Some little known history about the origins of GIS

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Some background history about GIS

- The GIS birth spark was ignited on October 4, 1957
- Does anyone know what happened that date?
- The need for NASA started on that date (1958); Also, NSF's budget tripled from $40M to $136M.
- Another important date was September 27, 1962
- It led to the ban of DDT; anyone know why?
- The next two important dates were January 1, 1970 and July 23, 1972.
- Anyone know the importance of these dates?

The "Environmental Crisis" led to the development of GIS.

- When Sputnik went up in 1957, Congress was forced to create NASA and NSF was in a catch up race with the Soviet Union.
- When Congress created NASA in 1958, it was born as an "unclassified" agency; no military strings attached.
- When Rachel Carson published "*Silent Spring*" in 1962, it touched off the "Environmental Crisis." The impact was worldwide.
- President Nixon signed the National Environmental Policy Act of 1969 on January 1, 1970.
- On July 23, 1972, NASA launched ERTS the "Earth Resources Technology Satellite" (ERTS – now called Landsat).

Hypothesis

The GIS came about because of the coalescing of two emerging technologies and one important environmental issue that captivated geographers and non-geographers alike in the 1960s and early 1970s. The two technologies were remote sensing and high speed computing. Specifically, it was the ability to capture electromagnetic data in a digital form for processing and the fact that large computers finally could handle (and house) more and more data internally in their core processors. The emerging environmental issue was the demand by the American public that something be done about uncontrolled environmental degradation.

NEPA addressed the environmental crisis; unfortunately tools didn't exist. GIS became the key essential tool to address environmental issues

- Congress directed NSF to create IRPOS; that then morphed into RANN.
- Numerous applied research centers created including, U of Illinois, U of MI (ERIM), U of WA, and ORNL, all were developing environmental modeling systems funded by NSF involving GIS tools.
- Meanwhile other centers developed their own capabilities related to GIS; Harvard laboratory for Computer Graphics, Roger Tomlinson developed the Canada Land Inventory (1963); James R. Anderson, Chief geographer of USGS, began the Land use/land cover data mapping system (1972 - refined by CARETS) and Fredrick Roland Broome at Census Bureau developed the TIGER/DIME system.
- In 1969, ORNL began developing one of the largest regional modeling experiment ever attempted (RESA was driven by ORRMIS)

Am independent evaluation in 1972 stated that :

