Week 2

GIS CONCEPTS
Part I

GIS ON THE WEB
Part II
topics of the week – part I

- GIS functions and GIS data
- Spatial relationships
Organizing convention for spatial data

- Store Information by thematic layers of spatial data
- Answer questions by integrating different layers of data
- Onion analogy for representing reality
Feature classes in the vector model

- Real-world objects are modeled into three fundamental geometric shapes

- Lines, Arcs, Routes
- Streets

- Points
- Houses

- Areas, Polygons, Regions
- Land Parcels
Determining spatial relationships

I-10 connects Jacksonville and Santa Monica

Santa Monica is contained in California

Jacksonville is adjacent to the Atlantic Ocean

I-10 has length and direction
GIS functions

Capture
Store
Answer Questions
Analyze
Display
Output
Capture, create data

New data

- Digitize from paper maps
- Digitize over digital maps
- Scan paper maps
- Create fresh using GPS devices
- Create from textfiles that store geographic location

[mostly points]

Text file example:

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>450632.55</td>
<td>355789</td>
</tr>
<tr>
<td>450633.56</td>
<td>355791</td>
</tr>
</tbody>
</table>
Capture, create data

*Use existing digital data - GIS format or other*

- Download from public GIS web portals
- Buy from specialized GIS agencies
- Convert from other formats into GIS formats
- Subtract, collapse, add, integrate from existing GIS data into new GIS data that respond to your needs
- Volunteered user data (knowingly, non-knowingly)
  - World peace map

*Create new vs existing, pros & cons*
Store data

Two fundamental models for storing geographic data

- **Vector Model** - *Discrete representations of reality, traditional geometric shapes*

- **Raster model** - *Uses square cells to model reality*
  - *with attributes* - grids
  - *without attributes* - aerals
More on Vector and Raster

*Vector* GIS is composed of points, lines, and polygons (areas).

*Raster* GIS is composed of rasters, or cells.

- Points
- Lines
- Areas
Answer Questions

- What is where, identify specific features
- Where is what, identify features based on known conditions

County Name = Alachua

- Context and Content of Questions
Analysis

- **Proximity**
  Which parcels are fully contained within the red line?

- **Overlay**
  What were the environmental and engineering factors that determined current landuse?

- **Network**
  Which is the shortest route to the house on fire?
### Attributes of Max Temp-June 1

<table>
<thead>
<tr>
<th>School ID</th>
<th>Current Air Temp (°C)</th>
<th>Maximum Air Temp (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USMA1T99</td>
<td>28.9</td>
<td>29.4</td>
</tr>
<tr>
<td>USH15MWH27</td>
<td>33.0</td>
<td>33.0</td>
</tr>
<tr>
<td>USVAW2QV</td>
<td>26.0</td>
<td>26.0</td>
</tr>
<tr>
<td>USVAW2QV</td>
<td>28.0</td>
<td>31.0</td>
</tr>
<tr>
<td>USVAW2QV</td>
<td>16.0</td>
<td>23.0</td>
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<td>USING8TK</td>
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<td>20.0</td>
</tr>
<tr>
<td>USING8TK</td>
<td>22.0</td>
<td>25.0</td>
</tr>
</tbody>
</table>
Output and medium of publication

Format
- Paper maps (wall, book, report, etc)
- Images, jpg, gif, pdf, bmp, etc.
- Project with interpreted data that points to the datasource, usually software dependent
- GIS data with new knowledge stored into various GIS formats

Medium
- Paper
- Desktop (images, projects, live data) – single user
- Network (images, projects, live data) – multiple users
- Internet (images, projects, live data) – public use
Three components of geographic data

**Geometry**
Geographic features

**Attributes**
Descriptive information

**Behavior**
Rules we set, ex. display only at a particular scale.
Map scales

*Map scale* = ratio of map distance to ground distance in the same unit

- Large scale vs Small scale
- Scale of display vs Scale of data capture
topics of the week – part II

