Getting started with GIS

Royal Geographical Society with IBG
Advancing geography and geographical learning

A GIS is a Geographical Information System and essentially it is a software tool that is available to geographers to aid the mapping and spatial analysis of data and information.

The 'Getting Started With GIS' Project is aimed at secondary teachers who are thinking about taking their first steps in using GIS to enhance the teaching and learning of geography in their schools. Many teachers have heard about the increasingly important role that GIS plays in commerce and industry but don't know how to get started with their own use of this valuable tool.

The 'Getting Started With GIS' Project aims to support teachers with independent and balanced advice and information that will place those who have little or no knowledge onto the first rung of the GIS ladder so that they have the confidence and knowledge to be able to cross the initial barriers into using GIS.

What does the Project contain?

The 'Getting Started With GIS' Project currently contains:

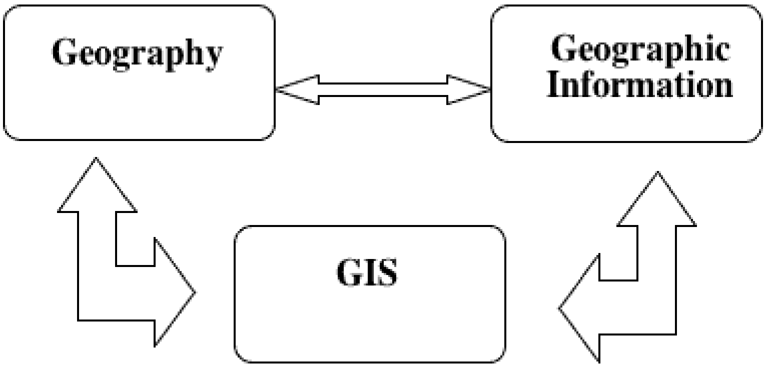
- A straightforward but detailed introduction to 'What is a GIS?'. It includes a simple explanation of the concepts behind GIS, the elements that make it up and a glossary of the key terms. This is linked in with the existing interactive examples given in the next section.
- A guide to the best of the existing interactive websites and digital resources that use a GIS structure so that teachers can familiarise themselves with GIS concepts and approaches.
- A guide to existing classroom exemplars of GIS use in teaching and learning appropriate to Key Stages 3 and 4.
- A summary of, and links to, a selection of other quality web-based sources of advice and information.

These documents will help you to understand GIS and feel confident in trying it by explaining what that extra third involves. It aims to give you a feel for how it could work to add value to Geography teaching in your school by answering some key questions.

Part 1 – Background to GIS
Question 1: What is geographic information?
Question 2: How do we create geographic information?
Question 3: What is the value of combining geographic information?
Question 4: How do we combine geographic information?
Question 5: What are the modern systems used for combining geographic information?
Question 6: What are the advantages of using GIS?

Part 2 – Representing geographic information in a computer
Question 7: What are the essential elements of geographic information?
Question 8: How do we represent geographic information in a computer?
Question 9: What can the GIS software do with the information stored in the computer?
Question 10: Who uses GIS and why?

What is a GIS?
GIS stands for 'geographic information System'. GIS has been developed in recent years for the purpose of using and studying geographic information. Consequently, geography underpins GIS and is the key to understanding it. As geography teachers, you already understand and are familiar with geography and geographic information, and use it every day in the classroom. This gives you a solid foundation to work with.



1. What is Geographic Information?
Geographic information is simply information that expresses and describes the locations of objects and features. It relates to the distribution and patterns of physical and human features that exist on the Earth's surface. Types of geographic information are as wide and varied as the field of Geography itself, from socio-economic or demographic data to physical and environmental data. It is usually treated as separate individual 'themes' of similar types of information. You will be familiar with:

- Physical features or phenomena such as rivers, roads, forests, earthquakes, volcanoes, erosion, floods, vegetation etc.

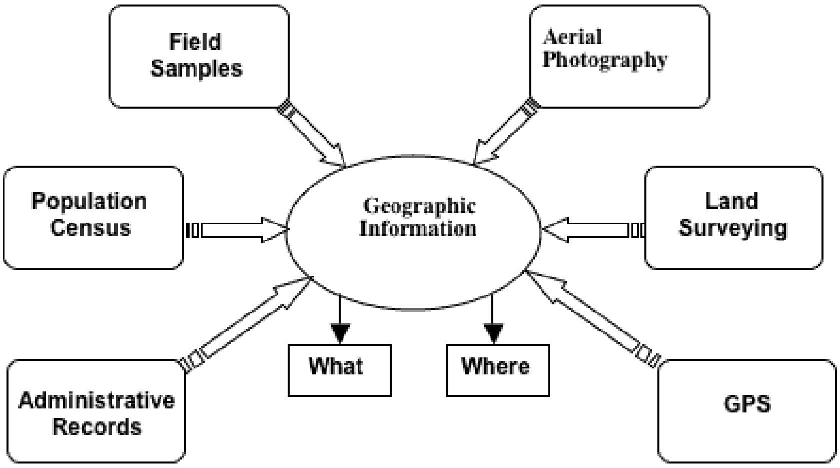
  And
- Human features or phenomena such as population, migration, electoral territories, poverty, religion, health etc.

So one geographical information 'theme' could relate to all the rivers in England.

'Physical' geographic information is used on the Environment Agency website. The physical features in this example include flooding and pollution. The location element is the postcode.

