HISTORICAL DEVELOPMENT OF GIS
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Development of GIS influenced by:

• key research groups (academic, gov’t), corporations, individuals
• timely development of key concepts
Battle of Yorktown (1776)

American Revolutionary War
Cholera outbreak (London, 1854)
HISTORICAL DEVELOPMENT OF GIS

Motivations:

- *Academic* - driven by pure and applied research potential
- *Government* - driven by potential enhancements to management (e.g., land mgt.)
- *Corporate* - driven by commercial potential of GIS
HISTORICAL DEVELOPMENT OF GIS
Canada Geographic Information System (CGIS)

[Influence - Government (Cdn Federal)]

- development began in 1963; completed 1971
- recognized as the first true GIS to be developed and fully implemented in the world
- established Canada as a world leader in GIS development
Canada Geographic Information System (CGIS)

PURPOSE:

- “to analyse the data collected by the Canada Land Inventory (CLI) and to produce statistics to be used in developing land management plans for large areas of rural Canada”
Canada Land Inventory (Agr. Classes 1-4)
Canada Geographic Information System (CGIS)

TECHNOLOGICAL INNOVATIONS:

• no previous experience existed in how to structure locational and attribute data internally (beginnings of “topology”, “relational” data bases)
• no precedent for GIS operations of overlay analysis, area measurement, etc.
• an experimental drum scanner had to be built for map input
FILM

“Data for Decision” (1968)

1960s
“Harvard Lab” established in 1964, with the intent of “developing general-purpose mapping software”

many pioneers of the leading GIS corporations of the 1970s and 1980s were trained there
The Harvard Mapping Packages: “SYMAP”

- “Synagraphic Mapping System”….. “acting together graphically”
- first real demonstration of the ability of computers to make maps
- output quality/resolution poor (line printer)
- sparked enormous interest in a previously unknown technology
The Harvard Mapping Packages: “SYMAP”
The Harvard Mapping Packages: “CALFORM”

- same as SYMAP, but on a plotter
- superior appearance, better legends, ability to append standard cartographic features (e.g., N arrow)
The Harvard Mapping Packages: “SYMVU”

- Provided “3-D visualizations” of SYMAP output
The Harvard Mapping Packages: “SYMVU”
The Harvard Mapping Packages: “GRID”

- raster (“grid”) cells could be displayed using the same output techniques as SYMAP
- allowed multiple input layers (i.e., beginnings of raster GIS)
- used to automate the ideas of overlay analysis emerging from landscape architecture (i.e., “sieve mapping” from Ian McHarg)
The Harvard Mapping Packages: "GRID"
Ian McHarg’s “Design With Nature” (1969)
[Influence - Academic (Univ. of Pennsylvania)]

…..the early beginnings of map overlay analysis for land planning purposes (“sieve mapping”)…..
Slope

Surface Drainage

>10%  surface water bodies
2.5 - 10%  natural drainage channels
<2.5%  no water drainage features
Internal Soil Drainage

Geology

poorly drained
imperfectly drained
well drained

marshlands
sedimentary rock and drift
igneous rock (shallow drift)
Soil Texture

- silts and clays
- sandy loams
- silt loams

Erosion Susceptibility

- sandy loams and >10% slope
- silt loams and 2.5-10% slope
- fine texture and <2.5% slope
Sieve Mapping Composite:

“Physiographic Obstructions to Urban Development”
Environmental Systems Research Institute (ESRI)

- formed in 1969 in California
- early products largely based on techniques and ideas being developed at the Harvard Lab
- creator of ARC/INFO and ArcView, the foremost vector-based GIS software packages used in industry today
M&S Computing Inc.
[Influence - Corporate]

- formed in 1969
- changed name to Interactive Graphics (INTERGRAPH) in 1980
- today, ESRI and INTERGRAPH are at the forefront of GIS development globally
HISTORICAL DEVELOPMENT OF GIS
Harvard Laboratory for Computer Graphics and Spatial Analysis

[Influence - Academic (Harvard Univ.)]

1970s

• “ODYSSEY” map package created in mid-1970s
• first, robust, efficient algorithm for vector overlay (including polygon “sliver removal”)
HISTORICAL DEVELOPMENT OF GIS
• Dana Tomlin developed the “Map Analysis Package” (MAP) in 1980
• MAP was a powerful raster-based GIS that was eventually installed in thousands of locations globally (educational version called OSU-MAP)
Environmental Systems Research Institute (ESRI)

[Influence - Corporate]

- ARC/INFO launched in 1981
- successful linkage of standard “relational” DBMS (INFO) to handle attribute tables, with specialized software to handle spatial entities stored as arcs (ARC)
- ARC/INFO was the first GIS software to take advantage of new PC hardware
Environmental Systems Research Institute (ESRI)

1980s

Forestry Applications
P.A. Burrough’s Book “Principles of GIS For Land Resources Assessment” (1986)

[Influence - Academic (Univ. of Utrecht)]

…..the seminal work on the use of GIS for land resource planning purposes…..
GIS has diversified widely to fulfil many niche markets:

- large, powerful, broadly applicable, expensive systems for workstation networks
- small, compact, application-specific, inexpensive, PC-based packages
Today

Boundaries among GIS, CAD (computer-assisted design) and DIA (digital image analysis) systems have become blurred

- PCI (EASI-PACE/Agroma GIS)
- IDRISI
- etc.
Five main areas on the “GIS landscape”:

• governments widely apply, adapt and develop GIS systems and databases
• academia influences the science and application of GIS
• both large and small corporations….
  ➤ continue to advance GIS technology
  ➤ fill GIS application consultancy niches
• individual users on PCs are applying desktop GIS to problem-solving
SUMMARY

The development of GIS is a result of several contributing factors:

• potential for application of the technology itself
• demand for computer-based GIS functionality in spatial analysis
• availability of large datasets
• parallel development of IT (“Information Technology”)
Today

SUMMARY

Distinctions among the 3 main entities driving change also becoming blurred:

- **Academic** - driven by pure and applied research potential
- **Government** - driven by potential enhancements to management (e.g., land mgt.)
- **Corporate** - driven by commercial potential of GIS
P.A. Burrough and R.A. McDonnell  
(Univ. of Utrecht)

…..remains the seminal work on the use of GIS for land resource planning purposes…..