



## Product Description

---

Pythagoras CAD+GIS, developed by ADW Software, is a modern CAD-program specially designed for topographical applications (land surveying, road design, city planning), integrating the calculation and drawing functions required for these tasks. Pythagoras CAD+GIS uses the newest software techniques like, intelligent snapping, indicating geometric relations and context sensitive input fields. These techniques make the program very user friendly and even casual users can reach a high degree of productivity.

Pythagoras CAD+GIS is available in different modules. Click on the below module names to learn more about the respective features.

### [Pythagoras CAD+GIS: technical features](#)

#### [Pythagoras CAD+GIS base](#)

This basic module contains the Pythagoras CAD engine, drawing tools, COGO functions and many more items.

#### [Pythagoras CAD+GIS geocoding](#)

While importing the survey data, Pythagoras generates your drawing automatically based on the point codes used in the field.

#### [Pythagoras CAD+GIS Digital Terrain Model \(DTM\)](#)

Based on a digital terrain model, Pythagoras generates contour lines, profiles and cross sections, calculates volumes and 3D areas.

#### [Pythagoras CAD+GIS Road Design](#)

An integrated module in Pythagoras to be used for road constructions and all relevant calculations like cut & fill, profiles and cross sections.

---

### Pythagoras CAD+GIS Raster Images

Allows the import of raster images and some relevant operations.

### Pythagoras CAD+GIS Pro

This module contains the options GIS and VBA.

#### **Additional Information :**

- main advantages of Pythagoras CAD+GIS
- Pythagoras CAD+GIS : short overview
- Pythagoras' philosophy

## ***Technical Features of Pythagoras CAD+GIS in general***

### **1. Environment and peripheral hardware**

Pythagoras is available both for Apple Macintosh (OS X) as for 80X86 computers running Microsoft Windows 2000 or XP.

Pythagoras CAD+GIS(for PC) is a Microsoft Windows 32-bit program. As a consequence it runs stand-alone and on all networks supported by Windows 2000 or XP. All monitors, printers and plotters supported by the Windows and Macintosh graphics environments can be used with Pythagoras. The compatibility and upgradeability of the system is guaranteed.

The printing and plotting is done by the default Windows or Macintosh functions. The advantage is that beside most plotters all standard printers (fast and cheap output) are supported.

Both the Macintosh and the Windows environment have the advantage that several programs can be executed simultaneously. Without leaving Pythagoras CAD+GIS other programs, for example spreadsheets or word processing can be executed.

### **2. Pythagoras CAD+GIS is WYSIWYG**

Pythagoras CAD+GIS drawings are WYSIWYG (What You See Is What You Get). The display always shows the drawing as it will be printed or plotted. Of course the displayed image has a lower resolution than the printout. The screen will display the border of the page, and the position of the image will be shown as it will be printed. For larger projects when the drawing will be plotted over several pages, the user can work independent of page dimensions.

### **3. Pythagoras CAD+GIS Internal CAD**

Pythagoras CAD+GIS is a completely stand alone CAD software, since his own CAD engine has been integrated.

ADW Software is member of the Open DWG Alliance. This assures our users of an up to date interface between Pythagoras CAD+GIS and other CAD programs via the use of DWG and DXF files.

#### **4. Pythagoras CAD+GIS manuals and education**

The program and the manual of Pythagoras CAD+GIS are available in the following languages: Dutch, French, German, English, Russian, Greek, Polish, Spanish, Bulgarian, Serbian, Croat, Arabic, Persian and Thai. Other language version can be provided on demand. In addition, Arabic, Cyrillic, Thai, Greek and Eastern European code pages are supported.

The manual is suited for self-study. It is divided into 3 parts: Installation, Tutorial and Reference.

**It is evident that the information given in this document is not complete and that it is very difficult to reflect the power of Pythagoras GIS+CAD. The look and feel of the program, its intuitive interface, the ease of use, ... only a detailed demonstration is able to show you this. To guide yourself, you can download the free demo version from our website.**

#### **5. Pythagoras CAD+GIS data security**

Loss of data can be minimised by the use of :

- automatic timed saving
- file auto back-up function

built in in Pythagoras CAD+GIS.