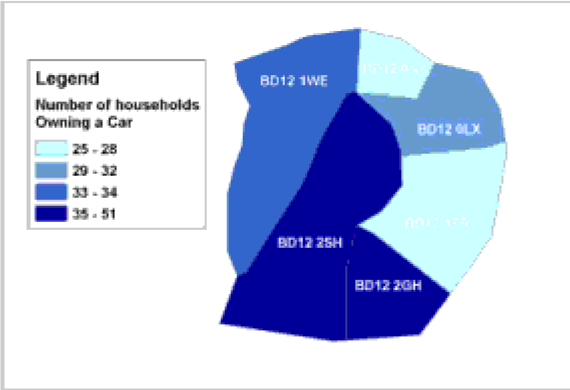
One of the main sources of 'human' geographic information is the Census. It records a large number of variables about every person in the UK including employment, housing and health. The geography element of it is the location of where people live. These are aggregated into 'output areas', on average 125 households, to disseminate the results, and can be mapped. The most recent UK Census was held in 2001, and is illustrated here. A National Curriculum example of its use in Birmingham is here.

2. How do we create Geographic Information?
Essentially, geographic information states what is where. So to create geographic information, we have to record these two elements somehow. They can be captured through many different types of observations, measurements and surveys. Data can be sourced from aerial photography, satellite images, field samples, land surveying, population censuses, global positioning systems (GPS) and government administrative records among others.



Geographic information can be captured and represented in a simple table format that textually lists features and where they are. The most common method is to illustrate the location or distribution of a feature in relation to a study area visually on a paper map. This is probably the format you are most familiar with in the classroom and every day life.

Postcode	Number of Households Owning a Car
BD12 0LX	32
BD12 0NY	25
BD12 1FR	28
BD12 1WE	34
BD12 2GH	43
BD12 2SH	51



The table on the left lists the number of households owning a car by postcode. The same information is represented on a map on the right. Both are geographic information. In this case, the postcode is the location.

If there is no notion of location, then it is not geographic information!

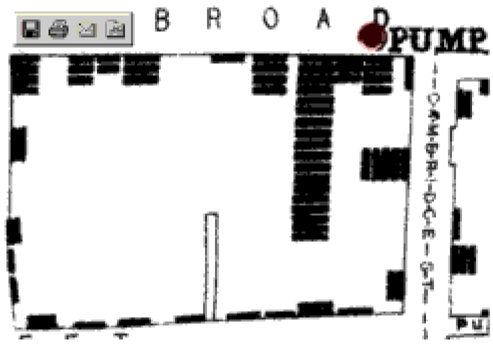
The only rule governing geographic information is that it contains a location. Location can be captured in many different ways including relative location (eg. a building is east relative to another) or absolute (eg. your postcode that can be used to uniquely identify the position of your property with a map coordinate location). For example, you may take a photograph of an area and use it to locate features shown on the photograph relative to one another. Aerial photographs are a great way of achieving this and are often used as a data source in geographic information systems. An example of aerial photography as a data source can be found on Multimap. Here you can toggle between aerial photographs and maps of an area to find locations. You can also input town names and postcodes, another form of location, to find specific locations on the Earth's surface. Similar location information can be entered at Mass Means Business. Here the location is used to search for photographs, aerial photographs and maps of building plots. Ordnance Survey provides a huge variety of products based on national mapping of the UK, all of which have location at their core.

3. What is the value of combining Geographic Information?

A single set of geographic information is limited in its analysis potential. It can be used to provide information about the location of the features to which it relates, and this can be used as the basis for recording and investigating distributions. However, it cannot be used to investigate interactions with other sets of geographic information. This ability to investigate the ways in which two or more sets of geographic information interact with one another is the ultimate goal in much of the work undertaken in geographic information systems.

Combining geographic information themes is a lot more powerful. The geography, or location, is used as the common denominator – the link. It has the potential to generate new information on patterns and relationships between multiple sets of geographic information that would otherwise be missed, and to aid in answering more complex questions or decision-making. Why do patterns exist and what impact might they have?

The classic demonstration of this is Jon Snow's investigation of Cholera in Victorian London in 1854. Jon Snow plotted the locations of incidences of Cholera against the location of water pumps, and noticed how they clustered around the Broad Street water pump. He identified the contaminated source and created the beginning of modern epidemiology. A map of just the water pumps or incidences of Cholera alone would have been of little value.



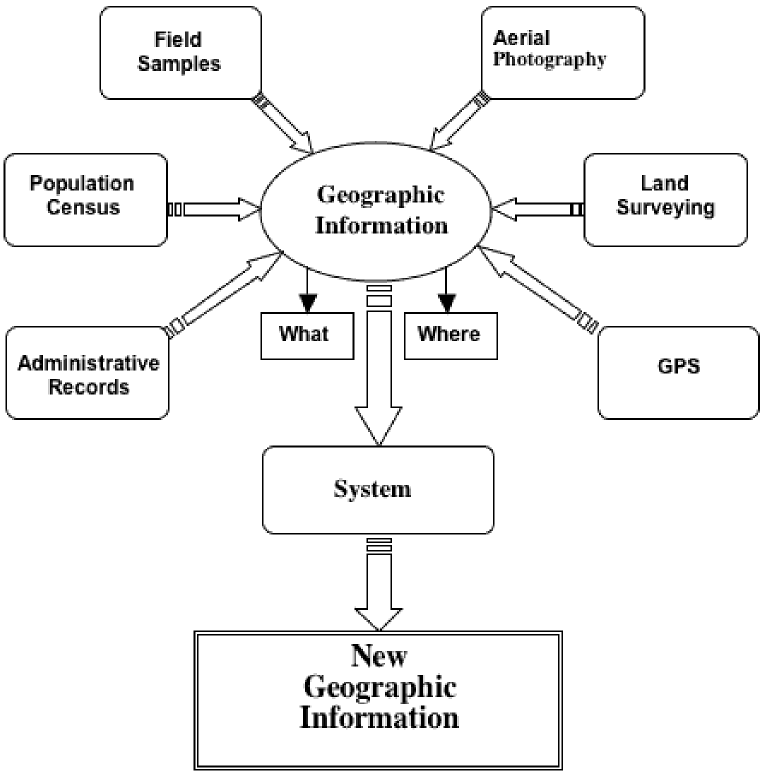
Cholera incidences represented as lines around the Broad Street pump. Map in Snow's 1855 book (http://www.ph.ucla.edu/epi/snow.html)

Another example is flood risk maps. This combines geographic information relating to the locations of properties and the locations of flood zones to identify properties at risk of flooding. Studied separately, these two themes of geographic information tell us very little. By combining them, we create new information. This combined information is of huge value to environmental groups and insurance companies.

