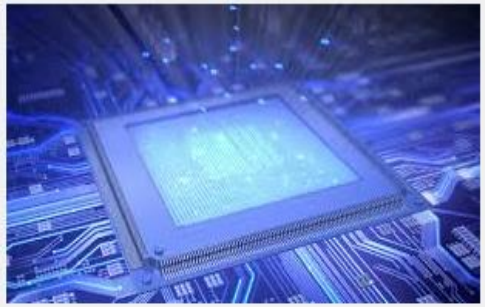
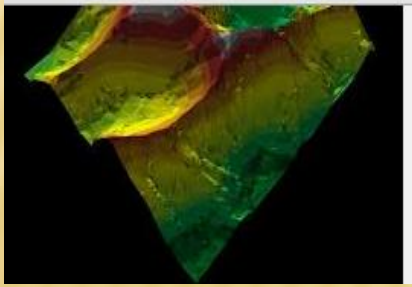
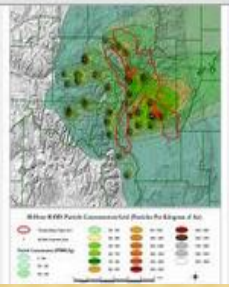
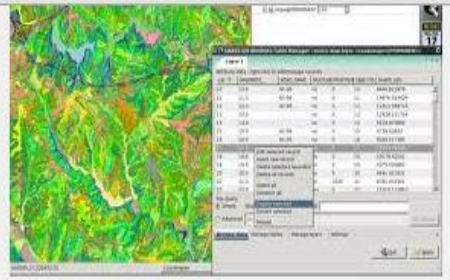
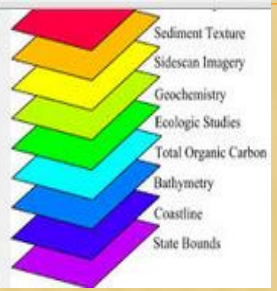
PERANAN TEKNOLOGI INFORMASI DALAM GEOGRAPHICAL INFORMATION SYSTEM (GIS)

EDWAR ALI, S.Kom, M.Kom
Dosen dan Peneliti





UMUM:

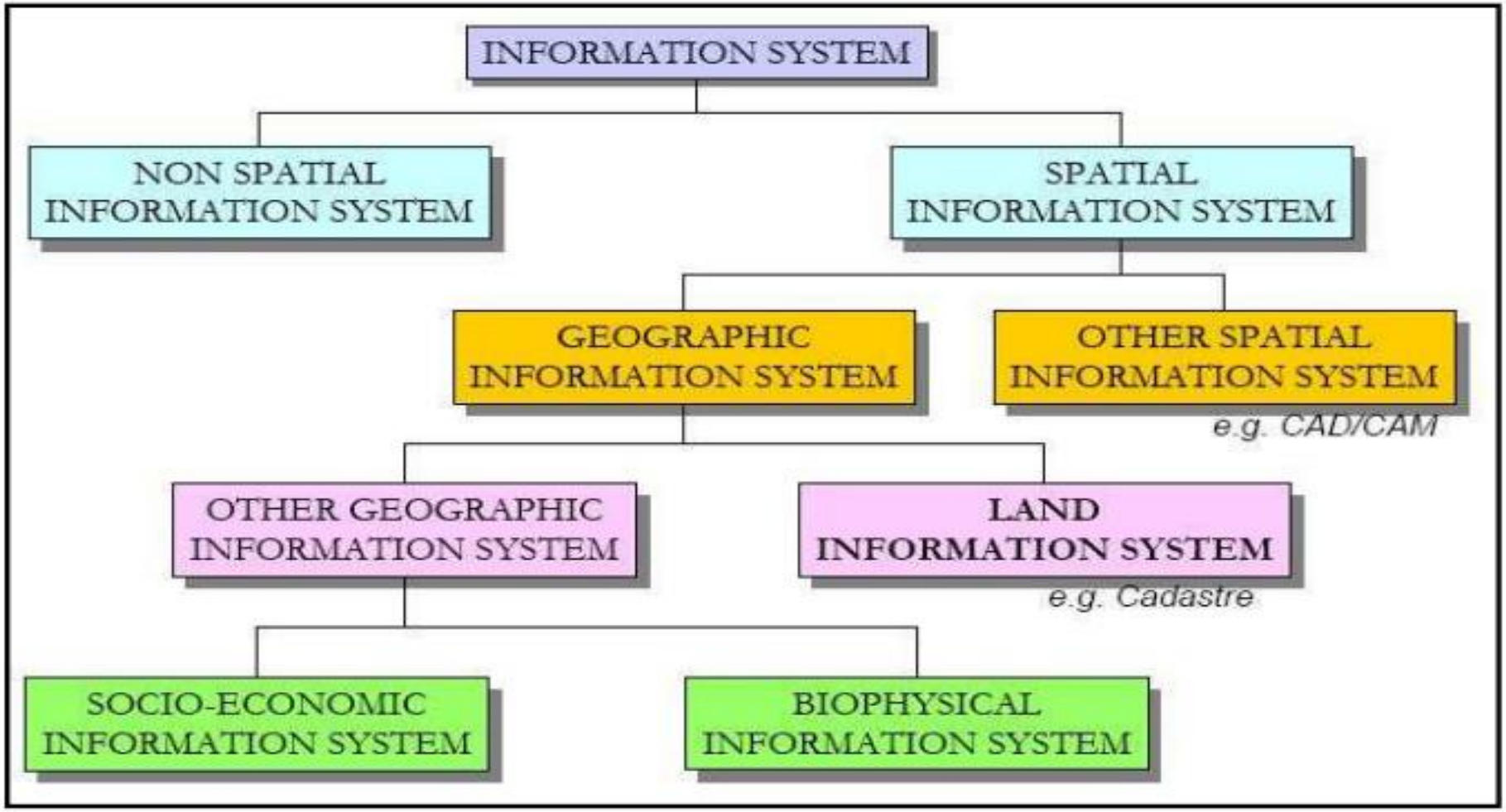


- Ruang publik merupakan salah satu sarana yang selalu digunakan oleh masyarakat umum dalam beraktifitas.
- Diperlukan ketersediaan akses yang tak terbatas terhadap informasi oleh masyarakat secara detil dan lengkap. Kriteria Informasi Berkualitas ?
- **Metode pengkomunikasian** informasi yang tepat merupakan salah satu strategi guna menyediakan informasi yang mempunyai banyak atribut data

INFORMASI YANG BERKUALITAS ?

