CATALIS

Clinton County, Ohio
GIS Program

Clinton County
Automated
Topographic
Aspatial
Land
Information
System

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What is a Geographic Information System?

A Geographic Information System *(GIS)* is a computer-based system for the capture, storage, retrieval, manipulation, analysis and display of geographic information. The number and type of applications and analyses that can be performed by a GIS are as large and diverse as the available geographic data sets that are available. GIS technology can unite diverse fields of expertise such as relational database management, computer systems support, surveying, and cartography to obtain information, which would be difficult if not impossible to obtain with using just one application in just one arena of knowledge.

Making maps is certainly not a new idea; some of the oldest maps are many thousands of years old, drawn by people that tried to makes some kind of sense of the world around them. While a GIS certainly provides the means of printing maps, it is *absolutely not* the sole purpose of such a system. As soon as the ink dries on a printed map, that map is dead. There is no easy way to do any edits or updates to that piece of paper; a new map will have to be printed.

As we approach the dawn of a new millennium, questions such as open space management, overpopulation, global warming and an increased crime rate are some of many issues that may not seem to affect many of us in our day to day lives; however, they do in fact effect each and every one of us. GIS is another tool that we can use in an effort to make our world…our *County*…a better place to live.

What makes up a Geographic Information System?

A working, successful GIS implementation consists of five basic components:

Hardware

The hardware that makes up a GIS program typically consists of a high-end workstation to run the core GIS software that will be used for data editing and creation, as well as a server that holds the GIS data. In some cases, the workstation is both the keeper of the data as well as the tool for data editing and creation.

Over the last few years, personal computers have been getting smaller and more powerful. Just eight or nine years ago, a GIS workstation, including software, would have cost over $30,000.00 and was anything but user friendly. Now, at the dawn of the 21st century, a top of the line computer system and core GIS software will not cost more than 10 to 12 thousand dollars. While this may still seem a little pricey, compared to the returns on the investment that a GIS system should provide over a three to five year period the cost of hardware is indeed minimal.

Software

GIS software provides the functions and tools needed to store, analyze and display geographic information. As previously mentioned in the hardware section of this paper, the *core* GIS software provides the tools necessary to edit and create potentially very large data sets. A good example of a large data set would be the parcel data for the entire county. While Clinton County has approximately 22,000 parcels, cities such as Indianapolis contain 350,000 parcels, Columbus, 427,000, and New York have 600,000 + parcels. Core GIS software products such as ArcInfo from ESRI are able to maintain and create very large data sets.

During the course of a GIS program, obviously not everyone who wants to take advantage of the GIS database will want or need the core software program. Most uses needs will entail being able to look up an address, a parcel number, a military survey area, or a street by street name. After the user has found the feature or area they are looking for, they may want to print out a map of the results. This software is usually referred to as end-user program or application. The difference between a program and an application is that an application is usually something that is very specific to a users needs; a program is usually software that is out-of-the-box ready to go. While it may not be as user friendly as most applications would be, it would answer most of the needs of a user, and may require more extensive training than an application specifically designed to address certain needs.

People

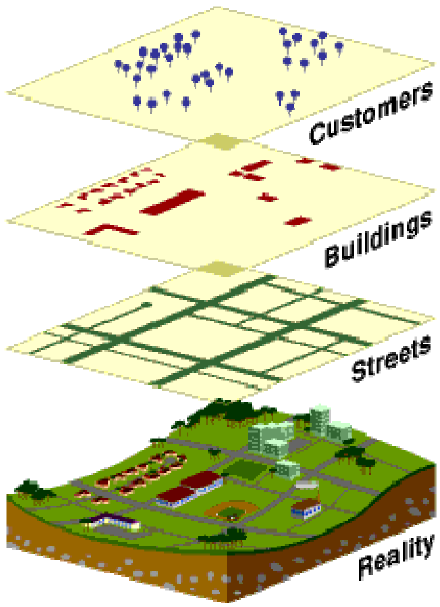
The greatest, most advanced technology in the world is of no value if it cannot be used to benefit the people that it was created for. There is a considerable risk in building a GIS system that is so technology dependent that the people are forgotten; the end users, which could theoretically be any citizen of Clinton County, as well as the folks within the GIS department that perform maintenance on the GIS data itself. It is important to remember that people are at the apex of the GIS pyramid, and not money, data, or technology.