Essentially, combining geographic information adds value to an analysis by providing new information that would not be detectable otherwise.

All the example interactive websites demonstrate the added value of combining geographic information. The Environment Agency website in particular is a good example. It illustrates how environmental data can be combined to assess environmental risk at specific locations. Mass Means Business allows you to gain a great deal of visual and demographic information about a possible building location by searching for sites based on a range of information, both locational and non-locational. A location name or postcode alone gives very little information. Similarly, a table of demographic data can only say so much. However, when linked to photographs a new, visual context to the information can be accessed.

4. How do we combine Geographic Information?
If we are combining a number of different geographic information themes together, they may be from different sources, in different formats and covering different study areas. Therefore, we need to use a **system** to deal with the disparate sources and organize them so that they can be combined.



A Geographic Information System does just that. It is a tool for the input of different geographical information themes so that they can be stored, organized, displayed and analyzed. It uses geography as the common denominator between separate themes so that they can be combined. Its purpose is to provide answers to questions based on geographical data.

Any tool that handles geographic information must also be able to handle the varied ways that location is described. Common methods include map grid references, postcodes and place names. The Environment Agency website allows you to search using all of these methods of assigning location. It also combines maps, tables and graphs of information relating to flooding, waste disposal and pollution so that you can view information about the location where you live that you can not just walk out of your door and 'see' (flood risk for a river can't be viewed outside of a flood).

5. What are the modern systems used for combining geographic information?
Traditionally, the most common method to combine geographic information is cartographically within a paper map or some sort of map overlay. Now, the input, storage and display of geographical information are realized in a computer. Once in the computer, the features and themes can be manipulated, combined and analyzed to generate new information. The software designed to do this is called GIS software.

As well as the software, the following elements are required to be able to run GIS:

- Modern PC
- Software and data input devices, ideally a CD-drive
- Output devices, including a monitor and a printer
- Human operator

There are a number of different GIS software packages available with different functionality and interfaces. These packages are evaluated in the documents available to download from the 'Software evaluations' page of our website.

6. What are the advantages of GIS?
In theory, all GIS processes can be undertaken manually. Before GIS, analysis procedures would have been manually undertaken using transparent overlays or run through very slow and cumbersome machines with far less power than the machines of today. The essential advantage of modern GIS, however, is that all the functionality for working with multiple sets of geographic information are grouped and automated within one piece of software. In addition it benefits from modern computer efficiency and speed.

Overall, the use of modern GIS offers many advantages over paper maps:

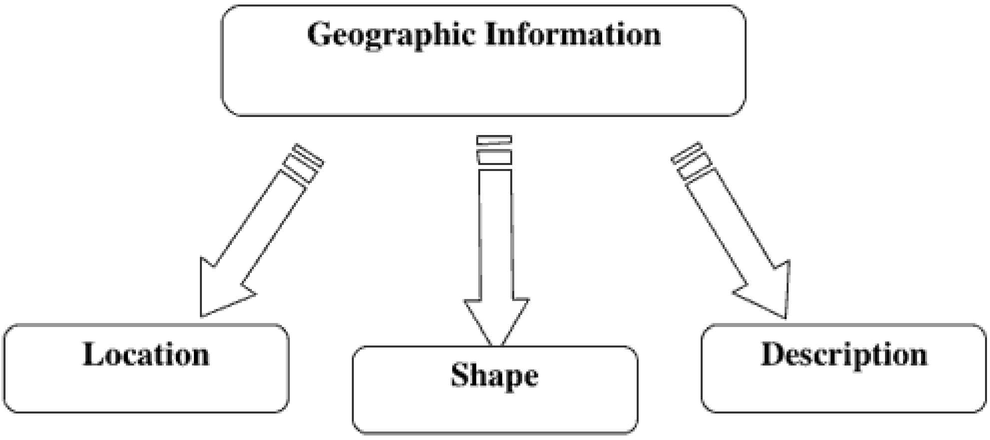
- Can cope with larger amounts of data
- Can cover large study areas (the whole world if necessary)
- Can conveniently select any sub-study area
- Can cope with unlimited and frequent edits and changes
- More robust and resistant to damage
- Faster and more efficient
- Requires less person time and money

The Census 2001 website is a good example of how GIS can store and display a number of large datasets for the entire country quickly and easily. Before the Census was made available through a GIS, you would have had to search manually through records on your computer on telephone staff at the Census office to get information about your area of interest. With GIS, data for any area can be accessed quickly and easily according to a location. Multimap is able to store and show maps and aerial photographs covering the whole of the UK. Unless you had an enormous map library and knew exactly where every town and village in the UK was, you would be unable to provide the level of information that Multimap is able to do in just a few seconds. Greenwood County's mapping system illustrates how GIS can provide access to a variety of detailed datasets quickly and how the display can be easily modified. Essentially, you are able to customise your data to suit your needs.

