The Future of GIS: a few thoughts

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http://www.utdallas.edu/~briggs/personal/futurefrom2015.ppt
x
(linked under *Papers and Presentations*)

Thinking about the future

- our only model for the future is the past
  - Looking back may be helpful
  - and I can look back longer than any of you
- think back as many years as you are looking forward
  - change has been both supersonic…. and glacial
  - technology is supersonic, people and their institutions more glacial

    …..altho. Edison's light-bulb has only just been replaced!
- Change is both **re**volutionary and **ev**olutionary
  - unexpected and highly disruptive
    - The PC and the iPhone
  - or continuously compounding
    - The $ cost of storage (a meg of disk space)
  - but the impact of either can be dramatic

Thinking about the future—contd.

- Is the pace of change accelerating?
  - are we are *gearing-up* for the information age, **or** reaching its climax?
  - 200 years for industrial age (1750-1950)
  - Only 50 years since Kilby's invention of the integrated circuit (1958)
- you have to get *there* from *here*
  - Don't get too carried away
  - Can you envision a realistic path?
- if I knew the future, I wouldn't be here!
  - I'd be on my own Caribbean island

Whither GIS?—3 topics

1. The arrival of analysis
2. The updating of data
3. The withering of GIS

…and I'm not going to talk about

- Cloud computing
- Everything mobile
- Petabytes of memory on your cell phone
- 1,000GB mobile networks
- etc.. these are surely coming (or come), or at least something close

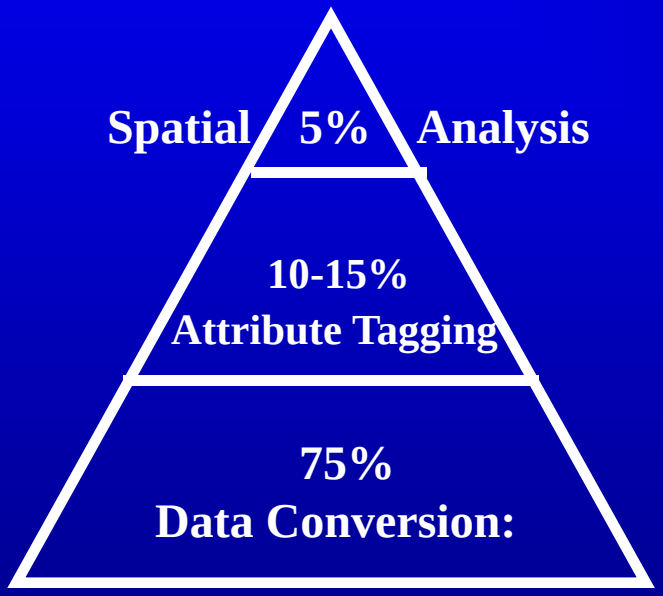
The arrival of analysis

The past as a guide to the future

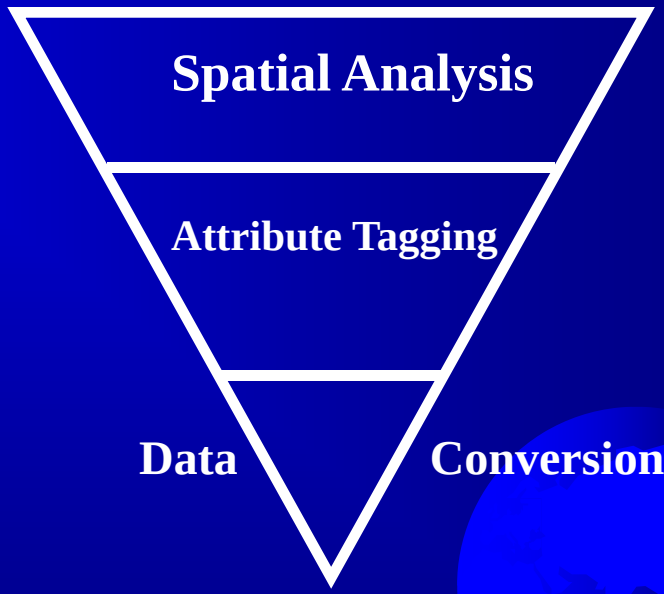
- Dominant IT (Information Technology) issues:
  - Hardware in the 1970s and 1980s (IBM as monopolist)
  - Software in the 1980s and 1990s (Microsoft as monopolist)
  - Data in the 2000s and 2010s (Google as monopolist)

  But what about the 2020s and 2030s?
  - Analysis in the 2020s (who as monopolist???)