Methods

A successful GIS implementation operates on well defined business rules and follows a plan that has been thoughtfully and carefully laid out and is adhered to throughout the life cycle of the program itself. This includes data, hardware, software, training, applications, communication, advertisement, etc. The Clinton County GIS department is currently working on an overall GIS implementation plan that will be shared among all interested parties upon its completion.

How Does GIS Work?

A Geographic Information System stores information about the world around us by "layering" different data sets over top of each other, with the common link between each of these layers being *geography*. Each point on the Earth has a unique id already; it has an x-y coordinate, or latitude -longitude. This is referred to as a *geographic reference*.

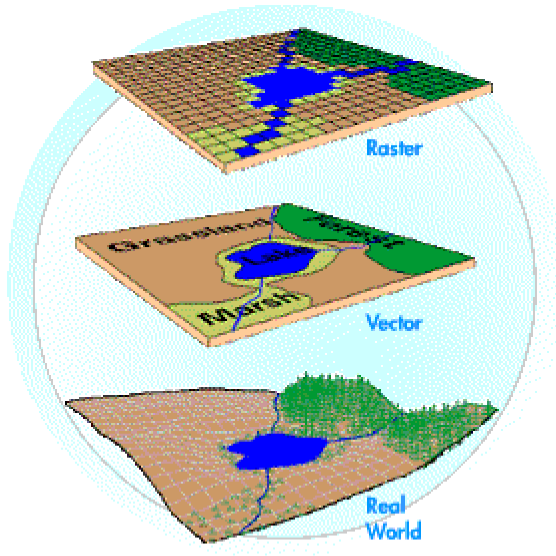


Geographic References

People reference geographic locations in essentially two different ways, either *explicitly* or *implicitly*. An explicit reference point would be a specific location that has latitude / longitude coordinates, or a national grid coordinate. An implicit reference refers to an address, a postal code, a census tract, or perhaps a lake, river, or stream name. A process known as geocoding is an automated method by which implicit locations can be used to create explicit locations. With the correct information, the geocoding process can be used if you have a list of addresses, showing perhaps the locations of underground storage tanks, in a spreadsheet. This tabular information can be processed in the geocoding operation to create a map showing these locations, so that the recipient can have both a picture of there locations as well as all the information that is within the spreadsheet. This is GIS at it's finest!

Vector and Raster Data

There are two main types of data that most GIS systems are capable of working with; they are vector, where each feature is made up of x and y coordinates, and raster, where information is a collection of pixels, such as an aerial photo or a scanned image.



Both of these types of data can be very useful when used to complement each other. They become like layers within a cake, the sum of which is a model of the world in which we live.

Day-to-Day Operations of a GIS

There are four essential ingredients to maintaining a successful GIS system on a day-to-day basis. They are:

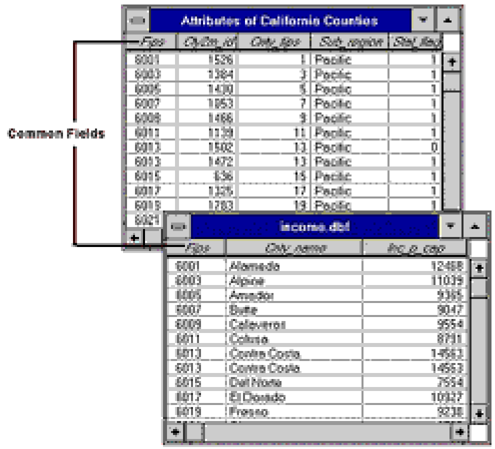
- Input
- Management
- Query and Analysis
- Visualization

Input

Before data can be used, it must be imported into the GIS database. This can be done via a translation, through the geocoding process, or through digitizing. Most of the work done within Clinton County will be digitized using up to date aerial photographs as a background, and paper maps as a reference.