#### **6. Pythagoras CAD+GIS Hardware Requirements**

##### **A. For the APPLE Macintosh Environment**

You need a Power Macintosh or compatible computer with:

- Minimum 256 Megabyte RAM memory
- A hard disk
- Operating System X

Any printer or plotter supported by the Apple Macintosh operating system is suitable.

##### **B. For the MS Windows Environment**

You need a PC with following minimum configuration:

- 
- a 486DX or higher processor
  - Minimum 256 Megabyte RAM memory
  - A hard disk
  - Microsoft Windows 2000 or XP

Any printer or plotter supported by above-mentioned operating systems is suitable.

## **Pythagoras CAD+GIS Base**

### **1. Interactive drawing**

#### The dynamic control panel

The control panel helps to obtain information of existing objects and to enter information during the creation of objects.

The following data is always displayed in the control panel:

- the scale of the drawing
- the active coordinate system
- the active layer
- the type of coordinates (XYZ, NEZ, YXZ, CDZ, Polar, ...)

The fields (information) in the control panel change depending of the object that is created and depending of the relation of the object with other objects. During the construction of objects, data is displayed dynamically. For example during the construction of the line, the actual line length while moving the mouse will be displayed. This allows for example to obtain very quickly the distance between 2 objects.

#### Drawing functions

Pythagoras CAD+GIS provides the following drawing functions:

- points and symbols
- symbols parallel to or perpendicular on a reference line or arc
- lines
  - in any direction
  - parallel to a line
  - perpendicular on a line
  - having a given bearing
  - tangential to or perpendicular on an arc or circle.
- arcs
  - through 3 points
  - tangential to a line or arc
  - tangential to 2 circles/arcs
  - tangential to 2 lines
  - with a given centre

- clothoids
  - tangential to a line, arc or circle
  - tangential to a line and an arc, or to 2 arcs
  - by its parameters
  - transition between 2 lines (clothoid-arc-clothoid)
- circles
  - through 3 points
  - with a given centre
- polygons
- paths
- (Rich) Text
  - horizontal.
    - Horizontal text remains horizontal, even if the drawing is rotated relative to the page.
  - parallel to, or perpendicular on a line.
- trimming or extending lines and arcs
- intersections of lines, arcs and circles
- removing a part of an object
- dividing a line, arc or circle

#### Intelligent cursor

The intelligent cursor will help you to construct new Pythagoras CAD+GIS objects and he also provides you useful information regarding existing Pythagoras CAD+GIS objects.

The intelligent cursor and the control panel support the above drawing functions to do a.o. the following operations:

- perpendicular line on a line, arc or circle.
- tangential line to an arc or circle
- a line tangential to 2 arcs/circles
- parallel lines, arcs, circles, paths and polygons.

#### Snapping - the target

When moving the cursor over a drawing, the control panel will show the coordinates of the cursor in the document. When the cursor approaches an object, the cursor will be attracted by the object (snapping). Depending of the drawing mode, a target will be displayed on the object, and the form of the target will indicate if the target is a point, a line, a point of tangency, perpendicular, ... Simultaneously, the control panel will display all relevant information (coordinates, distance, point number, ....).

When snapping the following information will be displayed in the control panel:

- points : point number, coordinates, information
- lines : horizontal length, slope length, bearing, difference of height, distance to the endpoints, the point numbers of the endpoints.
- arcs : arc length, angle at the centre, radius, distance to the endpoints, the point numbers of the endpoints, slope arc length, difference of height between endpoints.
- Clothoids : arc length, beginning and ending radius, K-factor, point numbers of the endpoints
- circles : radius, circumference

- 
- path : horizontal length, slope length, difference in height.
  - polygon : horizontal surface, horizontal perimeter, slope perimeter.

Intelligent "snapping" with indication of geometric relation.

- Lines : perpendicular on other line, arc, clothoid or circle. Tangential to arc, clothoid or circle.
- Points : snapping to other objects, points on 1/2, 1/3, ... of a line, arc or clothoid.
- Arcs : perpendicular on a line or other arc. Tangential to line, arc or circle.

