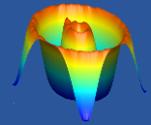


# Info to SimplexNumerica

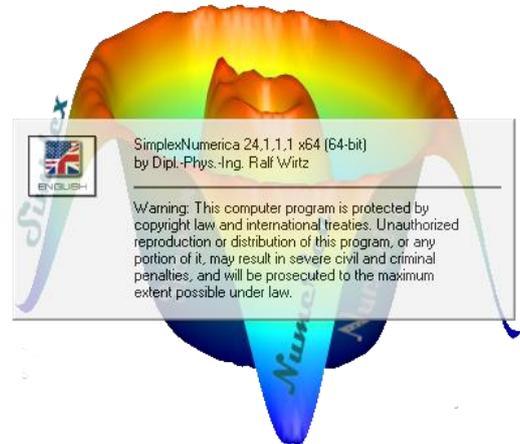
Release Notes for Upgrade V24



This document describes the enhancements and changes of the brand new SimplexNumerica V24 release.

The new V24 version has been developed by focusing on the three-dimensional (3D) part of the program for making high-quality scientific graphics.

In this version SimplexNumerica has more than 100 general types of graphics for 3D data arrays. It can export graphics in various file formats. It is also based on the SimplexGraphics vector interface. It has the easy-to-use data handling functions and the standard scripting language based on AngelScript<sup>1</sup> for automation. It also has several types of transparency and smoothed lighting, true type vector fonts and symbol parsing, an arbitrary curvilinear coordinate system, and many other useful things (see [www.simplexnumerica.com](http://www.simplexnumerica.com)).



## Download

You can download SimplexNumerica V24 for 64-bit Windows 10/11 here (32-bit upon request):

[https://drive.google.com/uc?export=download&id=12z\\_wXzDXBRv9L1nlhg-70lbUV\\_nUGIb8](https://drive.google.com/uc?export=download&id=12z_wXzDXBRv9L1nlhg-70lbUV_nUGIb8)

Then use the 'Live Update' menu item to update within the program. If the program detects during 'Live Update' a major new release version (like V24.x.0.0), then it refers to the main download page:

<https://www.simplexnumerica.com/download/>

... or use the link above to download the updated base version. Here how it works:

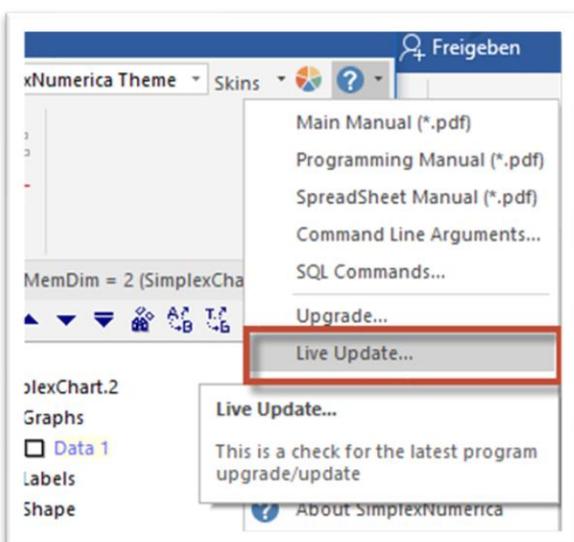
### Live Update (Minor new release version, e.g. V24.0.3.4)

You can make a live update from Pulldownmenu Help -> Live Update...

A 'Live Update' only re-installs the components that have been changed. To do this, however, it needs the right installed base version!

### Upgrade (Major new base release version, e.g. V24.1.0.0)

But, if you do an 'Upgrade...' (see on the left picture the menu point above 'Live Update...'), then it loads the latest version in the user folder and starts the installer. If there was found a previous version, then a message box pops-up with the hint to first de-install the previous version. Let the message box open and go to the Control Panel and **de-install the previous version**. Then go next in the installer procedure...