7. What are the essential elements of Geographic Information?
Geographic information is simply information that can be located. The most obvious source of geographic information is maps, in which information about the world around us is plotted within a structured framework (a coordinate system) that allows us to find its location. However, maps are not simple representations of

geographic information and are themselves produced by combining the three essential components of geographic information:

- The location of the geographic information – maps use a coordinate system to allow locations to be read
- The shape (geometry) of the geographic information – the shape of the features and themes are drawn onto the map
- The description of the geographic information – a legend provides descriptions of the shapes drawn on the map



Any system that is capable of working with geographic information must, therefore, also be able to:

1. Create a space in the which locations of features can be plotted
2. Plot and store information that describes the shapes of the features in the location space
3. Store information that describes what the shapes represent

8. How do we represent Geographical Information in a computer?
Geographic information contains locations, shapes and descriptions of the information. A geographic information system uses a computer to combine and analyse multiple sets of geographic information. In order to achieve this, it is necessary to code the geographic information into a format that the computer understands.

Representing location
Firstly, the geographic information needs to be located using some sort of cartographic format that the computer can understand. This requires geographic information in a GIS to also have information about the map projection and coordinate system in which it is stored entered. This data is usually input by the GIS operator and stored alongside the geographic information.

Geographic information held in a computer must be able to be located. Locating geographic information is achieved via mapping it against some sort of coordinate system. Any computer system that is able to work with geographic information must, therefore, be able to create a coordinate system space into which the geographic information can be mapped.

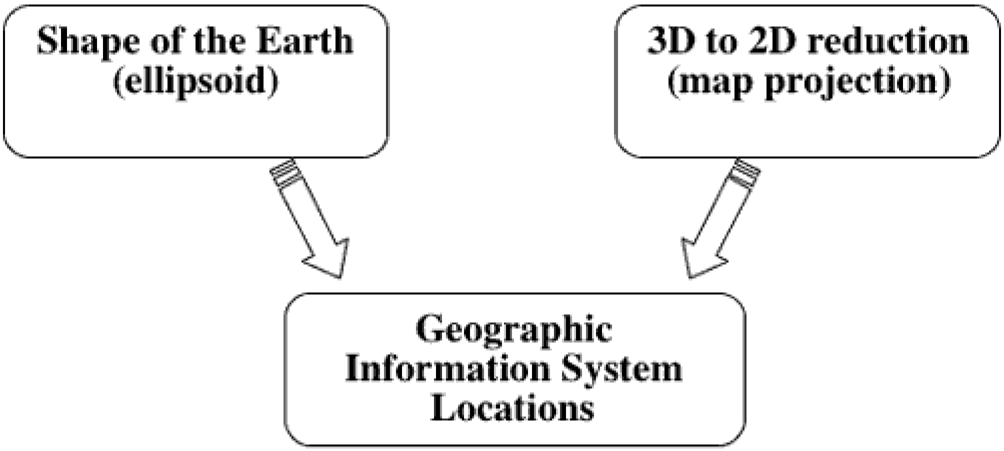
In its simplest form, a map can be thought of as nothing more than a two-dimensional space, with an x and y axis, into which locations of features can be plotted. As long as the units of the x and y axes are known and a system exists by which the values along the x and axes can be translated from the map space to a real location on ground as a map coordinate system, the map forms a valid representation of real world location.

There are, however, two significant problems associated with plotting real world locations using such a simple, two-dimensional map coordinate system:

a. The Earth is not a flat, two-dimensional object – it is a three dimensional ellipsoid (a sphere that has been squashed slightly so that the distance around the equator is slightly further than the distance around the poles).

b. There is no single, correct, description of the shape of the Earth – instead there are a large number of slightly different ellipsoid descriptions that can be used.

If we are going to successfully plot the locations of features on the Earth using a system of two-dimensional coordinates in a computer, the computer needs to have methods for reducing the description of a location on the Earth's surface from three dimensions to two, and needs to know the shape of the Earth that it will be locating information on.



Choosing the Earth's shape

The Earth is wider at the equator than at the poles as a result of centripetal forces caused by it spinning. Working out just how much wider at the equator it is has consumed geodesists for centuries. They have been responsible for working out the ellipsoid models (a mathematical description of the shape of the Earth) to be used in mapping. Historically, the shape of the Earth has been estimated by observing the movement of stars from many different locations on the Earth's surface. As the technology for stellar observation has improved, so the ellipsoid models have improved. The result has been a large number of slightly different ellipsoid shapes. Since the advent of satellites, it has been possible to calculate the shape of the Earth from space. The resulting ellipsoid model is called the World Geodetic System 1984 (wgs84) and this Earth shape is fast becoming the standard used across the world in mapping.

The good news is that the hard work has been done and deciding on the shape of the Earth to be used in a map simply involves selecting an ellipsoid model from one of the many available.

Reducing dimensions via map projection

Once the ellipsoid to be used has been decided all that remains is to find a way of squashing the 3D ellipsoid shape into 2D map space. The problem is known as map projection. The process can be grasped by attempting to squash the skin of half a grapefruit (effectively half of the Earth's surface) onto a flat surface. Necessarily, the grapefruit skin must be deformed by a process of stretching out at the edges and squashing in at the center and the process can be aided considerably be cutting the skin in places.

