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Quick guide

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GEUP 3D is an interactive geometry software for math calculation and visualization. Designed to be easy to use, it is a powerful and versatile mathematical environment. With GEUP 3D you can study graphically a general problem and obtain dynamically its particular cases. This property together with its calculation capability, enables you to study problems of different areas of Mathematics like Calculus, Algebra.

GEUP 3D is the equivalent one to GEUP (the plane geometry software) in the 3D space.

Installation and System requirements

Minimum requirements

- Microsoft Windows® 7 or previous (Windows Vista, XP, 2003, 2000, NT4, ME, 98, 95)
- Pentium® Processor 133MHz (1GHz for Windows 7, Vista or 300 MHz for Windows XP)
- 1 Gb RAM for Windows 7/Vista or
256 Mb RAM for Windows XP, 2003, 2000 and NT4 or
64 Mb RAM for Windows ME, 98 and 95
- 16-bits 65536 colors video card - 640x480
- 10 Mb of free hard disk space for electronic distribution and
30 Mb of free hard disk space for physical distribution.
- Mouse or compatible pointer
- CD-ROM/DVD-ROM drive (physical distribution)
- Adobe Acrobat Reader® 3.0 or higher (required to read the manuals in PDF format)

To install **GEUP 3D**, download and run `geup3di.exe` and follow the instructions.

Basic concepts

Overview

The main purpose is to help in the study of Geometry through the computer. The user can carry out geometric constructions in the 3D space.

The fundamental thing is that you can modify the position and other geometric properties of the elements of the construction. The established mathematical relationships between the elements through the construction tools will be preserved: when an element is moved, the construction will be reformed by maintaining these relationships. This property is the most important feature of GEUP 3D: you can obtain many particular cases of a construction quickly, being able to verify geometric properties about any construction.

It is possible to study problems of Analytic Geometry, together with the capability to calculate and plot functions enhances its application in other areas of Mathematics.

You can modify the appearance of any element of the construction.



Move or edit elements

To move or edit construction elements, activate the option [Edit][Move, edit] or 'click' on its button on the construction toolbar.

To edit an element, detect it and 'click' it with the right button, the edit box will be activated.

To move an element, detect/'click' it and move it. If we move a geometric element, the coordinates of the element not vary its z value (the element will be translated by a parallel vector to the plane oxy).

(to avoid rapid movements, the axis oz should not be parallel to the plane of the view(screen), to avoid this you can rotate the view until the axis z is not parallel to the plane of the view)

If the 'Shift' key is down, the element will be translated by a parallel vector to the axis oz.

To 'rotate the view', 'click' with the left button on a free position and move.

To 'move the screen', 'click' with the right button on a free position and move.

To 'zoom the screen', 'click' with the left and right button on a free position and move.



Edit element

The appearance of the elements is defined by its color, shape (the names, text and numbers by its fonts), by its name and visibility.

To activate the edit box there are three different ways:

- a) Through the option [Move, edit]: detect and 'click' with the right button on the element to edit.
- b) Activate the option [Edit][Edit element] or through its button on the construction toolbar, and detect and 'click' on the element to edit.
- c) If the [Construction list] is visible: double 'click' on the line text that represents the element in the list.



Eliminating elements

It is possible to eliminate an element through the option [Edit][Eliminate element] or by activating its button on the toolbar, then detect/'click' on the element to eliminate.

If an element is eliminated, all the elements that depends on it will also be eliminated.



Hide/View

It is possible to hide a visible element through the option [Edit][Hide/View] or through its button on the toolbar, then detect/'click' on the element to hide.

To show a hidden element, the option [Show hidden elements] must be activated, then activate the option [Hide/View] and 'click' on the element.

The option also changes the visibility of a previously selected group of elements.



Move screen

Activate the option [View][Move screen] to move the plane of the view, also through its toolbar button.

Then 'click' with the left button on the visualization plane and move the mouse; the visualization plane will change by a translation specified by a parallel vector to the visualization plane.

If the 'Ctrl' key is down only the elements represented by text will move on the visible area.

To 'rotate the view', 'click' with the right button on a free position and move.
To 'zoom the screen', 'click' with the left and right button on a free position and move.



Zoom

Activate the option [View][Zoom] (or through its toolbar button) to zoom in/out the visualization plane.

Then 'click' with the left button on the visualization plane and move the mouse up to zoom/in and down to zoom/out.

To 'rotate the view', 'click' with the right button on a free position and move.
To 'zoom the screen', 'click' with the left and right button on a free position and move.