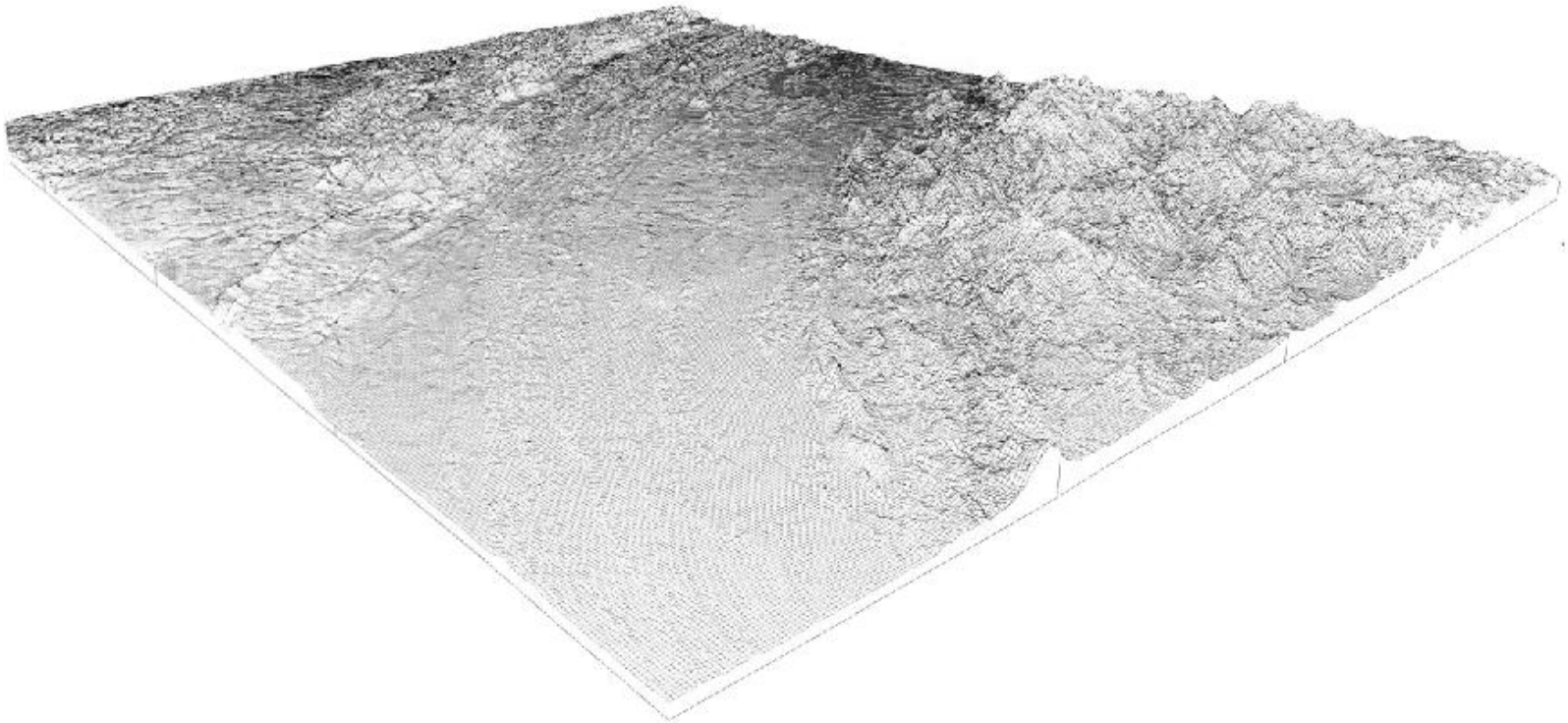
"ORRMIS may be one of the most sophisticated geographic systems yet developed in terms of data entry and computer storage. The initial system design called for three phases of development: the first phase, development of the basic input storage and retrieval capabilities, has been accomplished, and the second phase, the development and use of generalized record structures to support complex hierarchical data structures, is underway. The third phase will be the development of a user oriented search language so that users can more easily analyze and retrieve information."

But, without remote sensing, GIS would have been difficult to develop.

In truth, there were multiple origins of the concept of a GIS

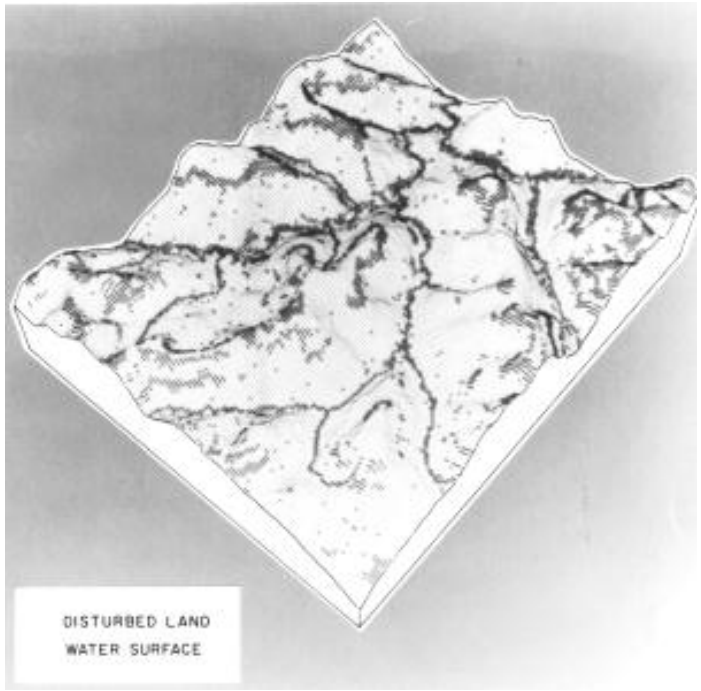
- At first, it wasn't even called GIS - (Regional modeling information system or Land use information system or Computer generated maps or Computer graphics or even Computer mapping)
- Roger Tomlinson (1962) takes credit for first using the term "GIS" but others probably uttered the same phrase around the same time.
- Even KU can claim some originality in creating GIS with SURFACE II, an automated contouring program developed by KGS; Also, KU Geography's Bob Nunley developed an "electro-potential" digitizer for population mapping in 1968-69.
- And, KU has been a leading center of excellence in remote sensing since the mid 1960s.