#### Operations in a drawing

- copy
- paste (scale and mirror is possible).
- rotate
- move
- duplicate
- delete
- change/copy/paste attributes (point style, line style, line width, colour, pattern, layer, ...)
- renumbering of points
- change text
- change height
- dimensioning
- clipping: the inside or the outside of a polygon/rectangle will be erased (vector/raster/vector+raster information)

#### Operations on a drawing

In Pythagoras CAD+GIS the Windows user can work simultaneously with 1024 drawings, each having their own window. The following functions are supported:

- zooming in, zooming out (till a factor 1000)
- scrolling
- making drawings active, dividing the screen, moving, ....
- copy and paste, also between different drawings/applications.
- save as... any DWG/DXF format

#### Annotation functions :

All information and dimensions relative to Pythagoras CAD+GIS objects can either be put on your drawing as a text annotation or can be exported as an object list report.

## **2. Layers**

A drawing can contain up to 4095 layers. Operations on layers:

- visible/hidden
- protected/unprotected

- active/non active
- selection on a layer's base.
- print/don't print

The content of layers can be displayed depending on a given zoom factor (user dependant)  
Layers can be organised in different groups, groups can be switched on/off.

### **3. Symbols, line styles and hatchings**

Pythagoras CAD+GIS provides 5 standard line styles, 8 standard point types and 8 standard polygon hatchings. The line- and point style can be selected and changed via menus and dialog boxes.

Using the standard drawing functions of Pythagoras, the user can create quickly own symbols, line styles and hatchings. A symbol, line style or hatching can be either defined in paper dimensions for symbols which are independent of the scale, or in real dimensions for symbols which need to be represented at the size corresponding with the selected scale. A symbol is either stored in a document or in a library. The use of a group name and a symbol name enables classification of symbols.

### **4. User Defaults**

Besides defaults for the style of points, colour, layer, ... the user can create up to 256 user defaults. A user default defines for all objects how they have to be drawn (colour, layer, style, ...). A user default is given a name. By using the mouse in a pop-up menu, the user can quickly select the preferred defaults.

This feature allows the user to switch easily between requested default settings for different customers, each having their own preferences.

User defaults can be applied (copy and assign) on a selection of objects.

### **5. Local Coordinate System - Page Coordinate System**

The topographical drawing will normally be drawn in a Local Coordinate System. The scale of the drawing and the selection of the print area (the position and the angle of the page relative to the local coordinate system) can be changed at any time. Rotating or moving the page relative to the drawing will not change coordinates.

The Page Coordinate System is used to draw information that is not related to the topographical data. The objects (lines, symbols, ...) drawn in the Page Coordinate System are bound to the page. Normally the frame and the headers of the drawing will be put in Page Coordinates. When copying Page Coordinate System objects in another drawing, these objects will always appear at the right position relative to the page. And this will be independent of the coordinates and the scale of the topographical part of the drawing.

## 6. Pythagoras CAD+GIS objects

A Pythagoras CAD+GIS drawing is composed of points, lines, arcs, circles, clothoids, polylines, texts, polygons, paths, raster images and coordinate systems. Coordinates are 3D, but the representation will be 2 dimensional.

The objects have the following common attributes:

- object information : all object, besides texts and coordinate systems can contain extra information. The information is a text of maximum 100 characters. The information has only a meaning for the user.

Standard object information, available in a text file, can be loaded. This enables you to save time when typing frequently applied object informations.

- the layer : objects are based in a layer. Max. 4095 layers.
- colour. 256 colours are available and each colour in 5 intensities : 12%, 25%, 50%, 75% and 100%
- Display level: this gives the order in which the objects are shown on the display. As a consequence it is possible to hide some elements of the drawing by making a 'superior' object opaque.

Point : A point in Pythagoras CAD+GIS has a point number consisting of maximum 8 alpha numerical characters. The automatic point numbering in Pythagoras CAD+GIS can be disabled. At any time a starting number for new created points can be set.

A point has either a standard style (cross, little circle, ...) or it is represented by a user defined symbol. Symbols can be rotated. The scale (x- and y-direction) can be changed, either relatively or absolutely.

Line-arc-circle : A line is always a connection of 2 points. As a consequence, lines without endpoints do not exist in Pythagoras. Therefore it is not possible to delete the endpoint of a line when the line still exists. When the cursor snaps to a line, also the endpoints of the line will be displayed in the control panel.

A line has either a standard style (normal, dash, dot, ...) or a style defined by the user. Almost any line style (containing circles, fills, ...) can be created. The styles defined by the user can also be scaled. A line may have arrows at one or both endpoints.

Arc : As a line, an arc connects 2 points. The projection of a 3D arc on a horizontal surface is an arc or a circle.