Rotate view

Activate the option [View][Rotate view] (or through its toolbar button) to rotate the visualization plane.

Then 'click' with the left button on the visualization plane and move the mouse; the visualization plane will rotate about a vector where its tail is the origin of the coordinate system.

To 'move the screen', 'click' with the right button on a free position and move.
To 'zoom the screen', 'click' with the left and right button on a free position and move.

Basic construction tools

Point (free/on element/intersection)

Create a free point or a point on element.

Free point:

To create: Move the pencil to a free position and 'click'. The coordinates (x,y,z) of the pencil are represented by three segments that represents the value of the coordinates x,y,z. The negative values are represented by a dashed style.

To modify the coordinate z, press the 'shift' key.

A free point can be moved to any position.

Point on element:

To create: Detect the element (segment, line, ray, circle, plane, polygon, sphere) and 'click'.

The created point will be linked to the detected element and will be able to move to any position on the element.



Intersection points

Create the intersection points of two given elements (segments, lines, rays, circles and their intersections with planes, polygons, spheres) or the intersection of three planes or polygons.

To create: Detect and 'click' on the elements to intersect.



Plot points

Plot points given its coordinates.

To create: Once the dialog box is opened, enter the coordinates (numbers or expressions). 'click' on the button [point] to create each point.

'Click' on the button [OK] to close the dialog box.

Once the points are created, detect and double 'click' on the points to modify its coordinates.



Point with coordinates

Create a point given its coordinates, the coordinates are represented by numeric values created in the construction.

To create:

- 1° Detect and 'click' on the coordinate x.
- 2° Detect and 'click' on the coordinate y.
- 3° Detect and 'click' on the coordinate z.



Segment

Construct a segment given two endpoints.

To create: Detect the first point and click, detect the second point and click. The segment will be able to move if both endpoints are free points.



Vector

Construct a vector given two endpoints.

To create: Detect the first point (origin) and click, detect second point and click.

The vector will be able to move if both endpoints are free points.



Line

Construct a line given two points.

To create: Detect the first point and 'click', detect the second point and 'click'. The line will be able to move if both endpoints are free points.



Ray

Construct a ray given two points.

To create: Detect the first point and 'click', detect the second point and 'click'. The line will be able to move if both endpoints are free points.



Circle

Create a circle by three given points or a circle by a given point and given the perpendicular line to the plane defined by the circle through its center.

Circle by three given points:

To create: Detect and 'click' on the three points of the circle.

Circle by a given point and given the perpendicular line to the plane defined by the circle through its center:

To create: Detect and 'click' on the point of the circle and the line (segment, vector, line, ray).



Intersection line

Create the intersection line of 2 planes or the intersection circumference(circle) of 2 spheres or the intersection circumference(circle) of a plane and a sphere.

Intersection line of 2 planes:

To create: Detect and 'click' on the 2 planes.

Intersection circumference(circle) of 2 spheres:

To create: Detect and 'click' on the 2 spheres.

Intersection circumference(circle) of a plane and a sphere:

To create: Detect and 'click' on the sphere and the plane.



Plane

Construct a plane by three given points.

To create: Detect and 'click' on the three points.



Polygon

Construct a polygon given its vertices.

To create: Detect and 'click' on each point(vertex) consecutively. To end the construction, detect and 'click' one of the selected vertices.

The polygon will exist when its vertices lies on the same plane.



Regular polygon

Construct a regular polygon given one of its vertices, given the perpendicular line to the plane defined by the polygon through its center (the center of the circumscribed circle) and given the number of sides of the regular polygon.

To create: Detect and 'click' on the first point(vertex) and the line (segment, vector, line, ray), and lastly select the number of sides.



Sphere

Create a sphere given its center and a point on the sphere.

To create: Detect and 'click' on the first point (the center) and detect and 'click' on the point that lies on the sphere.



Regular polyhedron

Create a regular polyhedron (tetrahedron, cube, octahedron, dodecahedron, icosahedron) given one of its vertices, given the perpendicular line to one of the faces formed by the selected vertex and through the center of the face (the center of the circumscribed circle to that face) and given the number of faces of the polyhedron.

To create: Detect and 'click' on the first point(vertex) and the line (segment, vector, line, ray), lastly select the regular polyhedron (tetrahedron, cube, octahedron, dodecahedron, icosahedron).



Locus (curves and surfaces)

Create the locus (described by a point, segment or circle) defined by the movement of a 'point on element' or defined by the variation on a 'parameter' between its maximum and minimum values.