However, ORNL pioneered in new areas of GIS research that were never acknowledged.



ORNL pioneered new technologies to encode data for analysis and combining data bases

Real-time digitizing of polygons



Landsat data over TOPOCOM data

The Oak Ridge Regional Modeling Information System (ORRMIS) was developed to drive RESA (Regional Environmental Systems Analysis)

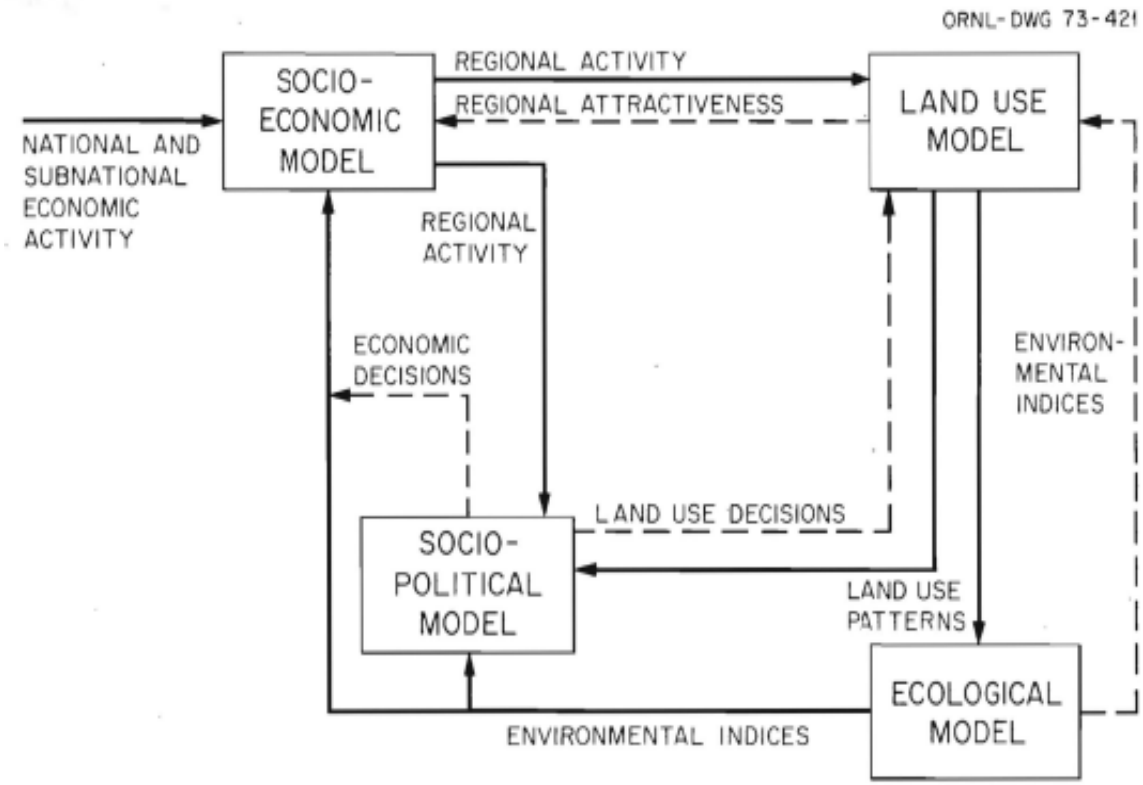


Fig. 1. Regional Environmental Systems Model

Data for each ¼ acre cell was difficult to come by before Landsat

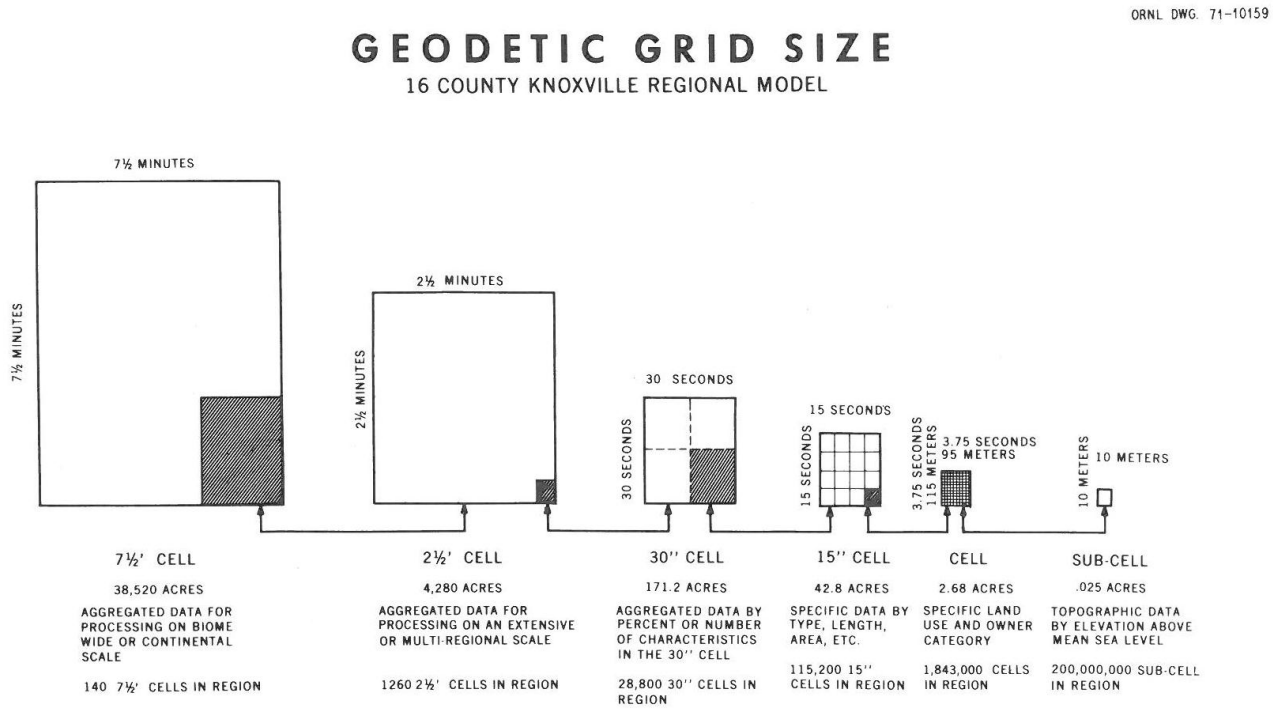


Fig. 4. Hierarchical data structure showing aggregated cell levels used in 16-county Knoxville regional model.

Before Landsat, ORNL developed a system to digitize land use data using digital scanners

