

Geographic Information System (GIS) versus Cartographic Software (CAC)

We can roughly sub-divide the software relevant for cartography into two groups:

- 'Geographic Information Systems' (GIS) and
- 'Computer Aided Cartography' software (CAC)

GIS programs generally provide a huge potential to store, manage and analyse referenced and interconnected data. In contrast to GIS, CAC software is mainly used for high quality visualisation of given spatial information. To achieve this, CAC users work with user-friendly graphic software with a large number of special functions and tools.

GIS and CAC visualisation of spatial information example

Discover the difference between GIS and CAC visualisation of spatial information by rolling over the following example with your mouse.

- A. GIS visualisation of spatial information .
- B. CAC visualisation of the same information.

Overview of CAC and GIS products

The number of computer programs for spatial data analysis and visualisation have increased during the last decade. Within this learning unit, we will analyse the relationship and the differences between GIS standard packages, GIS desktop software, desktop publishing software (DTP), Computer Aided Design (CAD) and specialised mapping programs.

Overview of some CAC and GIS Software Products.

The following table gives a short overview of the main CAC and GIS Software Products.

Geographic Information System (GIS)	Computer Aided Cartography Software (CAC)	
GIS Standard Packages	Statistical Programs and Spread Sheet Packages (with graphic modules)	Computer Aided Design (CAD)
<ul style="list-style-type: none"> - Arc/Info - MGE (+Microstation, +RDEM\$) - Geomedia - Microstation Graphics - Smallworld - GRASS GIS - IDRISI etc. 	<ul style="list-style-type: none"> - Excel - SPSS/PC+ - SAS/PC etc. 	<ul style="list-style-type: none"> - MicroStation - AutoCAD, etc.
GIS Desktop Software	Desktop Publishing Programs (DTP)	Mapping Programs
<ul style="list-style-type: none"> - ArcGIS 9 Desktop - ArcView 3 - Atlas GIS - MapInfo - PCMap - SiCAD special desktop, etc. 	<ul style="list-style-type: none"> - FreeHand - Illustrator - CorelDraw, etc. 	<ul style="list-style-type: none"> - ICAD - Dry/Nuages - Regio Graph
Further Programs		
<ul style="list-style-type: none"> - AutoCAD (+extension) - FreeHand (+extension MAPublisher) - Illustrator (+extension MAPublisher) 		

GIS Cartographic Functionalities

Advantages and disadvantages of cartography using GIS

It is true that analysing data is the real power of GIS, but analysis is wasted if you can not communicate your results. This is why more and more GIS includes some powerful cartographic tools. However, most of them are not adapted to the user and often violate cartographic convention. Furthermore, when analysing spatial data in a GIS, some temporary displays are quite often produced which are of course not intended for map communication.

Advantage of cartography using GIS

The technology of GIS mapping has evolved a lot in the last 10 years. This is why the GIS user has currently a wide range of functionalities and mapping tools at his disposal. Mapmakers which use GIS are no longer limited to simple black-and-white, letter-size pages produced on an office printer. You have now the choice of producing dazzling full-color paper maps from letter to poster size, high-quality published map products, and interactive maps with a GIS. With GIS you can easily:

- Create maps semi-automatically
- Manage layers
- Symbolise data

- Label maps with text and graphics automatically
- Layout and print maps
- Work with styles and symbols
- Look at data with graphs
- Create reports
- Query maps

Disadvantage of cartography using GIS

When creating a map, if the user does not indicate a projection and grid system, a number of GIS software packages default to a “Plate Carree Projection”. „Plate Carree” is a projection which distorts the shape, area, and scale as the displays moves away from the equator. And therefore, there are countless examples of bad maps whose creators do not realise that they must indicate an appropriate projection (the default projection is, of course, usually not the best. This is a classic problem by using GIS for cartographic purposes: the user has not to understand the characteristics of the data or of the mapping techniques used because the GIS automatically selects the default settings. This problem is exactly the same for many other cartographic considerations like:

- Classification: The classification tools included in most current GIS package allows quick and easy classing schemes. This can lead to inappropriate choice, because no significant experimentation is needed. Another factor to consider is the number of classes: the default number of classes in GIS package is frequently too high: nine or ten, whereas five or six classes are enough.
- Text Placement: Labelling points, lines and polygons automatically is often imprecise or cartographically false. Overposting (labelling for one feature placed on top of labelling for another feature), bad polygon labelling (on left/centre/right) are other placement, are classic errors.
- Colour schemes: Often the default colour schemes are qualitative, this can be a real problem for choropleth mapping (which use quantitative data).

Cartography functionalities using CAC

Cartography using CAC

The task of digital cartography is to realise a meaningful presentation and a perfectly readable choice, for paper or electronic media distribution, of the GIS processed data. This is why an ergonomically graphic software with a wide range of special cartographic functions must be available to the

mapmaker. As seen in the previous unit (GIS versus Cartographic Systems), many CAC systems exist. We will now present you the most needed tools for mapmaking, and also show you the advantages and disadvantages of cartography using CAC.

The most needed CAC tools for mapmaking

To depict the most needed CAC tools for mapmaking, we will have a look on the detailed functional demands for a new digital cartographic production system realised at the Federal Office of Topography in Switzerland:

- Input of analog and digital map data
- Visualisation of data on screen (WYSIWYG)
- Internal coordinate system
- Raster image manipulations
- Vector manipulations
- Editing of raster data (line art)
- Editing of vector data
- Hybrid processing of vector and raster data
- Text processing
- Processing of continuous tone data
- Data output

Disadvantages of cartography using CAC

One of the main disadvantages of cartography using CAC is the loss of data attributes when importing GIS data. Indeed, when moving geographic data in a CAC software, shapes will be held whereas all the geographically critical aspects such as associated tables, coordinates, projections, scale and the resulting relationships among the elements will be lost. Therefore, you will not be able to edit attribute data, or undertake mathematical calculations on the attributes (for example, to calculate a percentage) of the geographical data within a CAC software. Some other common problems when importing GIS data in CAC software are:

- The GIS designated colours, fills and strokes, line weights, pattern styles for fills and strokes, fonts, etc. are quite often altered, or even lost.
- Labelling using attributes from the layers associated tables is not possible.

- The projection properties and parameters are lost.
- Etc.

Geographic Information Systems (GIS)	Computer Aided Cartography Software (CAC)
- Presentation of modelled real-world elements	- Representations of objects by symbols
- Concept of topology is essential for the modelling of objects	- Graphical presentation only
- Strict use of layer technique, e.g. the system prevents custom representations of bridge and underpasses	- Layer techniques with special cartographic options, e.g. for the presentation of bridges or underpasses
- The meaning of objects is defined by the attributes in a database	- The meaning of objects is defined by their symbolisation
- Manipulation and analysis functions	- 2D visualisation and configuration options
- No generalisation of input data	- Generalisation and cartographic presentation of input data
- Not necessarily WYSIWYG* presentation	- Cartographic WYSIWYG* presentation (transparency, masks, depth effects, etc.)
- Integration of raster layers, switching between the different models may be possible	- Raster layers combined with vector layers
- Simple printing and plotting options only	- Output options conceived for high quality print
- Complex to use	- Simple to use (mainly Desktop Publishing Programs DTP)
<div> <div>-----</div> <div>svg</div> </div> <div>* WYSIWYGWhat You See Is What You Get</div>	