Map projections perform a very similar process to squashing and cutting a grapefruit skin. In map projections the ellipsoid is distorted mathematically to reduce it to a flat surface. You can perform the most simple map projection yourself by creating a map space with the units of the x and y axes set as degrees. The latitude (x axis) and longitude (y axis) locations of features to be mapped can then be plotted directly onto the axes to produce a map. This sort of map projection is called a geographic projection. The problem with this simple projection when plotting at a global scale is that it distorts the size of the polar regions of the Earth relative to the equatorial regions – making them much larger than they really are. As a result, more complex projections, that aim to minimize the relative distortions of feature sizes or shapes have been produced and a wide range of these are used in map production.

So what has all this got to do with geographic information systems?

Geographic information is information that can be located. It should now be apparent that locating geographical information can be achieved by plotting locations within a simple, two-dimensional coordinate system. However, this system is a simplification of the true three-dimensional nature of the Earth's surface. All maps require an ellipsoid and a map projection to achieve the simplified 2D representation.

A geographic information systems uses a known ellipsoid and map projection system to represent the geographic information.

<u>Describing shape</u>
Secondly, the computer needs to have a way of storing the shape of the geographic information. This might be the locations of points, the shape of lines such as roads, or the shape of polygon boundaries such as the outline of a building (this is known as vector data). It may also store geographic information as a grid, with each cell in the grid containing a subset of the geographic information (this is known as raster data). Generally, the computer relies on the complex shapes being simplified into a number of simple, linked, tables (often referred to as a database) containing the coordinates of the features and information about how each shape relates to those around it.

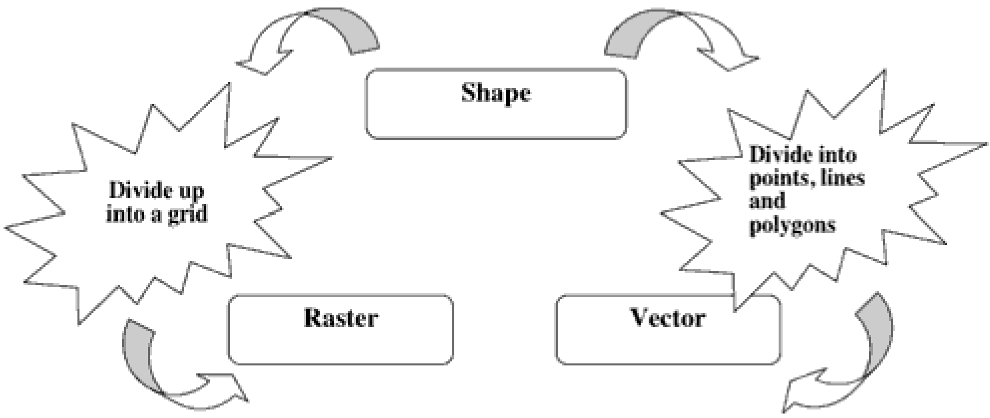
Geographic information systems allow us to represent, investigate and analyse the real world using a computer. A computer, at the fundamental level, is little more than millions of switches processing electronic signals. To work, a computer relies on the things that it is processing being reduced to a very simple level. Therefore, systems that work with geographic information need to break the geographic information down to very simplified versions of reality so the GIS can work with them.

There are two methods by which geographic information is broken down for use in a computer:

1. Physical features and human features are reduced to points, lines and polygons which are linked to information that describes them (their attributes). This method of representing the world around us is called vector

2. Physical features and human features are divided into a regular grid with each cell in the grid holding descriptive information about its contents. This method of representing the world around us is called raster.

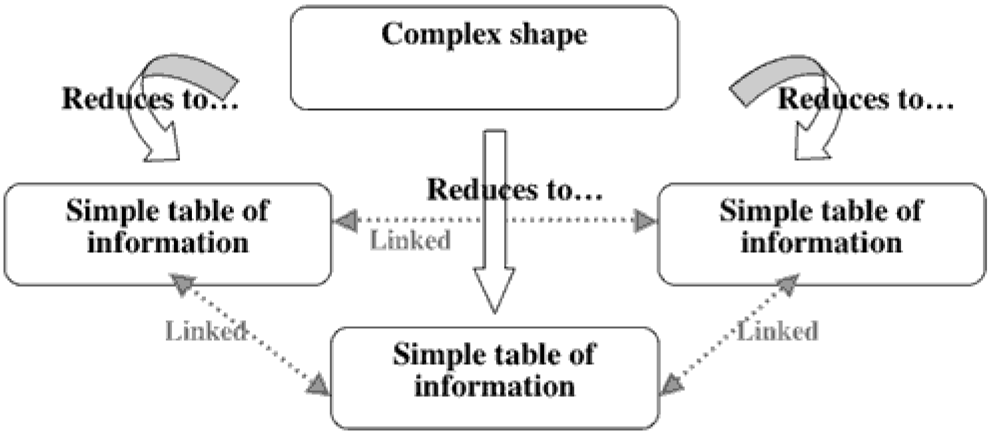
If you wish to use a geographic information system it is important to understand these two methods of representation:



Representing with vector

The key to understanding the vector method is realizing that **all shapes, no matter how complicated, can be simplified to a number of very simple tables containing information about the shapes that are linked together.** The vector method of representing the real world breaks down the shape component of the geographic information into simple tables of information that a computer can easily work with. It then links the tables together using a **database** to draw the shapes.

The key to understanding how a geographic information system works with the shape component of geographic information is to understand how complex shapes can be reduced to linked tables of information:



Points

Points are the simplest shape that can be associated with geographic information. They have zero dimensions and can therefore be located using a simple, single x,y coordinate located relevant to a coordinate system. Points can represent physical features (eg. a telegraph pole) or non-physical features (eg. the location of a road accident). Storing point locations is very simple and requires nothing more than a single table containing columns for the x and y coordinate locations and ID numbers, one for each point:

Point ID	X coordinate	Y coordinate
1	36549.7543	76549.5432
2	65382.4323	95045.0021

Lines

Lines are an extremely common form of one-dimensional geographic information. They are used to represent physical features such as roads and railways and contour lines.