- Memberikan manfaat/relevant
- Tidak Usang/Aktual/Up to date
- Bebas dari kesalahan/Akurat
- Dapat dipercaya/reliable
- Lengkap

SISTEM INFORMASI TERDIRI ATAS NON SPASIAL DAN SPASIAL. SALAH SATU TERAPAN SISTEM INFORMASI SPASIAL ADALAH SISTEM INFORMASI GEOGRAFIS (GIS)



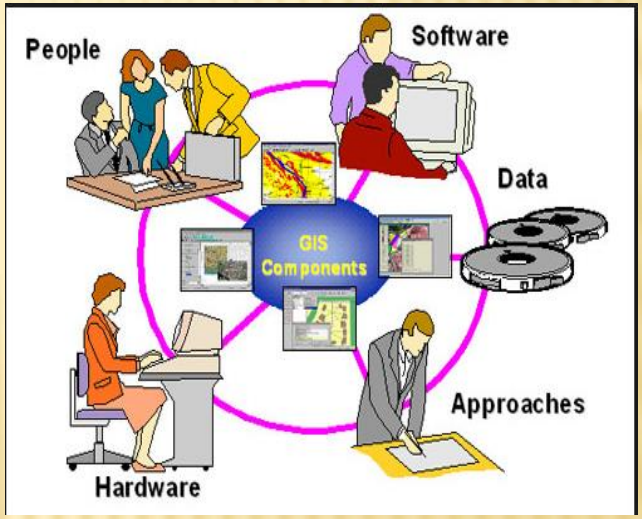
Kedudukan SIG dalam Sistem Informasi

METODE PENGKOMUNIKASIAN

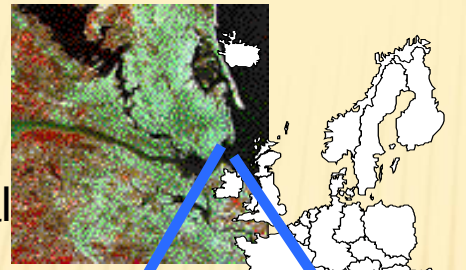
- Salah satu bentuk pengkomunikasian itu adalah dalam bentuk visualisasi/pencitraan.
- Visualisasi informasi merepresentasikan data yang telah diolah menggunakan berbagai macam perangkat pengolahan citra (hardware, software dan brainware) .
- Selanjutnya disajikan dalam bentuk visual berupa teks, gambar, warna, bangun, diagram, dan kombinasinya.
- Salah satu bentuk kombinasi ini adalah visualisasi georeferensi dalam bentuk peta

- Dalam dunia IT, bentuk visualisasi georeferensi dapat diperoleh dengan adanya Geographic Information System (GIS) atau Sistem Informasi Geografis (SIG).
- GIS merupakan sistem komputer dengan kemampuan mengolah, menganalisis, memanipulasi dan menyajikan data spasial yang bergeoreferensi beserta atribut-atributnya.
- Data spasial adalah data yang merujuk terhadap lokasi yang mempunyai koordinat-koordinat geografis sedangkan atribut adalah detail informasi dari setiap lokasi yang tersedia.
- Contoh jumlah penduduk suatu provinsi, ruang terbuka hijau pada suatu kota, dan lain-lain. Dengan kata lain, SIG mampu memberikan informasi yang aktual dan bersifat dinamis terhadap suatu lokasi.

KOMPONEN GIS



Data
Spasial



G I S

?

Computer hardware /
software tools

Aplikasi-aplikasi khusus/
Untuk berbagai keperluan

4 KOMPONEN UTAMA SIG

- Ada empat komponen utama yang dibutuhkan untuk mengembangkan Sistem Informasi Geografis, antara lain:
  - Perangkat keras (Hardware)
  - Perangkat lunak (Software)
  - Data dan informasi geografi
  - Manajemen (manusia)

KOMPONEN PERANGKAT KERAS (1)

- Perangkat keras untuk SIG meliputi perangkat keras yang bekerja sebagai: pemasukan data, pemrosesan data, penyajian hasil, dan penyimpanan (storage)
- Perangkat keras yang sering digunakan antara lain adalah Digitizer, scanner, Central Procesing Unit (CPU), hard-disk, mouse, printer, plotter.

KOMPONEN PERANGKAT KERAS (2)

KOMPONEN PERANGKAT LUNAK (1)

- Software SIG harus memiliki spesifikasi sebagai:
  - merupakan Database Management System (DBMS), fasilitas untuk input dan manipulasi data geografis, fasilitas untuk query, analisis, dan visualisasi.
  - Graphical User Interface (GUI) yang baik untuk mempermudah akses fasilitas yang ada. (Misal : Arc view, Idrisi, ARC/INFO, ILWIS, MapInfo, dan lain-lain)

KOMPONEN PERANGKAT LUNAK (2)

- Dari Universitas :
  - SYMAP, Harvard
  - CALFORM, Harvard
  - SYMVU, Harvard
  - Grid, Harvard
  - Polyvrt, Harvard
  - Odyssey,Harvard
  - ILWIS, ITC, Belanda
  - IDRISI, Univ. Clark USA

KOMPONEN PERANGKAT LUNAK (3)

- Dari Perusahaan :
  - MapX, MapInfo Corp. (www.mapinfo.com)
  - MapXtreme, MapInfo Corp.
  - MapInfo, MapInfo Corp.
  - Map Basic, MapInfo Corp.
  - ER Mapper
  - ERDAS Imagine
  - Spans GIS
  - MGE, Integraph
  - ArcInfo, ESRI (www.esri.com)
  - ArcView (Whats_new_in_ArcView8 basics.ppt), ESRI
  - ArcGIS, ESRI
  - MapObjects, ESRI
  - dll.

KOMPONEN DATA (1)

- Data SIG atau disebut data geospatial dibedakan menjadi data grafis (geometris) dan data attribute (tabel data).
- Data terdiri dari 2 jenis yaitu data vektor dan data raster yang mewakili geometri topologi, ukuran, bentuk, posisi, dan arah
- Data vektor mempunyai tiga elemen:
  - titik (node/point),
  - garis (arc/polyline),
  - luasan/area(polygon)
- Data raster berbentuk pixel

KOMPONEN DATA (2)

- 7 (tujuh) fenomena geografis yang dapat diwakili dalam bentuk titik, garis, dan polygon/area, yaitu:
  - Data kenampakan
  - Unit area
  - Jaringan topologi
  - Catatan sampel
  - Data permukaan bumi
  - Label/teks pada data
  - Simbol data

KOMPONEN MANUSIA (1)

- Teknologi GIS tidaklah bermanfaat tanpa manusia yang mengelola sistem dan membangun perencanaan yang dapat diaplikasikan sesuai kondisi nyata.
- Suatu proyek SIG akan berhasil jika di kelola dengan baik dan dikerjakan oleh orang-orang yang memiliki keakhlian yang tepat pada semua tingkatan.