The arrival of analysis



Past



Present/Future

The arrival of analysis

From Description to Simulation & Modeling

Picture worth a thousand words:

maps & diagrams of how is, or how was

Web portals serve static (outdated?) data sets

Visual simulation & virtual reality:

real time display of how is, and how <u>might be</u>
-forest fire
-freeway traffic flow

Web portals serve continuous, sensor-derived data

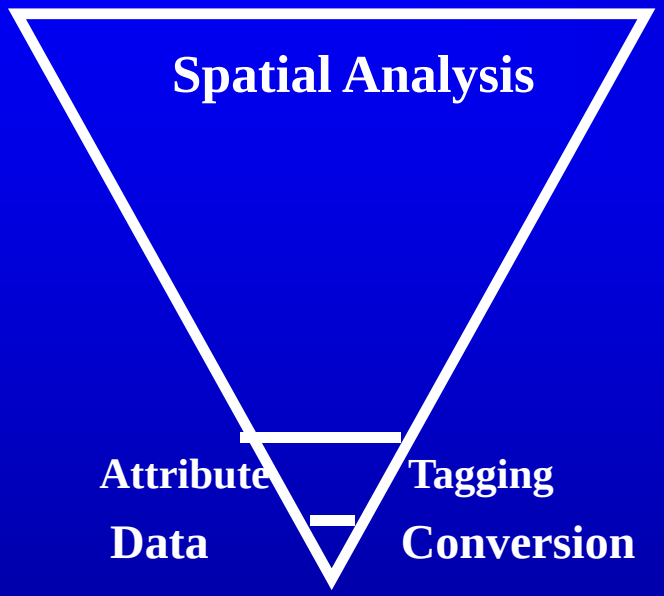
Past

Iconic models: scaled down reproductions of the real thing

Future

Symbolic models: based on logical relationships in mathematical or statistical form

The arrival of analysis



Not what are traffic conditions <u>now</u>
--but what <u>will they be</u> when I get there

Not where is the fire burning <u>now</u>
--but where will it be at dawn

Not last night's crime on a map
--but where is it most likely tonight

Future *We have always wanted these predictions.*
--getting them is becoming increasingly realistic.
From weather forecasting to >>everything forecasting
From where it's at to >>where it's going to be at

The Arrival of Analysis

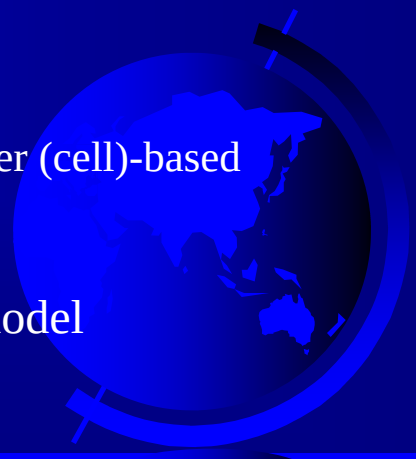
from 2-D description to 4-D interactive modeling

Past

- 2-D flat map displays
- Static representations of some past point in time
- User as observer

