slide 3: Perkins' statement about VGI

- I sent you an email about this. Perkins made this statement in a review of a new book on VGI that appeared in the Spring 2013 issue of Cartographica.
  CROWDSOURCING GEOGRAPHIC KNOWLEDGE: VOLUNTEERED GEOGRAPHIC INFORMATION (VGI) IN THEORY AND PRACTICE / Ed. Daniel Sui, Sarah Elwood, and Michael Goodchild. Dordrecht: Springer,2012
- What are examples of VGI?
    - Christmas bird count, OpenStreetMap, Photos of various locations with GPS coordinates
- In thinking about whether you agree with this statement, what other major developments have taken place?
    - Geobrowsers such as Google Earth

Slide 4: Peterson's view of "The Expansion of Cartographic Research" (Figure 1.1 from his text)

- Think about our geospatial technologies and how they relate to one another
- Peterson intended this figure to show the "development of research related to cartography"
- Ignoring this slide for a moment, what do you consider the subdiciplines that make up geospatial technologies?
    - Cartography, GIS or GIScience, remote sensing, spatial statistics (or quantitative methods)
- The left-hand side is composed of which of these?
    - Remote sensing (it is interesting that this is by itself)
- Looking at the right-hand portion, does GIS really evolve from Thematic Cartography?
- The right-hand side deals largely with cartography (list the elements that fall in this) and GIS (GIS, GISc, Geospatial Analysis)
    - Developments in spatial stats are not clearly depicted unless he intended these to fall in "Geospatial Analysis"
        - Spatial autocorrelation and spatial regression, for example, for example are spatial stats; we don't see these explicitly shown here.
- Since this course focuses on cartography, let me say a bit more about a few of the terms shown in this slide. Remember the varied backgrounds that we have in this course…

Slide 5: Cartographic Communication vs. Visualization (or Geovisualization)

- Important to contrast these two terms

Slide 6: Characteristics of Cartographic Communication

- Map author knows something and wants to communicate it
- Normally, the map author does not show alternative views of the data
    - For example, we probably wouldn't show the effect of different data classifications
- This could be on the Web, but it is probably static (user cannot interact with the map)

Slide 7: A Model for Cartographic Communication

- I teach an entire course on the basics of thematic mapping (maps that have a particular theme or purpose)
- We go through this model in detail: the net result is typically a single static map

Slide 8: Geovisualization

- Contrast with communication
    - Private: maps are not really intended for the public, but rather for individual private viewing or possibly a small group of folks who want to explore the data
    - Unknowns as opposed to knowns: again we are exploring the data
    - Interactive vs. static: interactive is the emphasis

Slide 9: MacEachren's cartography-cubed representation

- Communication is in one corner of the cube; in the opposite corner is visualization or geovisualization.
- Note the three axes…

Slide 10: Alaska vote on oil measure (see http://www.newsminer.com/news/local_news/unlike-statewide-fairbanks-voters-favored-yes-votes-on-measure/article_a77bfb98-2b46-11e4-bf4a-0017a43b2370.html?mode=jqm)

- A new oil tax system was passed in Alaska in 2013, which some felt was too good for the oil companies; the idea was to reduce taxes and encourage oil exploration, but if the oil companies are paying less tax, there is less money coming into the state; the state gets about 85% of its money from the oil-related activities
- They had a ballot to repeal the 2013 oil tax structure
    - Yes = in favor of repeal
    - No = against repeal
- Note that there are district level and precinct level views
- Note that you can zoom in on the precinct map and get different views
    - This is Interactive and there are certainly some Unknowns
    - However, a large number of folks (the public) will view this app, but they do so in private
- Note how the theme of voting is overlaid on Google; as you look at various maps in online newspapers and journals, how often do you see this done?

Slide 11: Geovisual analytics

- Stress that it combines visualization and computational capabilities

Slide 12: A simple example of geovisual analytics

- Many of the examples of geovisual analytics take a long time to explain
- Redistricting is a simple example

Slide 13: Goal of redistricting…

- Redistricting is the process of redefining congressional or legislative district boundaries to equalize voter representation
- Stress that the problem is computationally involved because there are so many possible solutions; here we have only about 100 counties in Iowa; what if we have a situation with 1000 enumeration units?