An arc has either a standard style (normal, dash, dot, ...) or a style defined by the user. Almost any line style (containing circles, fills, ...) can be created. An arc may have arrows at one or both endpoints.

Clothoid: The clothoid will be saved as an object with all its parameters (start and end radius, K-factor, beginning and ending point).

Circle : All points of a circle are in a plane that is 3 dimensional. The projection on a horizontal plane is a circle.

A circle has either a standard style (normal, dash, dot, ...) or a style defined by the user. Almost any line style (containing circles, fills, ...) can be created.

Polyline : A polyline has a fixed height and as a consequence lies in a horizontal plane. Polylines can not be created interactively. When Pythagoras CAD+GIS generates contour lines, these are polylines.

A polyline has a standard style (normal, dash, dot,...) or a user-defined style. Polylines can be linear or B-splines with a varying curvature factor between 1 and 10.

Polylines can be edited : adding, removing or moving a point to/from the polyline is possible.

Text : Pythagoras CAD+GIS supports very detailed vector fonts. All characters of the Windows character set are supported. Pythagoras CAD+GIS applies the so-called **Rich Text** possibilities. With Rich Text you can create long texts (almost unlimited) with different text formatting in Pythagoras. And in addition, it will be possible to copy texts from MS Word<sup>®</sup> into Pythagoras CAD+GIS so you can import existing texts from your text editor in a Pythagoras CAD+GIS drawing.

Text attributes:

- True Type Fonts (all Windows and Macintosh fonts are supported)
- horizontal – oblique (Mac: oblique only with vector fonts)
- point size (4 point up to 1000 point)
- weight (light, normal, bold, extra bold).
- normal or italic
- alignment : horizontal (left, right, centered), vertical (centre, top, bottom).
- border
- underline : normal, dashed.
- Opaque or transparent
- Codepages: Western, Cyrillic, Greek, East-European, Arabic, Thai (Windows only)

Standard texts, available in a text file, can be loaded. This enables you to save time when typing frequently applied texts.

Polygon : The boundaries of a polygon are defined by a sequence of points, lines and arcs. A circle may also contain a polygon.

A polygon can be filled with a hatch pattern. Pythagoras CAD+GIS supports standard 8 different patterns. Also solid fills (at 100%, 75%, 50%, 25% and 12.5%) and boundary hatchings are provided. The user can define up to 1024 own patterns and store these in a library so that they may be used in any drawing. The patterns can be set opaque-transparent and those that are stored in the library can also be scaled. The patterns can also be drawn as a border so that the patterns don't fill the entire polygon. It is possible to align a pattern given by an origin and a direction.

A polygon can be created by clicking in a certain area (flood fill).

Polygons can be edited : adding, removing or moving a point to/from the polygon is possible.

Path : A path is an open polyline. A path is used for:

- drawing of parallel lines and arcs to a path.
- creation of cross- and longitudinal sections.
- indication of the axis of a road when the road design functions of Pythagoras CAD+GIS are used.

A path can be edited : adding or removing a point to/from a path is possible.

Coordinate System : A private coordinate system can be made and stored in a drawing (max. 32). A coordinate system is 3-dimensional but lies always in a horizontal plane. The first point of the coordinate system defines the height.

A private coordinate system can be very useful to prepare local stake out activities.

Raster Images : Colour depth : monochrome, 256-colours, 24-bit colour.

The scale and the colour intensity can be adjusted. An image can be transparent and/or rotatable.

(GEO)TIFF, BMP and JPEG formats are supported.

Pythagoras CAD+GIS can export a BMP or JPEG from your imported and edited image.

## **7. Pythagoras CAD+GIS Object Linking**

Any Pythagoras CAD+GIS object can be linked to an external file. This file can contain additional (data base) information about the object, it can be a picture, a spreadsheet, etc... or even an executable (\*.exe) file from another program.

Once the link between the external file and the Pythagoras CAD+GIS object is established, the external file will be activated when double clicking on the Pythagoras CAD+GIS object.

This feature enables the Pythagoras CAD+GIS user to build up his first personal GIS environment.

## **8. Import & Export of data.**

### Keyboard

Field data can be entered manually by using the drawing functions. When a “user coordinate system” is made, points can be entered relative to a station.

Besides rectangular coordinates (N-E, X-Y or Y-X convention), Pythagoras CAD+GIS can work with polar coordinates (HDZ, HVD, HVS).