KOMPONEN MANUSIA (2)

	High Application Skill	Low Application Skill
High GIS Skill	**GIS Analysts : 'Applications Specialists'** E.q. system manager, analyst, cartographer	**Computer Technicians : 'Computer Specialists'** E.q. programmers, data processor, database administrator, digitizing technicians
Low GIS Skill	**Managers :** **'Occasional Professionals'** E.q. end-users, decision makers	**Customers :** **' The Public '** E.q. Customers

Adopted from Brown(1989), Grimshaw(1994), Eason(1994)

KOMPONEN MANUSIA (3)

GIS Analysts : Applications Specialists

- System Manager : maintain GIS every time. Have a good understanding of the applications' context and GIS.
- Analyst : able to translate the managers' requirements into real GIS analysis. Have a good understanding of the applications' context and GIS.
- Cartographer : help to produce spatial information into GIS
- They all also have a role in designing and maintaining the GIS, including the development of new application for the system.

KOMPONEN MANUSIA (4)

Managers :Occasional Professionals

- End Users Decision Makers : required strategic information from the GIS to make decision, but are unlikely ever to use the system in a ‘hands-on’ way.
- They are more interested in hard-copy output, such as maps.
- They have a good knowledge of the context of the application, but little GIS knowledge or experience.
- E.q. : Company directors, managers.

KOMPONEN MANUSIA (5)

Computer Technicians : Computer Specialists

- Have other responsibility in addition to the GIS.
- Responsible for the wages and personnel computer system, which has no GIS element.
- Assist data formatting and input, hardware maintenance and system upgrading.
- They are not GIS experts.
- E.q. :
  - Programmer
  - Data Processor
  - D/B Administrator
  - Digitizing Technicians

KOMPONEN MANUSIA (6)

Customers : Public user

- Using GIS to get spatial information by searching, retrieving, etc.
- Customers also receive any products or services as a result of the GIS analysts' manipulations of the customer databases.
- Do not need to know that it is a GIS they are interacting with. Unlikely to have any business, GIS or computer expertise.
- They are end-users of the products and services offered by the company.

KARAKTERISTIK DATA SPASIAL

- Lokasi:
  - **Description:** Kingston University,PenrhynRoad Centre
  - **Post Code:** KT1 2EE
  - **Grid Reference:** 518106.72 168530.37
  - **Latitude/Longitude:** 0° 21’ 55.38”W, 49° 36’ 17.62”N

KARAKTERISTIK DATA SPASIAL

Geometri

- Pola Suatu bangunan atau wilayah
- Jalur sungai, rute jalan
- Pola dari tanah, relief

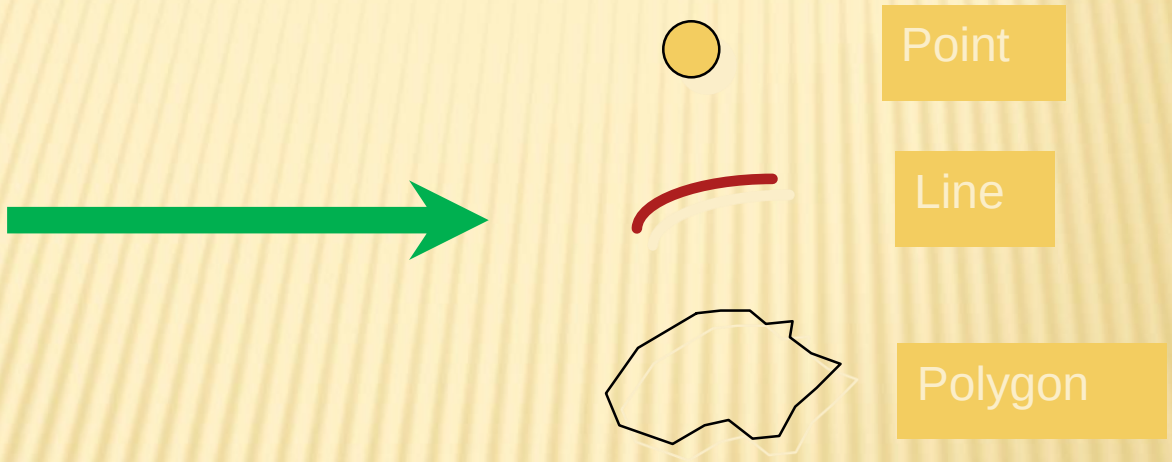
CONTOH DATA SPASIAL

- Data Sosial-ekonomi
  - Data kondisi kesehatan suatu wilayah
  - Konsumen / Profil gaya hidup
  - Geo-Demografi
- Data Lingkungan
  - Data topografi
  - Tanah, bebatuan, mineral

Data Modelling - step 1

- Features
  - Bangunan
  - Jalur jalan
  - Jalur penerangan
  - Pipa Gas, PDAM
  - Permukaan jalan

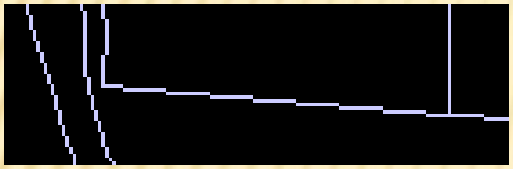
DATA MODELLING - STEP 2



DATA MODELLING - STEP 3

Feature : Building
Object: Polygon
Entity: Tourist Information Bureau

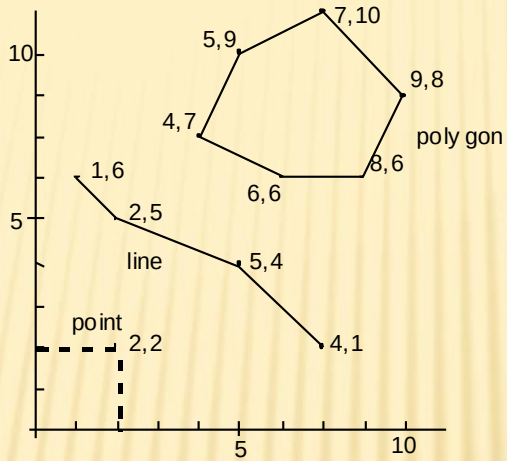
ATRIBUT



Name :	Next
Address:	5 Market Place
Town:	Kingston
Owner:	Ms J Shore
Tel. No:	0181 547 1245
Floor space	1300 sq m