Storing lines is more complex than storing points because lines change shape when distorted. We already know that distortion is an essential aspect of representing geographic information (eg. via map projections), and it therefore follows that the shape of a line in one map projection might be very different in another. Consequently, geographical information composed of lines cannot be stored by referring to the line shape alone.

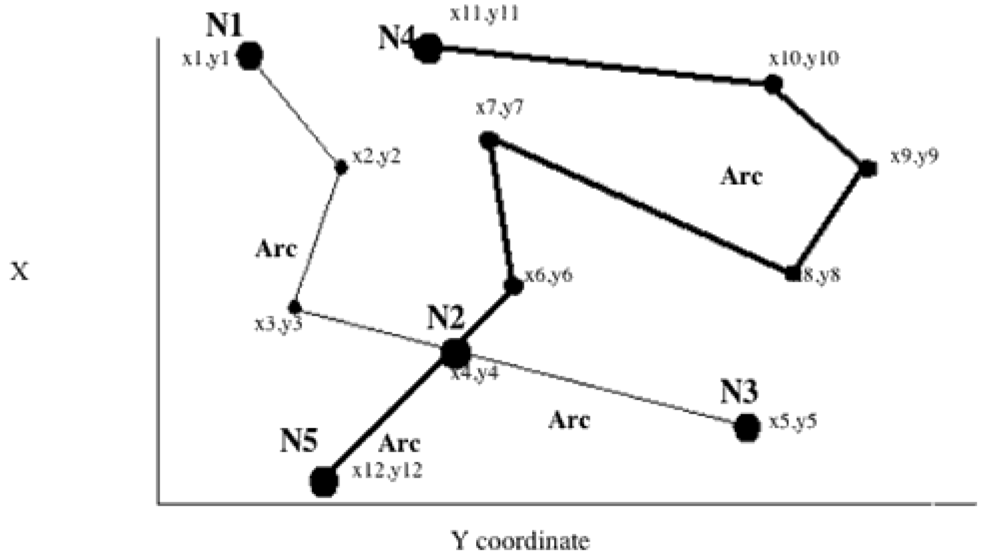
To get around this problem, lines are stored using the properties that remain invariant of distortion (known as topology). There are only three of these:

- Start points
- End points
- Intersections

All lines must have a start and an end point, irrespective of distortion. Also, two lines that intersect will always intersect no matter how much they are distorted.

The locations of these topological properties (called nodes) can be stored as individual coordinate pairs. The nodes can then be connected together with lines (called arcs) composed of ordered coordinate locations that define the line shape (including the locations of the nodes). Storing lines in this way requires a large number of tables of information that are linked together. This, in turn, means that a system for handling large numbers of linked tables of information is required. Commonly such as system is referred to as a database and it common to find a database at the center of large datasets of geographical information.

The following example shows how geographic information composed of lines is stored using topology tables. The use of topology means that what appears to be two lines is actually stored as four.



Node topology

Node	Arc
N1	1
N2	1, 2, 3, 4
N3	2
N4	3
N5	4

Arc topology

Arc	From Node	To Node
1	N1	N2
2	N2	N3
3	N2	N4
4	N2	N5

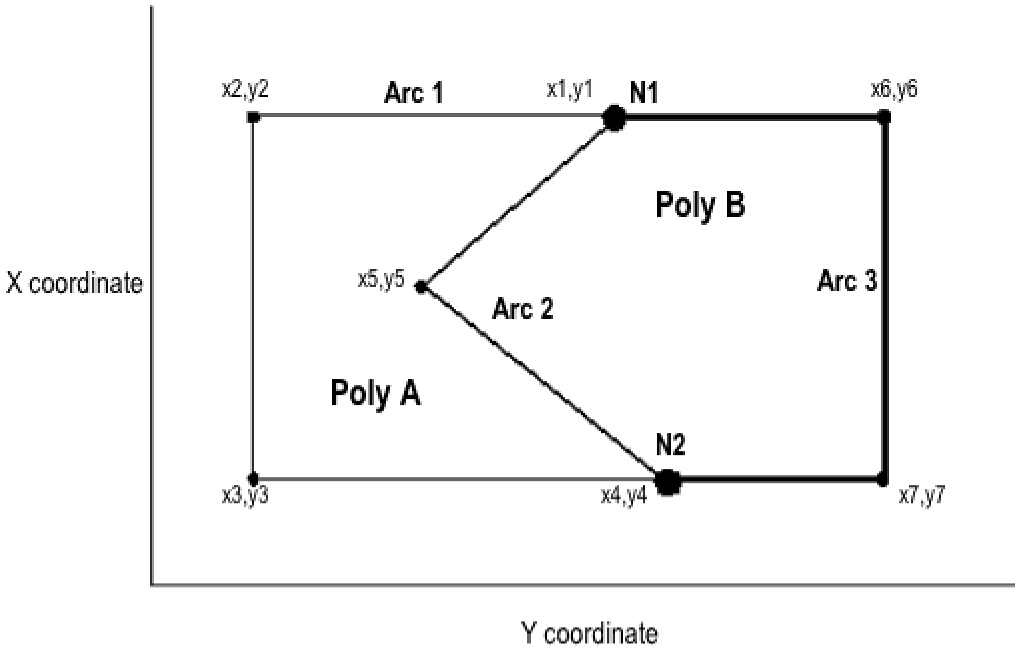
Arc coordinates

Arc	Coordinates
1	x1,y1; x2,y2; x3,y3; x4,y4
2	x4,y4; x5,y5
3	x4,y4; x6,y6; x7,y7; x8,y8; x9,y9; x10,y10; x11,y11
4	x4,y4; x12,y12

Polygons

polygons enclose two-dimensional areas. Any geographic information relating to enclosed boundaries or areas is represented using polygons. The sorts of features that polygons represent include the outlines of lakes and reservoirs, the outlines of buildings, country outlines and political boundaries.