The convention can be changed in the control panel at any time. These conventions are all supported when importing or exporting field data.

### ASCII Text file

A coordinate list (point number, coordinates, code) can be imported relative to the active coordinate system. The coordinates can be given in any of the conventions supported by Pythagoras.

A list of coordinates of the selected points can be exported. This list can be imported in any spreadsheet or word processor.

A coordinate list can also be put on the drawing.

### Total Stations

Pythagoras CAD+GIS can directly import files created by total stations and data collectors. Sokkia, Topcon, Leica, Pentax, Nikon, Geodimeter, Zeiss, Trimble, FOIF, South, UOM3 and TDS instruments are supported. The brand and model of the instruments can be selected.

Pythagoras CAD+GIS automatically retains the point number and the code used on the field. For stake out, Pythagoras CAD+GIS can create a file in the format recognised by the above-mentioned instruments.

### DWG/DXF files

DWG/DXF files can be imported in either a new drawing or in an existing drawing.

A drawing or a part of it can be exported in DWG/DXF format. This file can be read by most other CAD programs.

Pythagoras CAD+GIS writes DWG files from AutoCAD Rel. 13 till the latest AutoCAD 2005 release.

### Object Lists

An exported object list is a text file containing all relevant information for each selected object. You can read the object list in most word processing programs.

## **9. Topographical calculations**

Most topographical calculations like the transformation of polar coordinates to rectangular coordinates, transformations, perpendicular line, intersection points, area calculation, etc...

---

are obtained by using standard drawing functions. Other specialised calculations are selected via a menu.

- intersections : lines - arcs - circles.
- intersection - resection
- traverse : open- and closed. With the open traverse, 5 situations are provided with compensation on angles and distances where possible.
- transformations :
  - a) transformations between coordinate systems and conventions: via the control panel.
  - b) translation & rotation : a transformation of points and other objects between different drawings can simply be done by using the standard copy and paste function. It is sufficient that the active coordinate system of both drawings is identical. Transformation is also possible between 2 systems with no common points, but with known transformation parameters to a 3<sup>rd</sup> system (e.g. copy between 2 drawings in local coordinate system, with known Lambert transformation).

#### Best fit of line-arc-circle

These functions calculate the best fitted line/arc/circle in a given series of points

#### Calculation of the area

The areas of any region, inclusive regions containing arcs are calculated automatically by defining the region as a polygon. Polygons are saved in the drawing and the area and circumference can be obtained any time.

It is possible to link information to polygons, to create a list of polygons with all the information (such as areas, circumferences, coordinates). This information can be edited with most word processing and spreadsheet software

#### Transformation

Pythagoras CAD+GIS may calculate the transformation parameters based on maximum 10 points in the drawing whose coordinates are known in another coordinate system. This calculation is done based on the least squares method.

Calculation parameters:

- scale factor : 3 choices : (1) no scaling, (2) best fit scale factor, and (3) given scale factor.
- Standard deviation and the dx, dy after transformation are calculated for each point
- Points can be disabled.

This type of transformation is using the well known Helmert parameters.

## **10. Advanced Search Engine**

Pythagoras CAD+GIS offers the user the possibility to select all kind of objects (points, lines, (rich)texts, images, polygons and paths) based on different (complementary) search criteria like style, colour, layer, elevation, comment, pointnumber, ...

The selection can be highlighted, Pythagoras CAD+GIS is able to zoom in around the selected object(s), a selection can be made in an existing selection based on different criteria.

## **11. Thematic Maps**

Thematic maps allow to define a theme in your drawings. This theme can be based on data from a database or a drawing and/or query results. Different themes can be active at the same time. Using this technique allows to present multiple variables of one project.

## **12. Views**

Each drawing can contain multiple views. A view is like a set of visual parameters regarding layers, general information, digital terrain models and thematic maps. A view defines what items should be visible or invisible.

## **13. Viewports**

With a viewport you can show a part of your drawing under a different scale. Doing so, details can be showed easily.

A viewport can be linked to a sheet. Characteristics like : scale, view, shape (rectangular or oval), visible/invisible frame and the bearing of the viewport can be set.

## **14. Pythagoras CAD+GIS printing**

Using the Sheet Manager, you can create multiple "Sheets" that each have their own attributes such as printer, dimensions, position, view, etc.