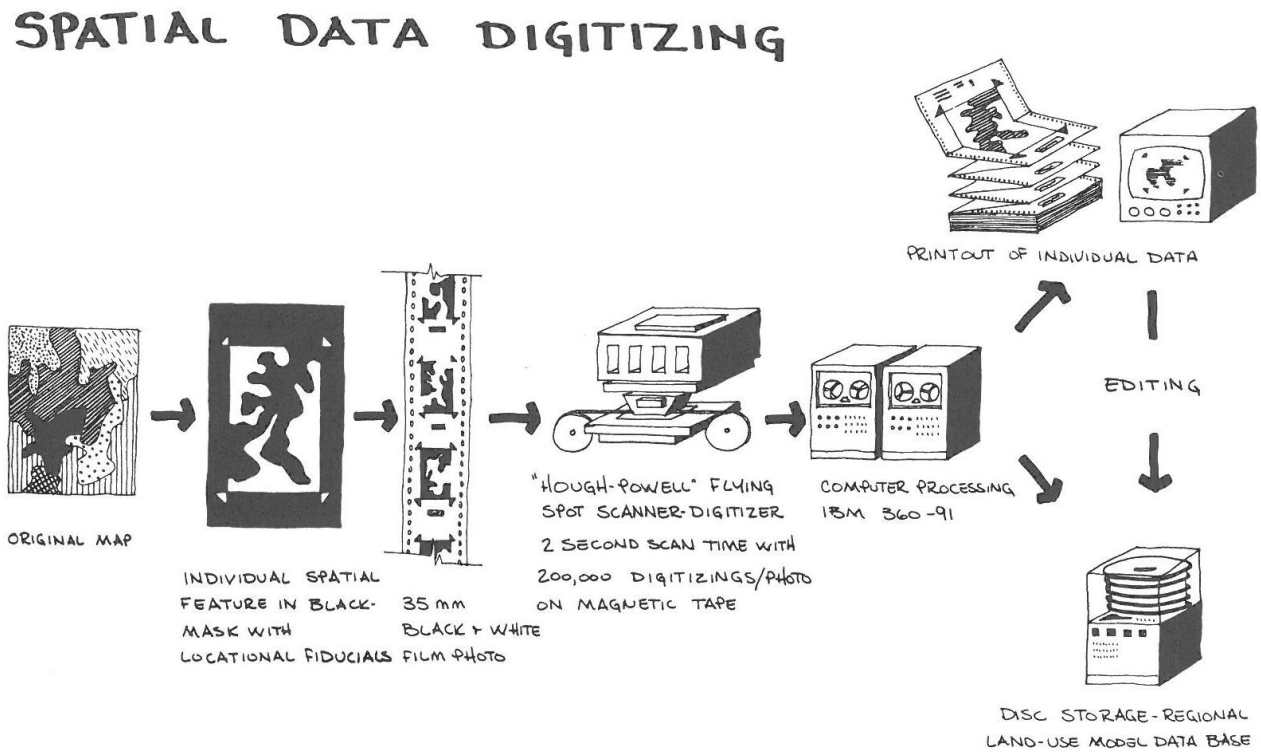


Fig. 9. The ORRMIS Geographical Digitization Process.

Initial method for beginning to enter spatial data into computer

The geographic distribution of each modeling variable was hand colored on Mylar overlays and photocopied on to 35 mm film.

The film was then sent to Pennsylvania to be digitized using a high resolution scanner.

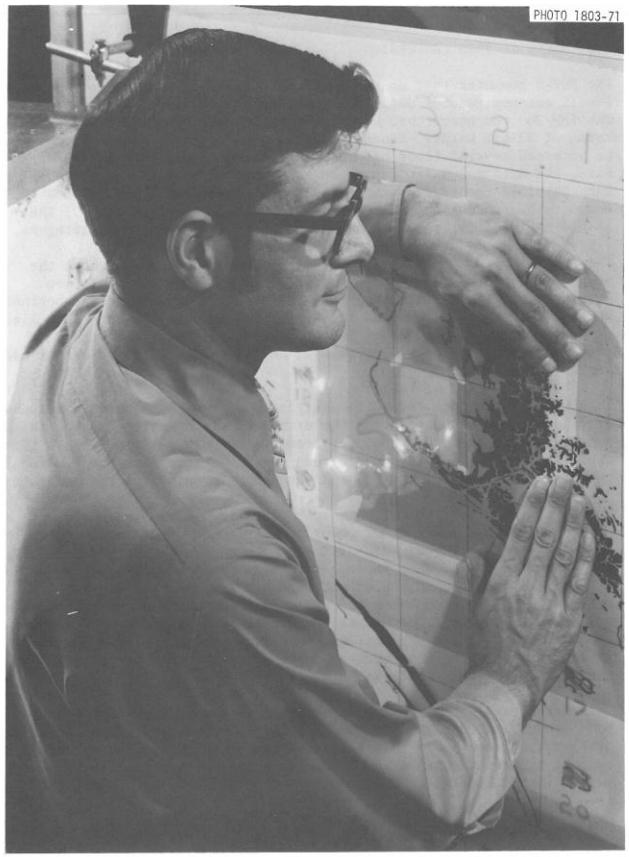


Fig. 17. Positioning of copy for photography.