Management

For smaller GIS programs, it may be sufficient to store GIS data as simple files or coverages that contain all of the attribute information in one place. As the program develops, attribute information should be stored in a relation database. This type of structure allows for attribute data to be related (or "connected") to attributes that are in the GIS feature itself. A good example of a relational database structure would be having the parcel database exist on one program by itself, but linked to the GIS data via a parcel number or some other id that is unique to each parcel, but is contained with the GIS also.



Query and Analysis

Queries

Once GIS data is in the database in a format that can be used, end-users can ask questions like:

- Who owns that parcel of land adjoining the airport and the County owned property?
- What affect will building a bypass have on the flora and fauna of Clinton County?
- What is the dominant soil type for the area in northern Clinton County where up to 300 new homes will be built in the next few years?
- What will the water runoff be like with the building of all of these new homes?

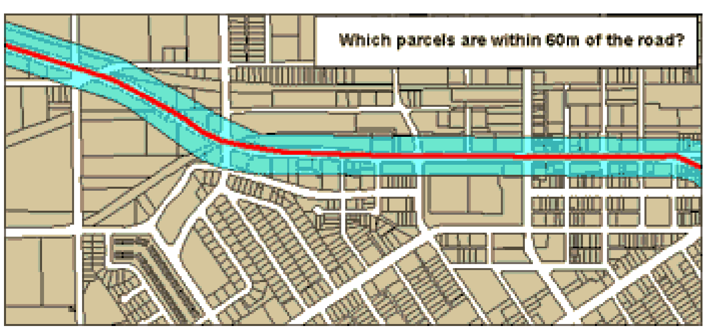
These questions and questions like these can be answered when we have collected the right kind of data and processed it accordingly.

Analysis:

Proximity Analysis

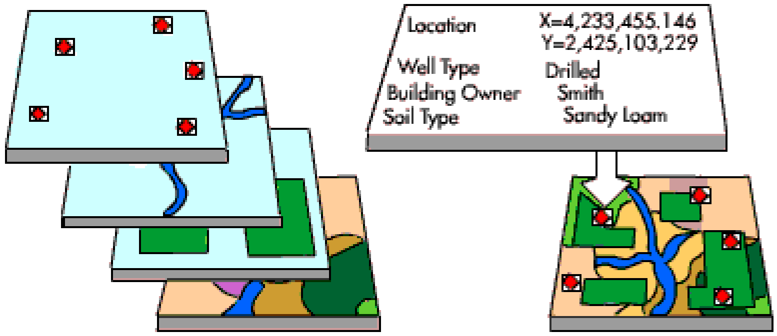
Proximity Analysis would answer such questions as…

- How many houses lie within a 100 foot corridor of a certain ditch that is prone to flooding
- What soil types are within 500 feet of this well?
- I need to get a list of property owners, complete with mailing addresses that are within 1 mile of this elementary school.



Overlay Analysis

With a GIS, users can display certain data layers over tip one another, which, in its simplest form, could be used for visual purposes only. However, analytical operations could be performed between multiple layers as long as there is common geography between them. This integration between multiple data layers is called a "spatial" operation or a "spatial join" if information is being joined between multiple layers.



Visualization

For many users, the best representation of GIS data is through the creation of a map. While maps have been and always will be an invaluable service from the GIS program, please keep in mind that map production does not have to be the end result of a GIS.

GIS Dictionary - List of Acronyms

A

AGI Association for Geographic Information
AI Artificial Intelligence
AM/FM Automated Mapping and Facilities Management
AML ARC Macro Language
ANSI American National Standards Institute
API Application Program Interface
ASCII American Standard Code for Information Interchange
AVHRR Advanced Very High Resolution Radiometer

B

BLOB Binary Large Object
BLPU Basic Land and Property Unit
BLUE Best Linear Unbiased Estimate
BSU Basic Spatial Unit