This allows you to split up large projects into different "print areas" and thus easily print the appropriate print sheets.

## **15. Pythagoras CAD+GIS subdocuments**

You can place different documents into one large drawing (e.g. details of different parts of a city, resulting into 1 large city plan), or to use a plan drawing as a "background". You can link multiple (large) documents together, assuming the documents are too large to cut and paste them together using traditional methods. The result is that it looks on the screen as if it is one large drawing.

---

## ***Pythagoras CAD+GIS Geocoding***

When using codes on the field, Pythagoras CAD+GIS can create automatically lines and symbols.

The type of the symbol, line style, layer, colour, etc. ... is defined by the code.

The user can define his own codes.

A few possibilities:

- An unlimited number of lines can be left open in the field. The user has not to remember line numbers.
- An unlimited number of points per polyline can be used.
- Automatic creation of parallel lines
- Codes for points in the extension of, left of, right of,... can be defined
- Codes for curves, arcs, rectangles
- Symbols can be orientated according to the direction of a line or arc
- Automatic generation of text (height, point number, information, ...).
- Codes for hidden or inaccessible points

Pythagoras CAD+GIS also offers you the possibility to adjust polygon data automatically during the import of field data. A user has the choice between :

- No adjustment
- 2D adjustment only
- 3D adjustment

The above adjustments are executed following the rules of Bauditch and a complete adjustment report will be generated.

## ***Pythagoras CAD+GIS DTM***

### Digital Terrain Model

- Delaunay triangulation.
- Correction possibilities:
  - Setting the area in which the calculation has to be done
  - Breaking lines. Even arcs and circles can be breaking lines.
  - Removing boundary triangles based on side length criteria.
- In one drawing, 256 DTM's can be calculated. For example existing situation and projected.
- Up to 2 million points per DTM
- Up to 500 000 break lines per DTM
- Automatic generation of a detailed report containing error messages when :
  - a. A point on a break line has a different height than the break line itself.

- b. Points have the same coordinates but a different height
- c. Intersecting breaklines

### Volume calculations

The volume (cut and fill) of any region (which may contain arcs) can be calculated.

The volumes are either calculated between:

- DTMx and a horizontal level.
- The difference between DTMx and DTMy.

Calculation method : numerical integration. The precision can be set.

The result of the calculation contains: (1) cut and (2) fill. The intermediate results of the calculation can be saved in a text file.

### Contour lines

Once a DTM is calculated, Pythagoras CAD+GIS can generate the contour lines. Line type, layer, colour, equidistance can be defined.

These contour lines can be linear or B-splines with a varying curvature factor between 1 and 10.

### Cross section/profile

- Xsection perpendicular to a path or profile along a path : the cross section/profile of a Digital Terrain Model can be calculated and will be put on the Pythagoras CAD+GIS clipboard. The result can be pasted in an existing drawing or in a new one.
- Automatic generation of multiple Xsections perpendicular to a path : the resulting Xsections will be pasted in a new drawing.
- Reference objects can be added to a Xsection or profile

### 3D-view

By defining the position of the camera and a viewpoint, Pythagoras CAD+GIS will generate a perspective view (line or raster model). The result can be stored in a drawing.

### Batter/Slope calculation

The connection of the batter lines with any DTM or a horizontal plane can be calculated.

One side of the batter is a path (a sequence of lines and/or arcs). The upward and downward inclination can be specified separately.

### 3D Area calculation

The 3D area of a polygon covered by a DTM can be calculated.

### Colorising

---

A DTM area can be colorised. Different colors will be given depending on heights or slopes.

### ***Pythagoras CAD+GIS Road Design***

This option, completely integrated in Pythagoras, allows the creation of the horizontal alignment of roads. Straight lines, arcs and spirals will be connected fluently. Tangent points will be calculated based on a general design speed.

The vertical curves, may be either parabolas or circles. The user has many options available to design the ideal profile:

- A special control panel : contains chainage, height, inclination and information about the vertical curves.
- Dynamic display of the cross section at the position of the cursor in the profile
- Reference objects (points, lines, ....) can be selected in the plan window and put in the profile window. This allows the user to view objects to be taken into account during the design of the profile.
- The radius and the length of the vertical curve can be set.
- Cross sections can be defined (similar to the creation of symbols) and their position (chainage) can be defined in the profile window.