Data for each portion of a single variable map was photographed with a precision camera

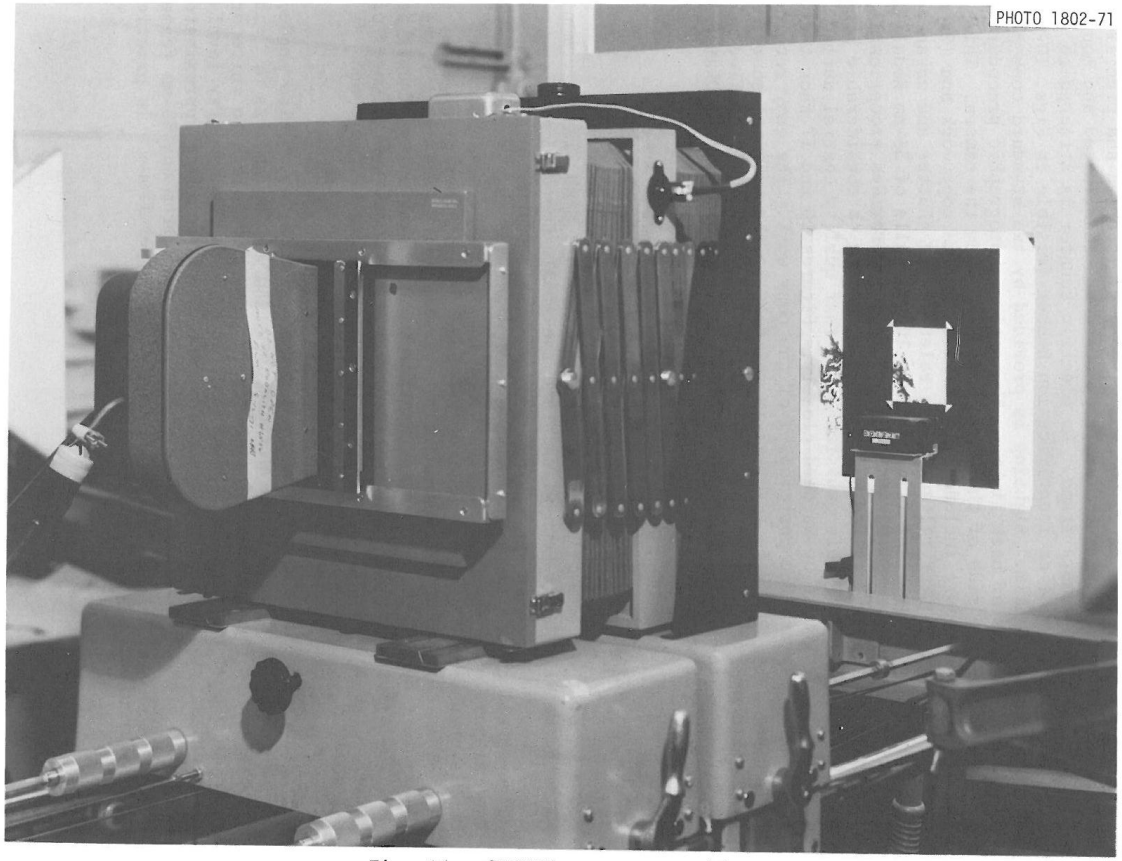


Fig. 16. ORRMIS camera assembly.

This was done to create multiple digital overlays similar to Ian McHarg's Mylar hand drawn overlay developed for landscape planning

In fact the leader of the land us modeling group was Chuck Meyers who was one of McHarg's students

Names and places that played a key role in the evolution of GIS

- Howard Fisher – architect
  - Developed SYMAP
    - Harvard Laboratory for Computer Graphics and Spatial Analysis
      - Carl Steinitz - GRID
        - Roland Broome - TIGER
          - Ian McHarg - overlay
            - Charles R. Meyers
              - Al Voelker
                - Hugh Keegan – VP ESRI
                - Richard C. Durfee

Richard C. Durfee is probably the most under-appreciated developer of GIS in the country.

- I would recommend that you have Richard come to talk about his 35 years of pioneering research in developing GIS technologies
- You will be amazed at the GIS techniques and processes that were first developed by Richard and his staff over the last 45 years.