Curve: (generated by a point)

To create:

1° Detect and 'click' on the point that will generate the locus.

2° Detect and 'click' on the 'point on element' or on the parameter.

Surface: (generated by a segment or by a circle)

To create:

1° Detect and 'click' on the segment or the circle that will generate the surface.

2° Detect and 'click' on the 'point on element' or on the parameter.



Midpoint

Create the midpoint of two given points.

To create: Detect and 'click' on the two points.



Mediating plane

Create the mediating plane of a segment defined by its two endpoints.

To create: Detect and 'click' on the two points.



Parallel

Create a line through a given point and parallel to a segment, vector, line, ray or create the plane through a given point and parallel to other plane or polygon.

Line:

To create:

1° Detect and 'click' on the point that lies on the line.

2° Detect and 'click' on the element (segment, vector, line, ray) parallel to the created line.

Plane:

To create:

1° Detect and 'click' on the point that lies on the plane.

2° Detect and 'click' on the plane or polygon parallel to the created plane.



Perpendicular

Create the line through a given point and perpendicular and passing through a segment, vector, line, ray or create the line through a given point and

perpendicular to a plane or polygon or create the plane through a given point and perpendicular to a segment, vector, line or ray.
The line through a given point P and perpendicular to other line r' and passing through r' will exist if the point P not lies on the line r' .

Line:

To create: Detect and 'click' on the point that lies on the line and on the element (segment, vector, line, ray, plane, polygon) perpendicular to the created line.

Plane:

To create: Detect and 'click' on the point that lies on the plane and detect the element (segment, vector, line, ray) perpendicular to the plane, then press the 'Ctrl' key and 'click'.

Numeric tools



Length/distance

Calculate the following measures:

Length of a segment, vector, circle or the perimeter of a polygon.

To create: Detect and 'click' a segment, vector, circle or polygon.

Distance point-point, distance point-line, distance point-plane, distance line-line.

To create: Detect and 'click' the two elements.



Angle

Calculate the measure of an angle given by 3 points.

To create: Detect and click three points that define the angle, the second point will be the vertex.



Area

Calculate the area determined by a circle, polygon, sphere or regular polyhedron.

To create: Detect and 'click' the element.



Volume

Calculate the measure of the volume determined by a sphere or regular polyhedron.

To create: Detect and 'click' the element.



Coordinates

Create the coordinates of a point.

To create: Detect and 'click' the point.



Calculate

Calculate the result of a mathematical expression through numbers (entered by the keyboard or by numbers created in the construction). You will be able to use the result in other construction step.

It works like a calculator:

- Enter the numerical values with the keyboard.
- Detect and click on the variables (numbers(a,b,c,d,...))
- Enter the operations with the buttons or with the keyboard.
- To obtain the result click on the [=] button.
- To use the result on the construction, click the result and drag the number to an appropriate position. You can edit the number to add it a name or description.

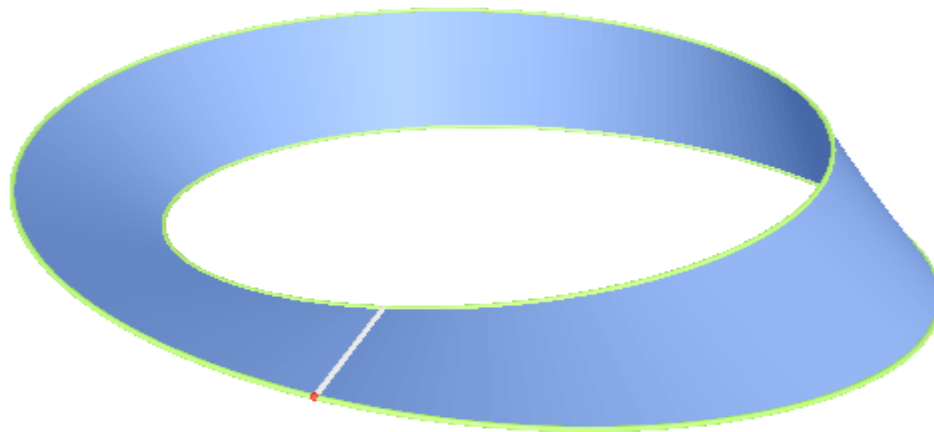
If you have created a number by using variables and these variables changes, the created number will be calculated again.



Parameter

Calculate the result of a mathematical expression as with the tool calculate. If we create the number(drag the result to the plane), it will be a parameter we can modify (detect and double 'click'). This shows its edit box.