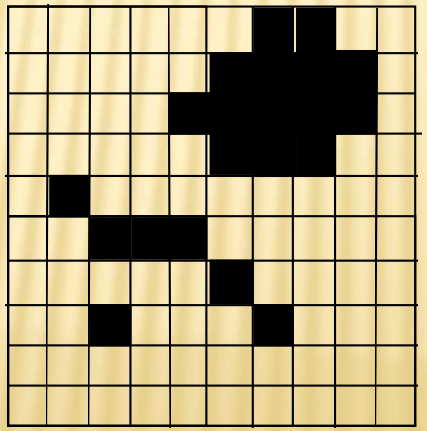
SPATIAL DATA STORAGE

- Vector model



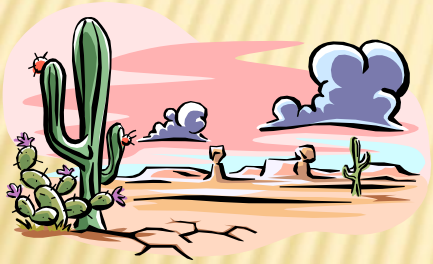
as geometric objects:
points, lines, polygons

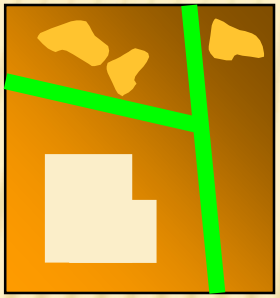
- Raster model

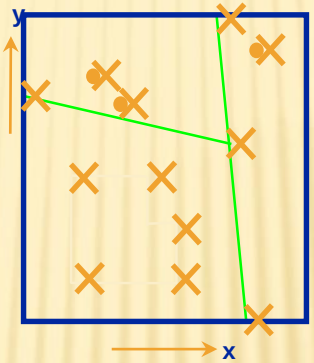


as image files
composed of grid-cells
(pixels)

MODELLING THE REAL WORLD







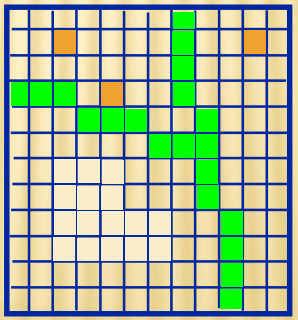
1 1 20 50

1 2 24 45

1 3 52 55

2 1 0 45 46
40

...



0 0 0 0 0 0 0 2 0

0 0 0 0 0 1 0 0 0

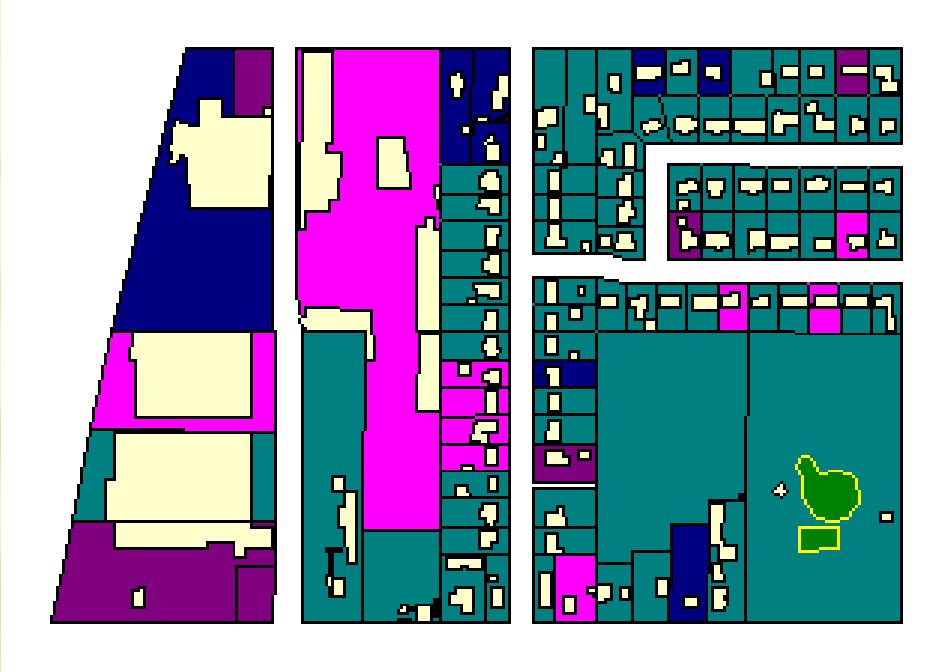
0 2 0 0 1 0 0 0 0

0 0 0 0 2 0 0 0 0

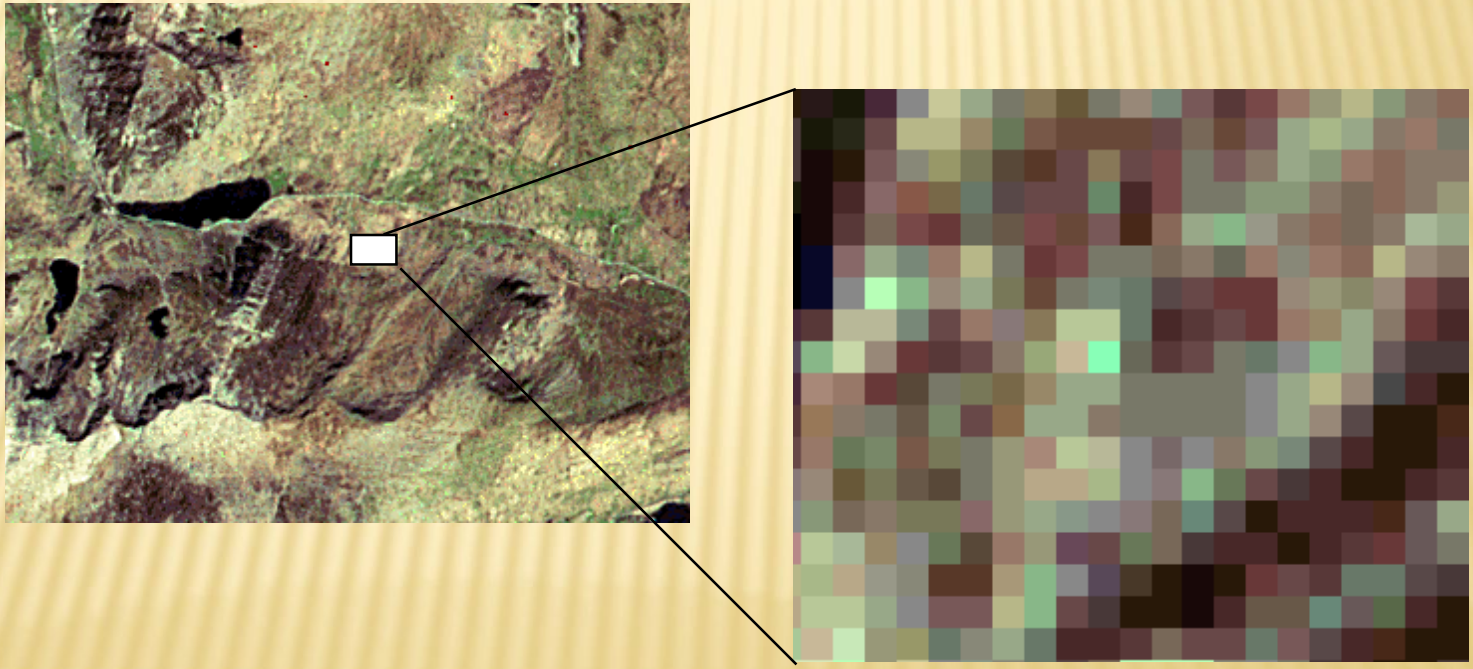
2 2 2 0 1 ...