Pythagoras CAD+GIS will generate drawings containing all details (existing terrain, project, vertical curves, plan information, reference objects) of the profile and of the cross sections.

Pythagoras CAD+GIS can calculate the earthwork (cut and fill) of roads with results separated in volumes of the general cut and fill and volumes of the topsoil.

- Daylighting of :
- axis of the road
  - main points of typical section
  - slope intercept points

### ***Pythagoras CAD+GIS Raster Images***

Raster- en vector information can be combined in the same drawing. Regarding the colour depth : monochrome, 256 colours and 24-bit colours are supported. One drawing can contain 64k raster images. This allows you to map large areas using scanned images like cadastral maps, topographical maps, ... Images can be put in a drawing in real dimensions or in paper dimensions.

(GEO)TIFF, JPEG and BMP formats are supported. On each image the following operations are possible:

- move
- rotate
- scale (x- and y direction)
- intensity : 0 - 100 %
- transparent
- always horizontal

- colour (only monochrome images).
- Erase parts of the image using an eraser or a lasso
- clipping: the inside or the outside of a polygon/rectangle will be erased (vector/raster/vector+raster information)

Pythagoras CAD+GIS can export a BMP or JPEG from your imported and edited image.

The calculation “Transformation” allows to work on a raster image in real coordinates. This allows to copy and paste vector information from other drawing over the raster image, or inverse to digitise part of the raster image, and to copy it in another drawing.

The images can be plotted together with the vector information.

## ***Pythagoras CAD+GIS Pro***

This module contains the options GIS and VBA :

### GIS

Pythagoras CAD+GIS can contain an internal database.

Those data can be used to :

- create thematic maps
- define spatial queries
- mail merge
- analysing, reporting and exporting situations
- ...

It's a unique concept since the GIS module works inside of the traditional CAD environment. The database structure can be created and managed. ASCII or SHP files can be directly imported.

A more detailed description of the GIS module can be found in the Pythagoras GIS+CAD product description.

### VBA

Pythagoras CAD+GIS gives access to its objects for programming with VBA (Visual Basic for Applications). Using VBA, you can program routines that automate operations in Pythagoras. These applications can be activated using a macro and it is even possible to create personalised menus in Pythagoras. Tools (using ODBC) are available to link with external databases like Access, Oracle, ... in order to create a personal GIS environment.

Own forms can be designed with Pythagoras CAD+GIS VBA.

---

## Main advantages of Pythagoras

Pythagoras CAD+GIS is a very “modern” CAD program specially designed for topographical applications (land surveyors, road design, city planning, ...). This specialisation allows the user to get work done much easier and faster than with any other tool or any other general purpose CAD program.

Besides, Pythagoras CAD+GIS uses several new user interface techniques not found in other programs. Because these techniques are not generally known, you really need to see Pythagoras CAD+GIS working to get a feeling of the advantages.

### 1) Pythagoras CAD+GIS is a real Windows 32-bit & Power Macintosh program.

- These graphic environments allow to use a large variety of peripherals (display, printers, ...) with a minimum of compatibility problems. No new software release is required when the computer system is upgraded.
- Simple and consistent user interface
- Multiple applications can be run simultaneously. The results of specific calculation programs can be imported in Pythagoras.

Pythagoras CAD+GIS is the only CAD program specifically designed for topographical use available under Windows and Macintosh.

### 2) Pythagoras CAD+GIS integrates in one program all the specialised calculating and drawing functions.

- Integration of specialised calculation functions
- Specific drawing functions adapted to the needs of surveyors
- Special user definable line styles and symbols. (paper or real dimensions)
- ...

### 3) Intelligent "snapping" with indication of geometric relations.

- Lines : perpendicular on another line, arc or circle. Tangential line to arcs and circles.
- Points : snapping to other objects, points on 1/2, 1/3, ... of a line or arc.
- Arcs : perpendicular on a line or arc. Arc tangential to line, arc or circle.

### 4) Context-sensitive input fields.

When during the creation of objects, there is either no snapping or snapping without a geometric relation (for example, the endpoint of a line is on another line), the control panel will present only those fields which are relevant in the given context.

This way the user can create on very simple way constructions that require complex manipulations in other CAD programs.