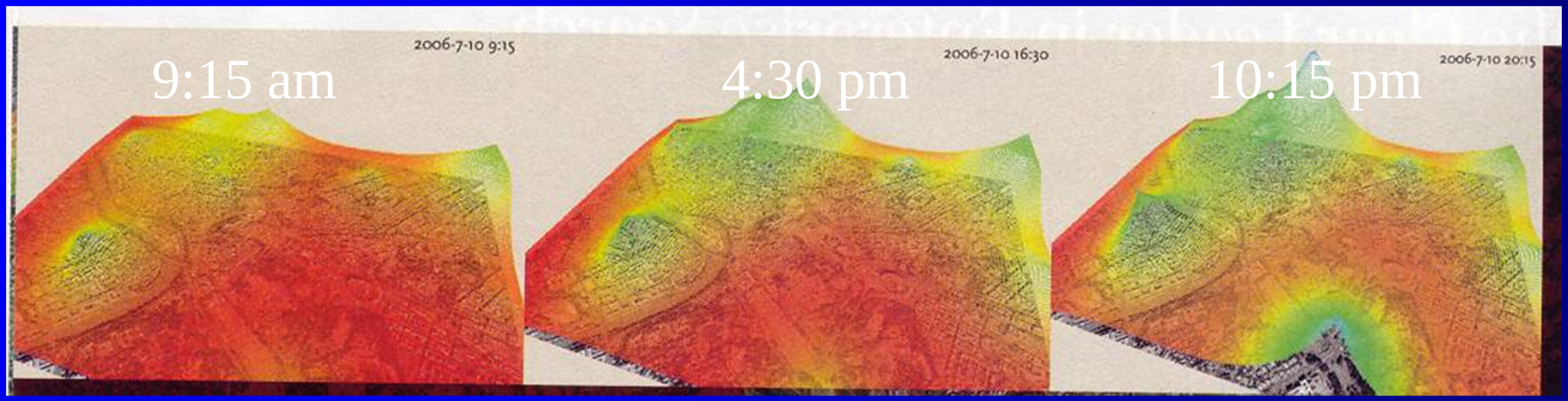
Future

- Effective 3-D visualization
  - integration of CAD and GIS is over
  - Integration of GIS, visualization, and gaming?
- 4-D incorporation of time: *"The time has come for time."*
  - Space-time modeling
  - agent-based / cellular automata? Or how?
    - agents (e.g. vehicles, fires or people) interacting over time in a raster (cell)-based environment according to established rules
- User as participant
  - Users (researchers, professionals, the public) interact with the model
  - Participatory GIS: the public as the planner



The Updating of Data
the sensored city or the censored city?

- Data no longer created and updated, but continuously derived in (near) real time from automated sensors and existing systems
- from systems supporting organization's daily operations
  - Traffic sensors, security cameras, smart meters, intelligent vehicles, cell phone traffic, tax collection, store check-out systems, etc.
- and from systems supporting individual lifestyles
  - Google searches (e.g. public health and epidemiology)
  - Facebook, twitter, yelp, etc.
  - Web site visits and clicks



Source: *The Economist*, March 10-16, 2007 p. 20.

Population density (green is high) at different times during the day tracked by cell phone data. (note: cell phone location is constantly tracked by the network to enable calls to be received.)

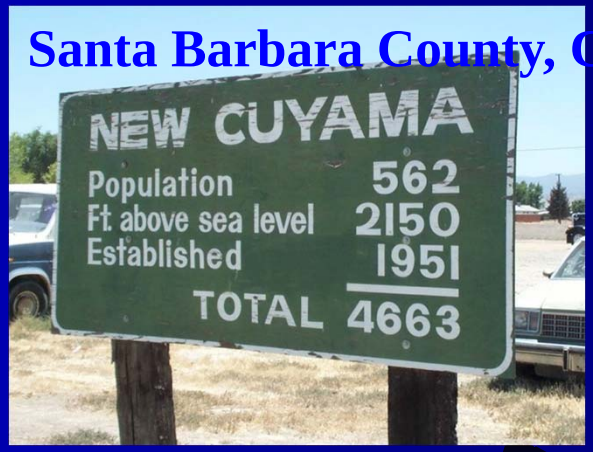
Applications: real time traffic information, transportation planning, taxi-cab location, retail store location, etc., etc..

…and the date on this example is nearly 10 years ago!

Rome, Italy, July 10, 2006.

Implications for GIS

- Not a question of data shortages, but a concern with being drowned by the deluge
- Not an issues of acquiring data, but of managing and integrating it
  - turning it into useful information



Santa Barbara County, CA

or is this really true?

- Will data availability be:
  - Plentiful and cheap, or
  - In infinite detail, if you can afford it, or
  - Severely curtailed by legal and other controls

Data is plentiful and cheap:

A Virtuous Self Generating System

Will this model of the past continue into the future?

--was the US' leading role in GIS a consequence of public domain data availability (unique to the US)?

--is this changing?

Data in infinite detail, if you can afford it

- **The private sector clearly taking over the data provision role from government in the US**
  - **NAVTEQ replaces TIGER**
  - **government a wholesaler of data (e.g. census) with private sector making it usable (at a price)**
- **but will data distribution occur via**
  - **an advertising model? (aka Google)**
  - **a fee for use model? (aka iTunes)**
  - **and is there a lesson from the evolution of broadcast and cable TV?**
    - **From free but limited (the 3 networks) to plentiful and expensive (cable)**
- **And is private sector provision a panacea?**
  - **e.g. the case for a public cadaster and national parcel-level database***

*http://www.nap.edu/catalog/11978/national-land-parcel-data-a-vision-for-the-future

Data severely curtailed by legal and other controls

- Invasion of privacy through detailed data collection and its pervasive distribution produces a backlash of demand for privacy
  - *No call, no spam, no appraisal photos, no red light cameras, no drones:* are they the beginning?
- or "Privacy is dead. Get over it."
  - Scott McNeally (CEO of Sun Microsystems, now part of Oracle)
    - and Oracle systems are probably now the world's largest data depository
  - a big policy "yawn" has greeted Eric Snowden's revelations
    - No new policy rules to limit data collection