VECTOR DATA

Land use parcels



RASTER DATA



MANIPULATION AND ANALYSIS

- Apa yang akan terjadi bila. . .

  Terjadi kebocoran kimia berbahaya ke sungai ?
- Dimanakah. . .

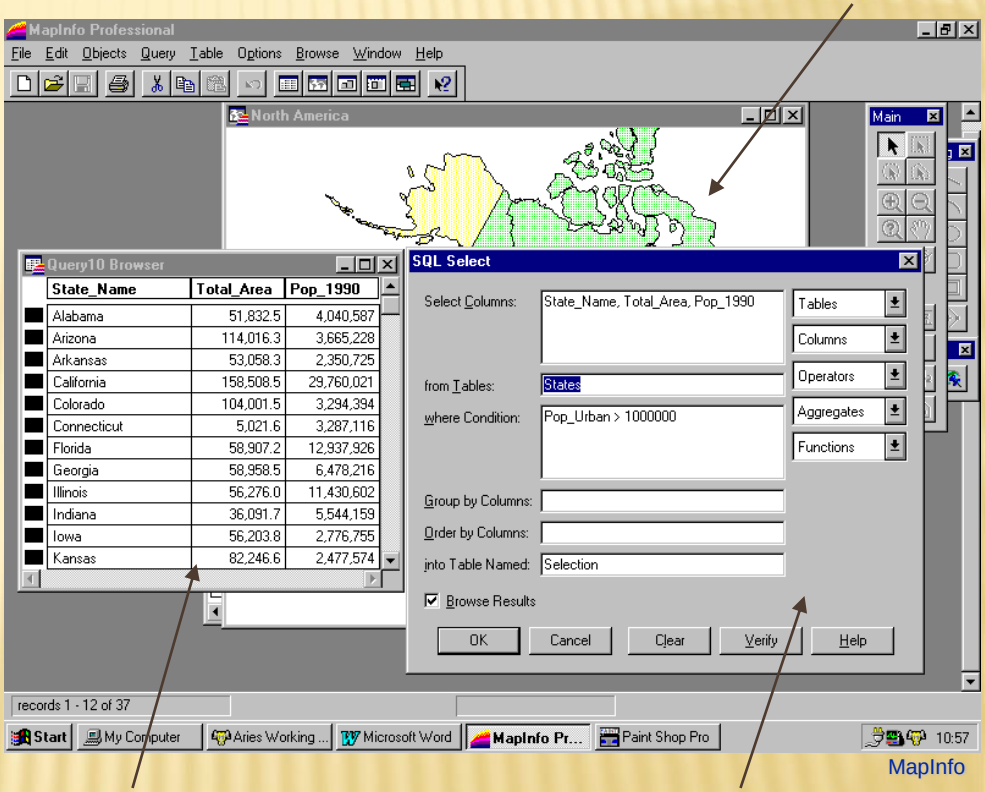
  Letak Kampus UIN Suska di Kota Pekanbaru ?
- Adakah . . .

  Terjadi perubahan populasi dalam 10 tahun terakhir ?
- Apakah data spasial dapat menunjukkan. . .

  Para Pemilik mobil di Pekanbaru ?

Databases & GIS

- At a simple level a GIS may just form the graphical interface to a database
- The majority of GIS applications follow this example



Geo-relational Data Models

- Linked tables based on the relational model, but storing geographical information such as:
  - Geometry
  - Topology
  - Attributes