### 5) User friendly

- Pythagoras CAD+GIS is easy to learn and easy to use.
- Very productive also for the occasional user.
- Detailed manuals and training videos are available

## Pythagoras CAD+GIS : short overview

Pythagoras CAD+GIS is a state-of-the-art integrated surveying and CAD program designed specifically for surveyors and civil engineers. It is not merely a front end tied to a complicated general-purpose CAD program.

Pythagoras CAD+GIS works and thinks like surveyors and civil engineers, which makes it extremely intuitive and easy-to-use.

But don't let its ease-of-use fool you. Pythagoras CAD+GIS was designed to perform highly accurate design and survey geometric calculations. It provides unique and powerful drafting functionality to specifically address the critical production issues faced by surveyors and civil engineers.

- Object snapping and context-specific input fields provide a consistent user interface for all geometric construction functions.
- Use any of the built-in **CoGo functions** : intersection, resection, best fit, etc.
- Define **multiple coordinate** systems.
- Create **custom mapping symbols, line types and hatch patterns**.
- Complete site layout including stake-out reports.
- **Transform** (rotate, scale and translate) project data between any coordinate system, using two or more known points.
- Create **Digital Terrain Models** from elevation points and break lines and curves.
- Automatically draw **contour lines**, calculate slope intercepts.
- Calculate accurate **volumes** between two DTM surfaces or from a DTM to a known elevation. Experiment with different layouts quickly and easily to find the perfect design.
- Visually verify accuracy with a **3D view** of your site or project.
- Download from and upload to industry leading data collectors and total stations.
- Let Pythagoras CAD+GIS draw parts of your job. If you incorporate field commands as you collect data, Pythagoras CAD+GIS can automatically draw lines, curves, etc. Pythagoras CAD+GIS can even separate data into layers, helping you organize your job quickly.
- Import and Export **ASCII, DXF, DWG, SHP** and other industry standard formats.
- Import, view, scale and plot **raster images**. It provides an ideal backdrop for mapping, design and land planning functions, and perform heads-up digitizing.
- Use the **Road Design** module to design roads, streets, multi-lane highways, and more. Generate full reports including cut and fill volumes, staking points, profiles and cross sections. Perform sophisticated mass haul analyses.
- Pythagoras CAD+GIS is customizable through programming with Visual Basic for Applications (**VBA**).
- Pythagoras CAD+GIS supports all MS-Windows graphic **plotters and printers**.

- Support of the Western, Greek, East-European, Arabic and Thai character sets
- Pythagoras CAD+GIS is the only program of its kind that supports both **MS-Windows** (2000 or XP) and the **Apple Macintosh** (OS X) platform.

## Pythagoras' Philisophy

Pythagoras of Samos (569 - 475 BC), a Greek mathematician and philosopher is credited with discovering the Pythagorean Theory. Historians now believe the Babylonians knew of this relationship a thousand years earlier, but Pythagoras was the first to prove it mathematically. At any rate, Pythagoras, and his followers, the Pythagoreans, did much to advance the principles of mathematics, especially triangular relationships, which are used daily by surveyors.

The computer program "Pythagoras" is a CAD application for surveyors, civil engineers, construction companies, town planners, etc.... The developers of Pythagoras CAD+GIS wanted a unique program that would make it easy for land development professionals to create drawings quickly and conveniently.

Pythagoras CAD+GIS can be used for the design of new projects such as roads, railways, dams, bridges, towns, ... The program provides adequate information about projects : volumes, areas, lengths, geometry and easy links with graphical information of the terrain supplied from photographs, maps, DTM models and other Cad programs.

Pythagoras CAD+GIS is a tool for any company that contributes to a sustainable development. Based on available terrain data from a land surveyor, a GIS or GPS source, Pythagoras CAD+GIS users can optimize Pythagoras CAD+GIS for the geometric presentation of projects.

Pythagoras CAD+GIS works and thinks like surveyors and civil engineers, which makes it extremely intuitive and easy-to-use. But don't let its ease-of-use fool you. Pythagoras CAD+GIS was designed to perform highly accurate design and survey geometric calculations. It provides unique and powerful drafting functionality to specifically address the critical production issues faced by surveyors and civil engineers.

Pythagoras CAD+GIS is a stand-alone CAD product, developed by the Belgian company ADW Software ([www.pythagoras.net](http://www.pythagoras.net)) that runs on Apple Macintosh and Microsoft Windows platforms.