Topology is also used in storing the coordinates that represent polygons because polygons are fundamentally composed of arcs. Below the two polygons (Poly A and Poly B) are composed of three arcs which, in turn, are composed of two nodes and a number of coordinate pairs. As before, the shapes can be reduced to a number of linked tables (a database) that, together, hold all of the information necessary to draw the shapes in a map space.



Polygon topology

Polygon	Arcs
A	1, 2
B	2, 3

Node topology

Node	Arcs
1	1, 2, 3
2	1, 2, 3

Arc topology

Arc	From Node	To Node	Left Polygon	Right Polygon
1	N1	N2	Poly A	-
2	N1	N2	Poly A	Poly B
3	N1	N2	-	Poly B

Arc coordinates

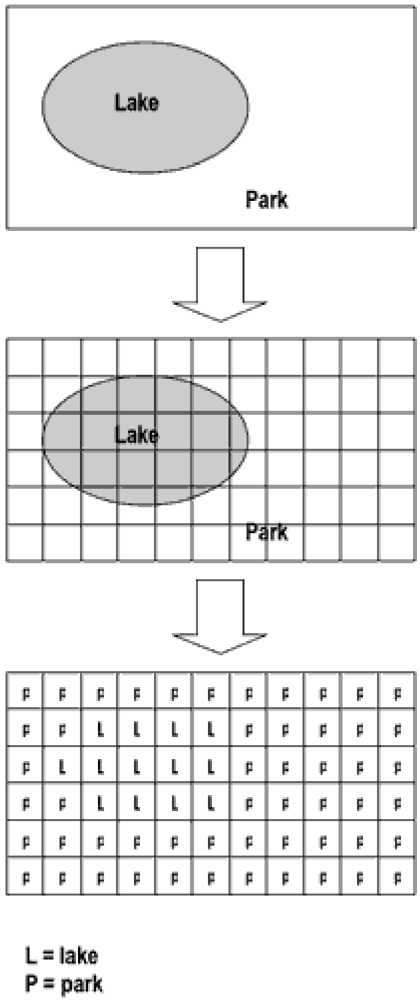
Arc	Coordinates
1	x1,y1; x2,y2; x3,y3; x4,y4
2	x1,y1; x5;y5; x4,y4
3	x1,y1; x6,y6; x7,y7; x4,y4

Using topology to build polygons also has the enormous advantage that lines are not doubled up at the point at which two adjacent polygons juxtapose. As for lines, a large number of tables of data are required and so a database is used to organize and manage the data.

Representing with raster

Physical features and human features can usually be divided into a grid and this is a much more simple way of representing the world around us than using points, lines and polygons.

Take the following example of a lake in a park that has been represented by dividing the geographic information into a grid



This is the process of representing the world using raster. Raster is an extremely simple method of representing geographic information and, therefore, the computer in a geographic information system is able to work with raster very easily. Raster does not require the extensive database of linked tables to store the shapes of the features.

The main drawback of raster lies in its representation. Whilst many physical features and human features naturally form points, lines and polygons, very few naturally form a grid pattern. Therefore, raster is limited in the reality with which it can represent geographic information and the detail that the raster data is able to provide is clearly limited by the size of the grid that is used.

<u>Describing the information</u>

Finally, the computer needs to hold descriptions of the geographic information. This is also done using tables containing descriptions that are linked to the tables containing the shape information.

As well as recording where features are, geographic information also needs to be capable of recording what features are. This is known as attribute information. When using a paper map, this aspect of the geographic information is held in the legend located at the margins of the map rather than being located within the mapped area itself. Consequently, it is known as aspatial information because the attribute component of geographic information does not hold any information about location – it is purely descriptive information about what the points, lines and polygons represent.

Describing vector data

In the same way that the information needed to draw points, lines and polygons using the vector method can be held in one or more tables, so the attribute information can also be held in tables. The following table holds a information about two polygons that form the boundaries of two agricultural fields. The crop planting history of the last two years is recorded in the table.

Polygon	Area (m^2)	Crop (2004)	Crop (2003)
A	180355	Wheat	Wheat
B	174023	Barley	Fallow