C

CAD Computer Aided Design
CASE Computer Aided Software Engineering
CCITT Comite Consultatif International de Telegraphique et Telephonique
CCT Computer Compatible Tape
CEN Comite Europeen de Normalisation
CERCO Comite Europeen des Responsables de la Cartographie Officielle
CGI Common Gateway Interface
CGM Computer Graphics Metafile
COGO Co-ordinate Geometry
COM Component Object Model
CORBA Common Object Request Broker Architecture
CPU Central Processing Unit
CSSM Content Standards for Spatial Metadata

D

DBMS Database Management System
DCW Digital Chart of the World
DDE Dynamic Data Exchange
DDL Data Definition Language
DGM Digital Geospatial Metadata
DIGEST Digital Geographic Information Working Group Exchange Standard
DIME Dual Independent Map Encoding
DIP Digital Image Processing
DLG Digital Line Graph
DML Data Manipulation Language
DPI Dots per Inch
DXF Digital Exchange Format

E

EDI Electronic Data Interchange
EDIFACT Electronic Data Interchange For Administration, Commerce and Transport
EIFOV Effective Instantaneous Field of View
EOS Earth Observation Satellite
ERIN Environmental Resources Information Network
EUROGI European Umbrella Organisation for Geographic Information

F

FDDI Fibre Distributed Data Interface
FDDI Fiber Distributed Data Interface
FGCC Federal Geodetic Control Committee
FGDC Federal Geographic Data Committee
FIPS Federal Information Processing Standard

G

GBF/DIME Geographic Base File/Dual Independent Map Encoding
GIRAS Geographic Information Retrieval and Analysis
GIS Geographical Information System
GIS Geographic Information System
GKS Graphics Kernel System
GPS Global Positioning System
GRASS Geographic Resources Analysis Support System
GUI Graphical User Interface

H

HRV High Resolution Visible
HTTP Hypertext Transfer Protocol

I

IAC Inter-application Communication
IEC International Electrotechnical Committee
IEEE Institute of Electrical and Electronics Engineering Inc
IFOV Instantaneous Field of View
IGDS Interactive Graphics Design Software
IGES International Graphics Exchange System
IRDS Information Resource Dictionary System
ISDN Integrated Services Digital Network
ISO International Standards Organization

J

JPEG Joint Photographic Expert Group

L

LAN Local Area Network
LIS Land Information System
LUT Look-up Table

M

MEGRIN Multi-Purpose European Ground Related Information Network
MSS Multispectral Scanner

N

NAD North American Datum
NFS Network File System
NGD National GeoSpatial Database
NIST National Institute of Standards and Technology
NLIS National Land Information Service
NTF National Tranfer Format

O

OCR Optical Character Recognition
ODBC Open Database Communication
OEEPE Organisation Europeene d'Etudes en Photogrammetrie Experimentale
OGC Open GIS Consortium
OGIS Open GeoData Interoperability Specification

OLE Object Linking and Embedding
OMG Object Management Group
OSF Open Systems Foundation
OSI Open Systems Interconnection
OSTF Ordnance Survey Transfer Format

P

PHIGS Programmer Hierarchical Interactive Graphics System
POSIX Portable Operating System Interface

R

RADAR Radio Detecting and Ranging
RDBMS Relational Database Management System
RLE Run Length Encoding
RPC Remote Procedure Call

S

SDML Spatial Data Manipulation Language
SDTS Spatial Data Transfer Standard
SIF Standard Interchange Format
SINES Spatial Information Enquiry Service
SNA Systems Network Architecture
SPOT Satellite Pour l'Observation de la Terre
SQL Structured Query Language
SQL/MM Structured Query Language/MultiMedia
SRG Standardised Raster Graphic
SRG Standardized Raster Graphic
STEP Standard for the Exchange of Data

T

TCP/IP Transmission Control Protocol/Internet Protocol
TIGER Topologically Integrated Geocoding and Referencing
TIN Triangulated Irregular Network
TM Thematic Mapper
TSP Travelling Salesman Problem

U

UTM Universal Transverse Mercator

V

VPF Vector Product Format
VRF Vector Relational Format

W

WAIS Wide Area Information Server
WAN Wide Area Network
WWW World Wide Web