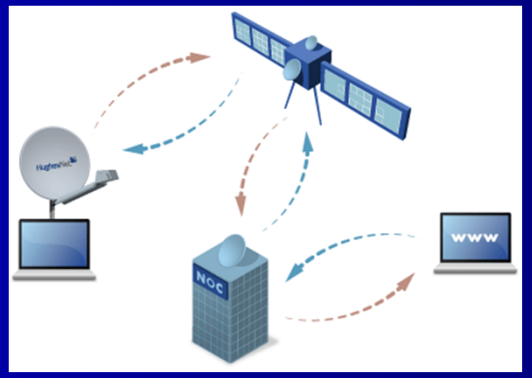
Microdrone $21,367
Base Station $19,424
Video Transmitter $1,545
Video Receiver $1,000
Daylight Video $1,545
Lowlight Video $3,100
GPS Hold $1,934

Complete Package $59,681
From my last lecture at UTD, August 2007

ad. in the *Dallas Morning News* earlier this year
(Friday, January 30, 2015)

Source: http://www.microdrones.com/

The data deluge



- On balance, a data deluge is likely
  - the era of big data
- Remote sensing products increasing relevant
  - Shift in emphasis from vector to raster
    - a return to the origins of GIS
  - fine time/space/band resolution produces monster files
  - but with immense potential information content
    - Land use change, tree inventories by species, housing counts

Dealing with the data deluge

- The deluge can only be dealt with by automation
  - Again, the arrival of analysis
- Computers act rather than just process
  - *Old model*: human enters data, computer processes and outputs it, human receives and reacts
  - *New model*: data from sensors & transducers, computer processes and acts to get job done

- Humans design the decision making system
  - No longer make the decisions on an on-going basis
    - the driverless car is the model

The withering of GIS:

GIS becomes mainstream:

1. Increasingly indistinguishable from mainstream IT
2. Embedded in everyday objects
3. Practiced by the general public

Increasingly indistinguishable from mainstream IT

- GIS functionality purchased as undifferentiated component of a *business application system*
  - Nobody wants GIS; they want a solution!
  - outage management for utilities
  - city business package
  - package tracking system (pizza or spare parts)
- GIS simply another module in standard software application development environments and DBMSs
  - VB, C++, Java, Peoplesoft, oracle spatial, etc

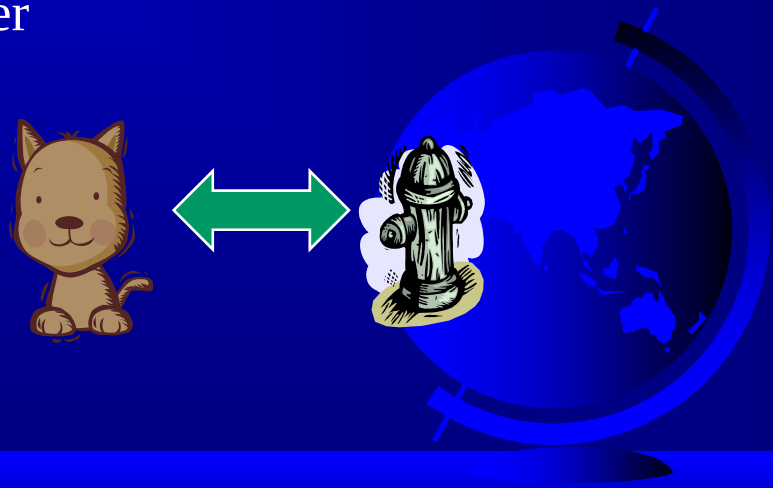
The withering of GIS:

The IT world takes over GIS….
or could GIS take over the IT world?

Could Geography becomes **the** foundation of data management?

- Could geographic location become the predominant relation or key field?
- Certainly more universal than SS number

How else do you relate a dog to a fire hydrant?



gis embedded in everyday objects

- Gis/gps embedded in everyday objects
  - cell phones
  - Car navigation systems
  - truck cabs,
  - aircraft cockpits

Practiced by the general public: --the general public becomes GIS analysts

- Volunteered geographic data
  - A faster way to identify new roads?
- location based apps
  - Yelp and a dozen (thousand?) others
- Bloggers as GIS analysts: they know the local scene
  - And Google is bringing free, simplified mapping tools
- Web-based community-driven systems
  - neighborhood crime control : police or citizen?
  - code enforcement: city or citizen?
  - service standards verification (cabs, cafes, hotels): city or user?

Conclusion

Does GIS have a future as GIS?
Perhaps not!
Name goes but value explodes

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and an apology

- Sorry if you hoped for answers
- But I hope I've given you some things to think about

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