<sup>1</sup> AngelScript is a powerful object-oriented C/C++ like scripting language from Andreas Jönsson at AngelCode

# Release Notes for Upgrade V24

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## Update third-party libraries

Of course, the program uses external commercial libraries that have been on the market for years. Most recognizable are:

- **BCGControlBar** Pro for the user interface (commercial)  
This library has more than 500 thoroughly designed, tested and fully documented MFC extension classes.  
[www.bcgsoft.com](http://www.bcgsoft.com)
- **The Server Framework** from JetByte (commercial)  
The Server Framework is a C++ framework for writing highly scalable, high-performance Client/Server programs on Windows platforms.  
[www.jetbyte.com](http://www.jetbyte.com)
- **AngelScript** (donation)  
AngelScript is a powerful object-oriented C/C++ like scripting language from Andreas Jönsson at AngelCode  
[www.angelcode.com](http://www.angelcode.com)
- **ChartDirector** (commercial)  
ChartDirector is a professional charting component for windows. It comes with an extensive chart range.  
[www.advsofteng.com](http://www.advsofteng.com)
- **MathGL** (donation)  
A library for making high-quality scientific graphics and for the fast handling and plotting of large data arrays. A code for working in window and console.  
[www.mathgl.sourceforge.net/](http://www.mathgl.sourceforge.net/)
- **Graph** (donation)  
Graph is an open-source application used to draw mathematical graphs in a coordinate system.  
<https://www.padowan.dk/download/>

In order to keep these commercial libraries up to date, we need a commercial version of SimplexNumerica to bring in the money to pay for the libraries. That is SimplexNumerica Pro!

Difference between the Freeware version:

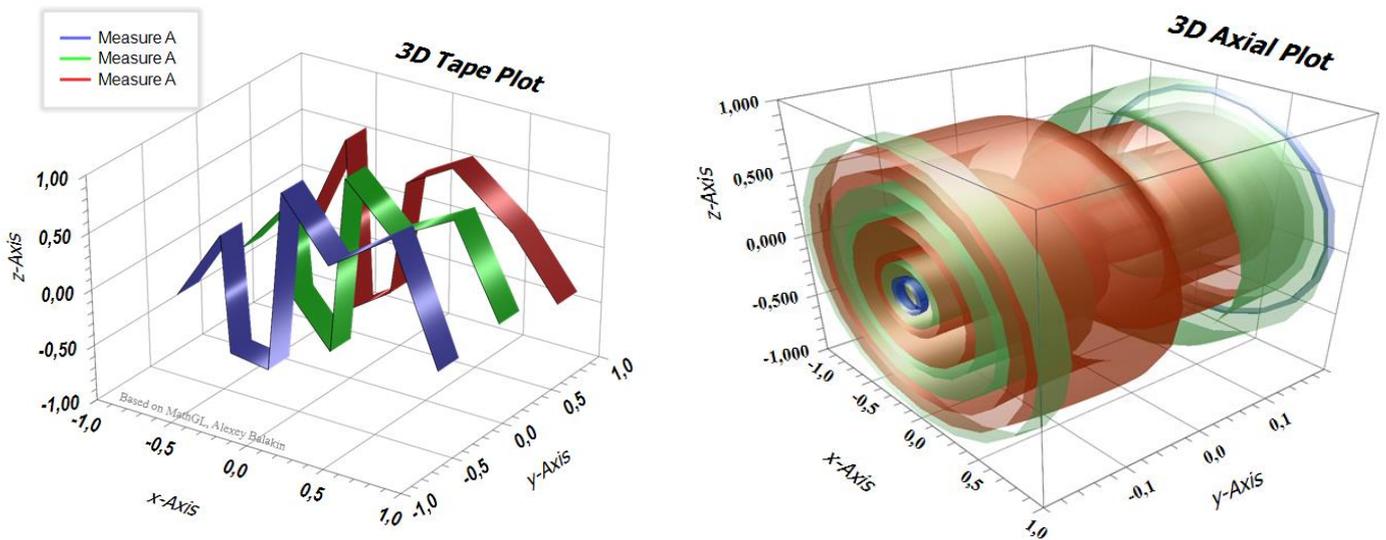
- SimplexNumerica Pro: All functions accessible!
- SimplexNumerica Freeware: The first 30 days are all functions accessible!  
(After this trial period, the commercial charts from these libraries above will be blocked in the Freeware. But the huge number of built-in ones are still free to use - like 2D Physics and 2D Math Charts)

These libraries have been updated to the latest versions.