GIS & Analysis

In the context of GIS, analysis is…

*"**Deriving new information from existing data**"*

It is also the manipulation of data to solve a problem

e.g. *identify all areas within 500m of a lake*

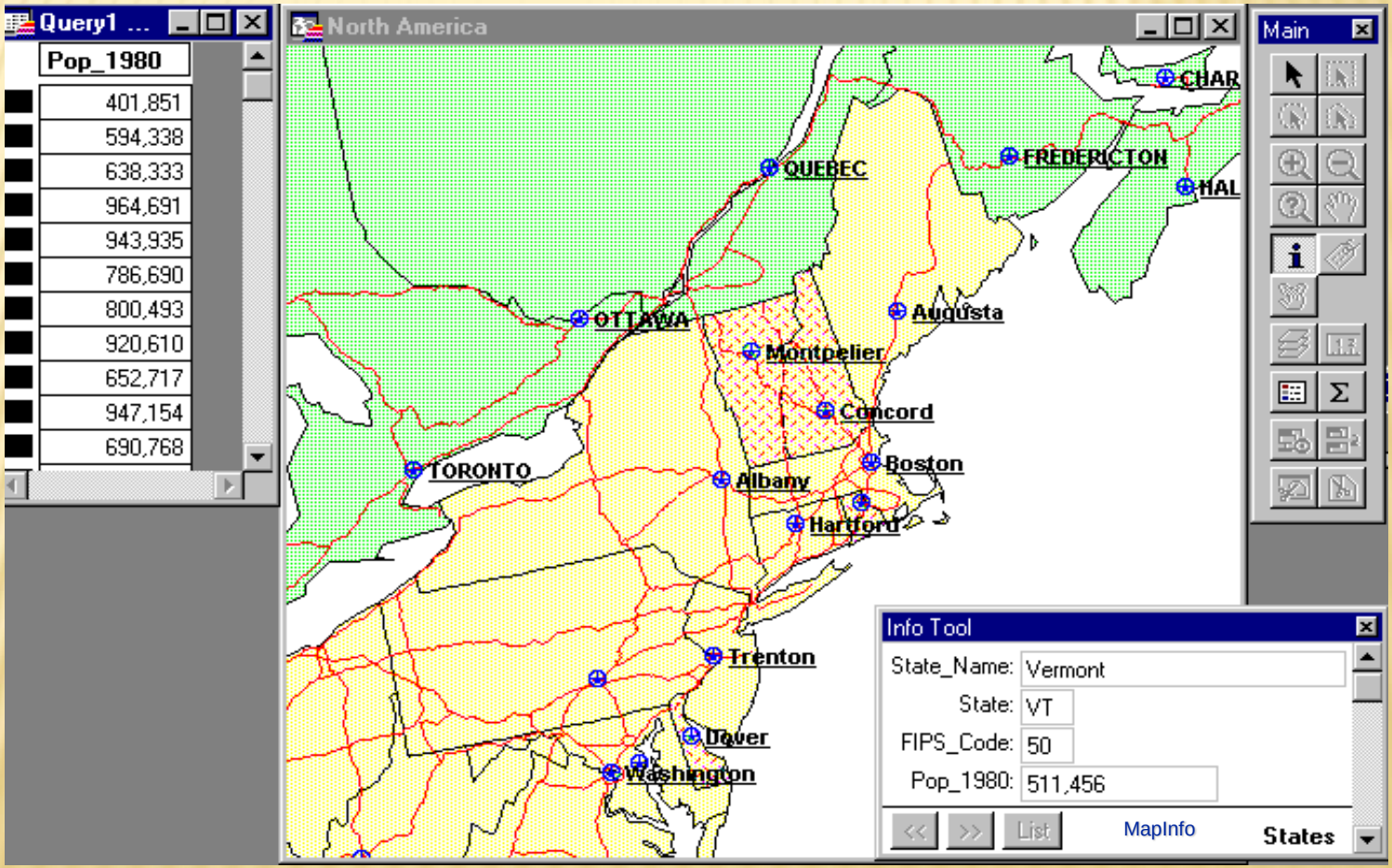
Increasing use is made of the analytical capabilities of GIS, BUT

many GIS projects only use the software to store and manage geographical data

Yet analysis often relies on many simple basic GIS techniques

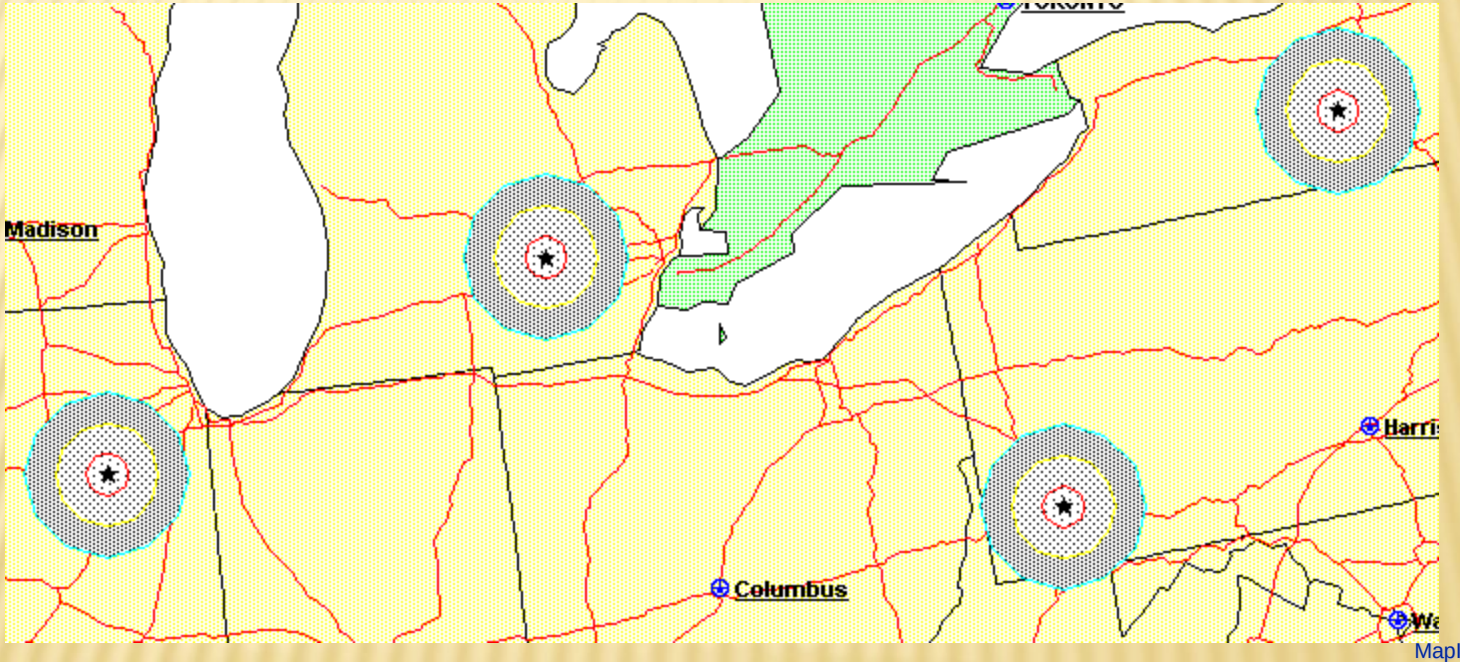
Simple Query

- The identification of objects and their attributes either by location or attribute query.



Buffering

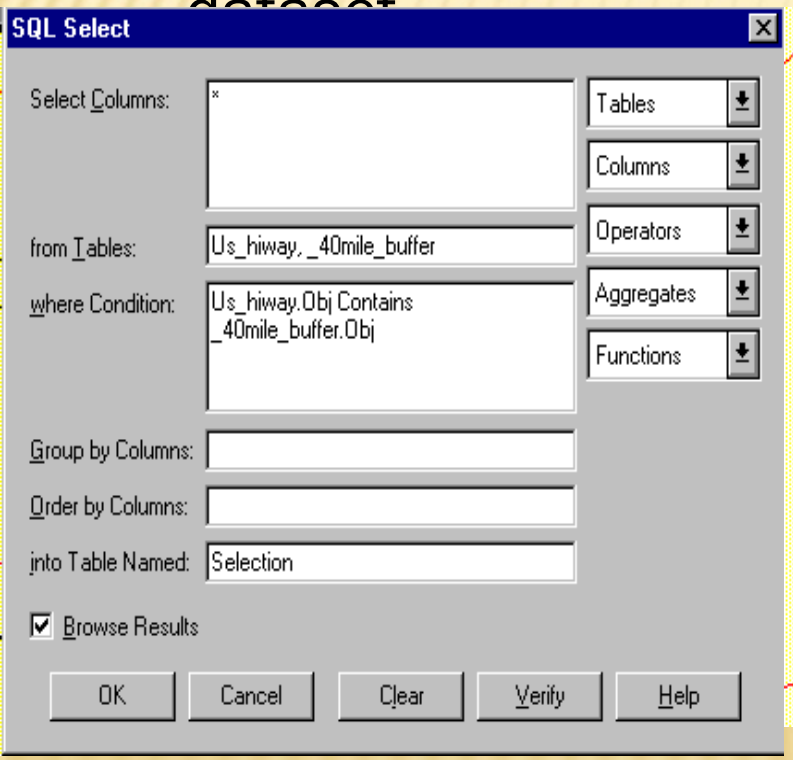
- Creation of an area of interest around an object
  - proximity analysis and environmental impact assessment.