    - At the recent CyberGIS conference Xingong and I attended, there was actually a talk on redistricting and the suggestion was made that parallel computing might be necessary
- Visualization comes into play when we want to examine the results of the redistricting; we might want to try out different solutions; ideally, we want to pick a solution that has high compactness and relatively low population deviation

Slide 14: MapQuest

- Ask them to respond to the two questions on the slide

Slide 15: Raster vs. Vector Maps

- We will be making use of raster maps in our first exercise and so we need to differentiate between raster and vector maps; for some of you, this difference should be a review of material learned in your GIS class

Slide 16: Raster definition and image

- Note the basic definition on the slide
- The image shows the result of zooming in
- I would say that you can't really tell if the underlying database is raster or vector because the monitor or display that you are using is raster

Slide 17: Raster Graphic File Formats (Begin with GIF)

- We now consider the various raster graphic file formats
- We begin with the GIF raster graphics file format; its characteristic are shown in the slide
    - 256 shades (1 byte per pixel)
    - An early standard…
    - Used for lines because so few colors are available
    - Often used with map animations

Slide 18: JPEG raster graphics file format

- 16.8 million colors
    - Of course we can't see that many different colors
- Red, green, and blue are combined
    - Principle of Additive color
- Use of bytes
    - We can store a number from 0 to 255 in each byte, which yields 256 different values
    - Multiply 256*256*256= 16.8 million colors
- Most common Internet compression method
    - Turns out to be bad because maps may be compressed this way
- Compression is a problem as maps are composed of lines, which are adversely affected by the compression
- Best suited for pictures (not maps)

Slide 19: Example of undesirable affect of JPEG compression

- Note the mottled appearance of lines and lettering.
- Mention my own experience in Snow Hall with immersive large-scale visualization system
    - Who has had a similar experience?

Slide 20: PNG format…

- Stress that this is a good alternative when working with maps

Slide 21: Vector Maps definition

- Basic definition is given here…
- The Florida example at the bottom from MapQuest is supposed to show the detail that is possible at different zoom levels

Slide 22: PDF and Adobe's Flash (Proprietary vector graphic file formats)…

Slide 23: SVG (Open vector graphic file format)…

Slide 24: Raster vs. Vector question

- Have students respond to this question

Slide 25: Part a of Exercise #1

- Exercise #1 is going to be a programming exercise in HTML. The guts of this are covered in Chapter 4 of Peterson, which we will cover next Wednesday.
- We will assign the programming on Wed. and it will be due the following Wed., which will give us the Monday to deal with questions that you have
- Show them how to do a simple search for a GIF that involves climate change
    - Search for "Climate change map GIF" in Google

Slide 26: to prepare for exercise #1

- Chapter 4 of Peterson is the key
- Become familiar with the free web hosting service described in Peterson (set up your own account)
- There are alternatives for learning html and other programming languages online
    - We've tried both the Code Academy and w3schools. We like w3schools because you can easily move between individual teaching elements
    - Suggest that they go through the section "Tables" within the HTML section of w3schools

Slides 27-28: Tiled web maps

- Slides 27 and 28 cover the basic concepts related to tiled web maps

Slide 29: Cost of map storage using disk or RAM

- The figures that Peterson gives in this table are what it would cost if the maps were stored for various zoom levels on disk or RAM
    - Disk is too slow and RAM is too expensive, so we use both
- Contrast with using RAM and GPU
    - GPU may be faster, but Xingong questions whether GPU can actually be used for storage
    - The issue is that Google is not going to tell us exactly how they do this.

Slide 30: Question on TCP/IP

- Map tiles are still needed as those "packets" are designed based on an application, in our case, the maps. The zoom in/out and pan operations determine what map tiles need to be sent to the client.

Slide 31: Map Mashups

- Basic definition of map mashups and then Peterson's quote; check to see whether they agree with his statement.

Slide 32: Animation

- Basic definition is that animated maps are maps that are characterized by continuous change while the map is viewed
    - You may select various parameters for displaying the animation, such as the pace of animation, but once you have done so, you sit back and watch the map change
- In a course that I taught last semester we spent a lot of time on animation
- At this point, we stress that Peterson emphasizes his own work on animation
    - For example, the Animated Atlas of Flight Traffic (We have the complete atlas at KU; a coarse depiction of some of the capability can be found at http://maps.unomaha.edu/animatedflightatlas/)
    - There are problems with the atlas, for example he does not clarify what the colors mean, but actually it is one of the more effective animations
        - Many animations are difficult to follow, whereas many of Peterson's examples in the atlas are fairly easy to follow.
        - We will discuss animation more when we get to that particular section of the course

- Note that his atlas is not animated web mapping ; we will see later that animated mapping was not really planned for in the context of web services