- What is Internet GIS?
- Examples of Commercial GIS Internet Applications
- Examples of Government/Public GIS Internet Applications
- Examples of Civil Society GIS Internet Applications
What is Internet GIS

- Internet GIS uses the Internet to distribute data and to conduct spatial analysis in a distributed environment.
- Web Mapping refers to making and displaying maps on the Web, with little or no analysis capability.
Features of Internet GIS

- Wide accessibility, users anywhere can access GIS data and analysis tools over the Internet.
- No GIS software is required to be installed locally.
- Takes advantage of the existing graphic user interface provided by the World Wide Web.
- Users can manipulate maps and GIS data directly over the Web.
- Local GIS software can also access remote data anywhere, via the Internet, if it is Internet aware.
- Internet GIS facilitates incorporation of real-time information.
- It is generally at no cost to the user.
Evolution of GIS architecture

Accessibility vs Time

Mainframe GIS
Desktop GIS
Internet GIS
Mobile GIS

Centralized vs Distributed
Basic Architecture of Internet GIS

- Client
- Web Server with Application Server
- Map Server
- Data Server

- desktops/laptops
- computer acting as server and related software
Commercial GIS free for everyone

Yahoo Maps - http://maps.yahoo.com/

Google Maps - http://maps.google.com

Google Earth - http://earth.google.com/

MSN Virtual Earth - http://local.live.com/
Features

- Created and maintained by NAVTEQ
- Can be accessed at: http://maps.yahoo.com/
- Provides maps, imagery, hybrid display of the two
- Provides for geo-spatial searches, driving directions
- Provides traffic information
Google Maps

Example searches:
- Go to a location
  - kansas city
  - 10 market st, san francisco
- Find a business
  - hotels near lax
  - pizza
- Get directions
  - jfk to 350 5th ave, new york
  - seattle to 98109

Drag the map with your mouse, or double-click to zoom. Take a tour.

Business Owners: Add/Edit Your Business
Features

- Created and maintained by Google
- Can be accessed at: [http://maps.google.com/](http://maps.google.com/)
- Provides maps, imagery, hybrid display of the two
- Provides for geo-spatial searches
- Lately provides for user customization
- A new feature the street view – does not cover the entire US yet
Google Earth

- Maintained by Google
- Can be downloaded at: [http://earth.google.com/](http://earth.google.com/)
- Developed by Keyhole, Inc.
- Acquired in ‘04, renamed in ‘05
- Three versions:
  - Free
  - Plus
  - Professional
Features

- Combines satellite imagery, maps, Google Search
- Allows for user’s own information, for street view, etc.
Google Sky

- **The New Digital Sky**, Google Video – Tony Tyson, UC Davis

- **New Frontiers in Astronomy**, Google Video - Alberto Conti and Carol Christian, Hubble Institute

- **Mars Crowdsourcing Experiment** – from images to GIS data
MSN Virtual Earth

- Created and maintained by Microsoft
- Also known as Windows Live Local
- URL - http://local.live.com/
Features

- Scratch Pad option: a place to "hold" the locations of interest during a search and discover session
- Ability to add local data layers, such as businesses or restaurants
- Ability to choose from a number of different data types
- Allows for user’s own information
- Provides oblique imagery i.e. satellite images with 45-degree-angle views of buildings and neighborhoods
Oblique Imagery

- Created by Pictometry and sold to Microsoft along with orthogonal images under a five year contract.
- The oblique does not cover all counties in US, much less the world.
- Live demo on Oblique Imagery from LocalLive.
- Live demo on Oblique Imagery using the desktop EFS.
Oblique Imagery
Public GIS Internet Applications - MIT Ortho Server Tools

http://ortho.mit.edu/
Public GIS Internet Applications - EPA EnviroMapper

Civil Society GIS Internet Applications - OpenStreetMap

http://www.openstreetmap.org