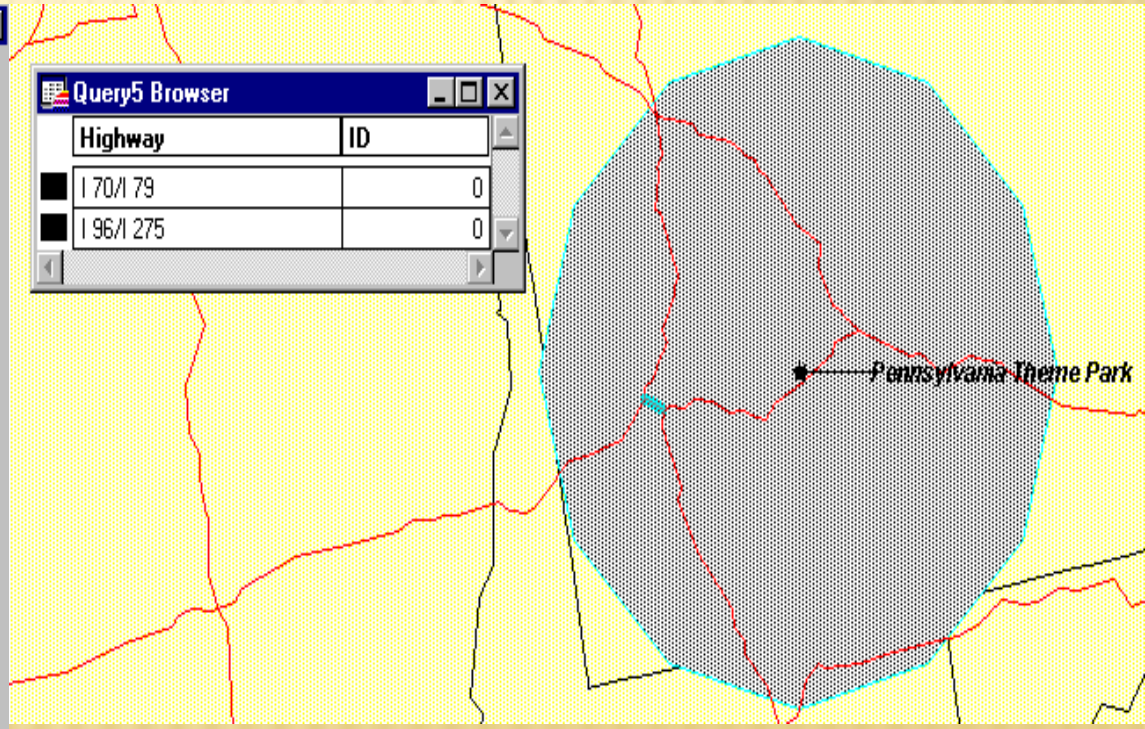


MapInfo

Cookie Cutting

- Overlay of datasets using one dataset as a sieve or cookie cutter to select a subset of the other dataset