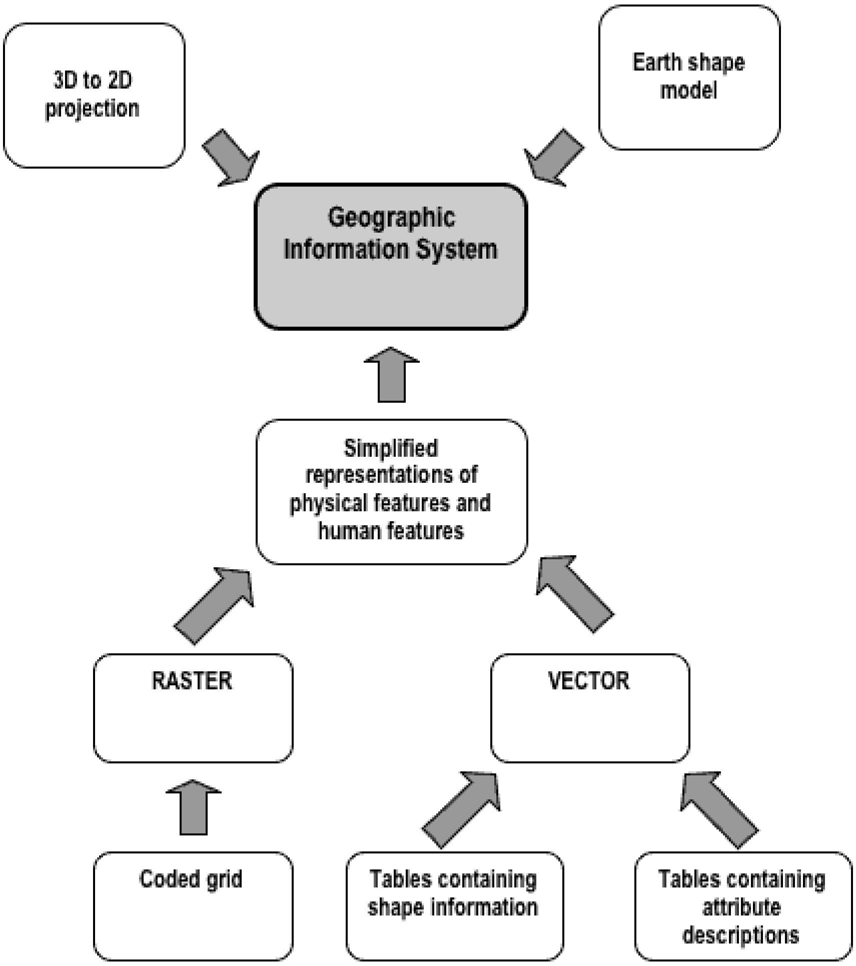
Note that the table above contains the name of each polygon so that the polygon topology tables can be linked to this table. Geographic information systems are able to perform this linkage.

Describing raster data

Raster data does not use tables of information linked to the grid shapes to describe the information. Instead, each grid cell contains a single code that represents the geographic information held within the cell. Only one piece of information can be contained within each grid cell with the raster method of representation meaning only very limited description information can be held by the raster method.

Summary

The following diagram summarises the components required to represent the physical features and human features around us in a geographic information system.



Location can be described using a number of methods including map grid references, postcodes and place names. A GIS can find location based on any of these. The Environment Agency website is a good example allowing you to search for information about your local area by any of these methods.

The shape of features can be represented using points lines and polygons (vector) and grids (raster). Multimap is able to integrate both forms of representation together. By overlaying the map (made up of points, lines and polygons) on the aerial photograph (a raster) it is possible to see how a GIS can represent the same features in two different ways.

Tables of geographic information are used to describe many features (known as attributes). The Census website is able to access these tables and display records from them so that descriptions are displayed when your mouse pointer is placed over the map.

9. What can the GIS software do with the information stored in the computer?
GIS software has a large variety of tools of varying levels of complexity. Listed below are core standard functions that are common to most GIS software packages.

- Mapping and cartography: Visualize features and manipulate symbology and colours to create an output map with title, scale bar, north arrow etc.
- Query: Ask questions of feature attributes such as: where is…? What's the nearest…? What intersects with…?
- Select: Identify features and their attributes that meet some criteria.
- Distance: Calculates the distance between features.
- Buffers: Rings drawn around features at a specified distance from the features.
- Overlay: The display of multiple layers of information at one location.
- Clip: Cuts an input layer to the size and extent of a selected layer.
- Merge: Combines multiple layers into one layer.
- Raster analysis: There is a whole separate suite of tool for raster analysis that includes classifying cells, deriving aspect and slope, mosaicing and calculating new cell values among many others.
- 3D: Data can be viewed with 'height' in 3-dimensions for powerful visualization.

A GIS can do more than just display maps. It can allow you to:

- perform selections of information based on radii from locations (Mass Means Business)
- overlay different types of data to produce increasingly complex, new information (Greenwood County)
- select locations using a range of different ways of describing location (Environment Agency; Multimap)
- provide information for use in other software (Environment Agency)

10. Who uses GIS and why?
GIS has evolved into a technology that is used by a huge number of industries and agencies to help plan, design, engineer, build and maintain information infrastructures that effects our everyday lives. The table below lists common users of GIS.

Industry	**Use of GIS**
Forestry	Inventory and management of resources
Police	Crime mapping to target resources
Epidemiology	To link clusters of disease to sources
Transport	Monitoring routes
Utilities	Managing pipe networks
Oil	Monitoring ships and managing pipelines
Central and local government	Evidence for funding and policy e.g. deprivation
Health	Planning services and health impact assessments
Environment agencies	Identifying areas of risk from e.g. flood
Emergency departments e.g. ambulance	Planning quickest routes
Retail	Store location
Marketing	Locating target customers
Military	Troop movement
Mobile phone companies	Locating masts
Land ReGIStry	Recording and managing land and property
Estate agents	Locating properties that match certain criteria
Insurance	Identifying risk e.g. properties at risk of flooding
Agriculture	Analyzing crop yields

Central and local governments are major users of GIS. They use them in environmental applications (Environment Agency), statistical applications (Census) and to disseminate information to local people (Wiltshire and Swindon, Greenwod County). Businesses are also extensive users (Mass Means Business). In addition, any agency involved in mapping is likely to have an extensive use of GIS (Ordnance Survey; Multimap).

'Getting started with GIS' project
This information has been developed by the RGS-IBG with the support of:
Judith Mansell, Education Officer, RGS-IBG - Project Manager
David Rayner, head of Geography, Rainham Mark Grammar School - Project Co-ordinator
Dr Nick Mount and **Gill Harper**, Birkbeck College - GIS professionals
Funded by the DfES
2003-4