It is possible to modify directly the parameter or change its value with the track bar or to change its maximum and minimum values.



Geometric transformations



Central symmetry

Create the symmetrical image of an element by a given point (symmetry center).

1º Detect and 'click' on the element to transform (point, segment, vector, line, ray, circle, polygon, plane, sphere).

2º Detect and 'click' on a point (symmetry center).



Axial symmetry

Create the image of an element defined by an axial symmetry.

1º Detect and 'click' on the element to transform (point, segment, vector, line, ray, circle, polygon, plane, esfera).

2º Detect and 'click' on the symmetry axis (segment, vector, line, ray).



Reflection

Create the image of an element defined by a reflection (defined by a plane).

1º Detect and 'click' on the element to transform (point, segment, vector, line, ray, circle, polygon, plane, sphere).

2º Detect and 'click' on the plane or polygon.



Translation

Create the image of an element after a translation given a vector.

1^o Detect and 'click' on the element to transform (point, segment, vector, line, ray, circle, polygon, plane, sphere).

2^o Detect and 'click' on the vector.



Rotation

Create the image of an element rotated around an axis a given angular value.

1^o Detect and 'click' on the element to transform (point, segment, vector, line, ray, circle, polygon, plane, sphere).

2^o Detect and 'click' on the axis (segment, vector, line, ray).

3^o Detect and 'click' on the number (angular value).



Translated point given number

Create a point that is obtained moving a point on a path a given distance.

1^o Detect and 'click' on the point to translate.

2^o Detect and click on a 2^o point: [the first point will be translated on the ray(imaginary) through both points].

3^o Detect and click on the number that defines the distance to translate the first point.

Other operations



Text

Create a text on the visualization plane.

To create:

1^o 'Click' on the position of the visualization plane to add the text.

2^o Edit the text in the edit window. It is possible to change the window size.

3^o 'Click' the button ('OK') to put the text on the plane.

Later the text will be able to be moved freely.

Viewer mode

Activate the menu option [View][Viewer mode].

The purpose of the viewer mode is to optimize the visualization and usage of constructions when its modification is not required.

The viewer mode hides the construction and edition elements of the program interface to maximize the visible area.

If a document is saved with the viewer mode enabled then that document is activated with the viewer mode enabled when it is opened through a command line, this method is useful to publish documents in web pages or to work with multiple documents by using a file manager.



Step by step

Select the menu option [View][Step by step] to view the construction step by step (visible elements) or click on its button on the toolbar or with the keyboard [F2].

Button [>] Step forward.

Button [<] Step back.

Button [|<] First visible element.

Button [>|] Last visible element.

The element for each step is shown blinking. The element type is also named.



List construction

To show the construction list, activate its button on the toolbar or activate the menu option [View][Construction list] or with the keyboard with the key [F3].

It is possible to go up and down through the construction steps, the current element will be selected.

It is possible to Hide/View the hidden elements with its option in the context menu.

To copy the construction to the clipboard, 'click' with the right button on the list and activate the menu option [Copy list to clipboard].

Print the construction

The print dialog box can be activated through the option [File][Print] or through its button in the main toolbar or with the key [Ctrl][p].

The visible area of the visualization plane will be printed.
Select the number of copies.

It is possible to choose the printer, the configuration of the printer and the paper size through the button 'Properties'.

To print, 'click' on the button 'OK'.

Configuration options

General options

It is activated with the menu option [File][Options].

Environment variables

Adapt cursor message color: Choose this option if you usually change the background color.

Background color: If you change the background color, change the color of each element type with the option 'Elements appearance', the color of the hidden elements and the color of the selected elements to make sure that they are visible on the screen.

Hidden elements color: It is advisable to choose a different color to the selected color for each one of the visible elements to be able to distinguish them.

Selected elements color: It is necessary to choose a different color to the selected color for each one of the rest of the elements.

Construction list: It is possible to choose the background color and the font.

Language: It is possible to choose one of the languages included in the directory [languages] of the installation directory.

Construction settings

Coordinate system: It is possible to choose the visibility of the system, its shape and its size.

Projection: It is possible to choose central projection and parallel projection to represent the visualization plane.

Automatic rotation: Select the speed and the direction of the rotation.

Number of decimal places: The numbers will show this number of decimal places on the screen.

Angle unit: You can choose radian(RAD), grad(GRA), degree(DEG).

Elements appearance

Geometric elements appearance: Choose color, size and shape.

Antialiasing: Activate the option 'antialiasing' for the elements without 3-Dim shape.

Fonts: The font of texts, numbers and names.