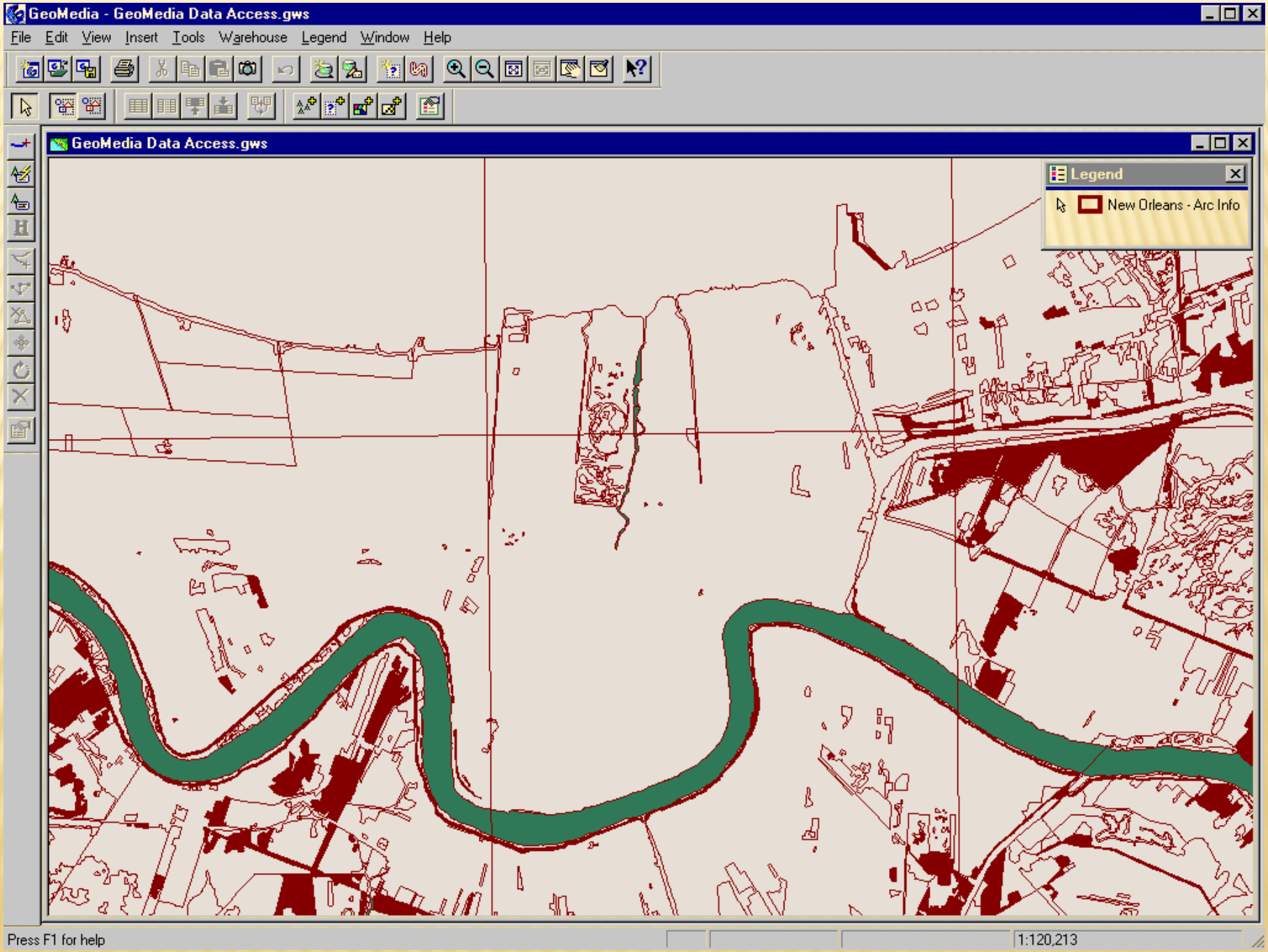




MapInfo

OVERLAYS

- Layer: A thematic plane of GIS features containing geographically and logically related data
- Overlaying involves superimposing two or more map layers to produce a new map layer.
- Example: a new genetically engineered variety of wheat grows well in dry environments, with long growing seasons and alkaline soils. Given the availability of data on the length of the growing season, moisture regime and soil alkalinity, where is the best place to plant the wheat?
  - overlaying (superimposing) several maps showing (separately) water-budget, growing season length, soil pH, sodium content, and so on. The GIS analysis can establish the locations where all the favorable soil conditions coincide, as the places where the wheat will grow best.


GeoMedia - GeoMedia Data Access.gws
File Edit View Insert Tools Warehouse Legend Window Help
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New Orleans - Arc Info
Press F1 for help
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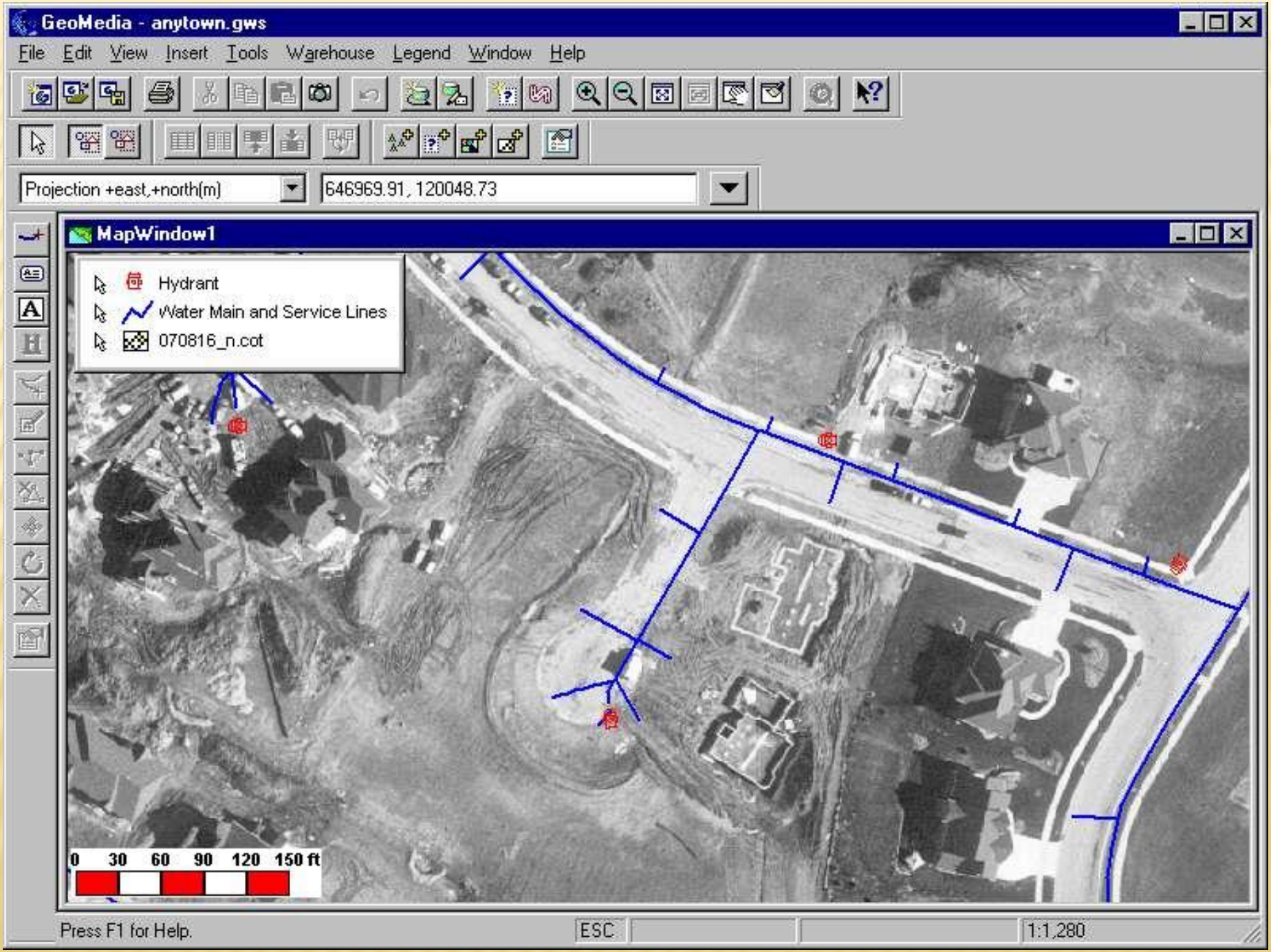
GeoMedia - anytown.gws
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MapWindow1
Hydrant
Water Main and Service Lines
070816_n.cot
0 30 60 90 120 150 ft
Press F1 for Help.
ESC
1:1,280

THE BENEFITS OF GIS INCLUDE:

- Better information management
- Higher quality analysis
- Ability to carry out “what if?” scenarios
- Improve project efficiency

APLIKASI GIS

- Facilities management
- Marketing and retailing
- Environmental
- Transport/vehicle routing
- Health
- Insurance

dan sebagainya. . .

SELESAI

ILMU TIDAK AKAN BERMANFAAT BILA TIDAK DIAMALKAN