# Release Notes for Upgrade V24

## 3D Plots

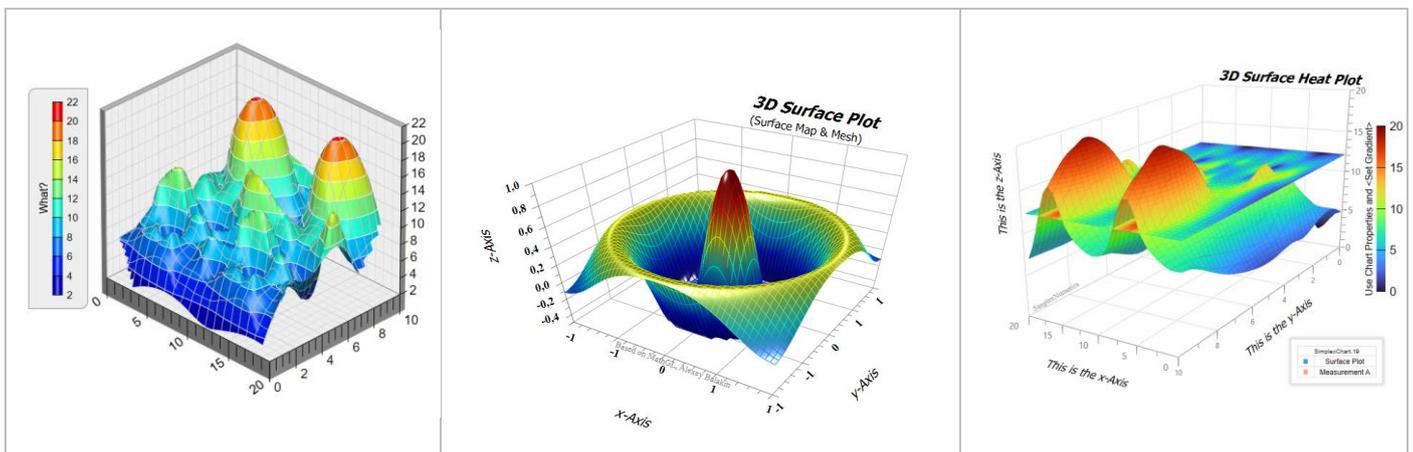
Three-dimensional (3-D) plots can be a useful way to present data that consists of more than two variables. *SimplexNumerica* provides various options for displaying three-dimensional data, like line and wire, surface, mesh plots, and many others. The plots can also be formatted to have a specific appearance and special effects.



Surface plots are charts of three-dimensional data. Rather than showing the individual data points, surface plots show a functional relationship between a designated dependent variable (y-Axis), and two independent variables (x-Axis and z-Axis). The plot is a companion plot to the Contour Plot.

It is important to understand how these plots are constructed. A two-dimensional grid of x and y is constructed. The range of this grid is equal to the range of the data. Next, a z value is calculated for each grid point. This z value is like a weighted average of all data values that are "near" this grid point. But, to make it more precisely, *SimplexNumerica* used a triangulation or interpolation algorithm to find the best approach to the data. The three-dimensional Surface Plot is constructed using these fit values. Hence, the Surface Plot does not show the variation at each grid point. For that, you should use a 3D Scatter Plot.

Here three different chart types for Surface Plots:



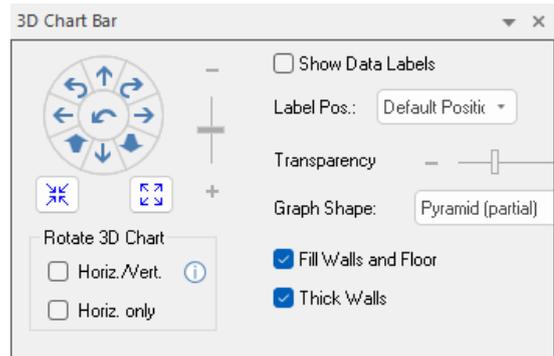
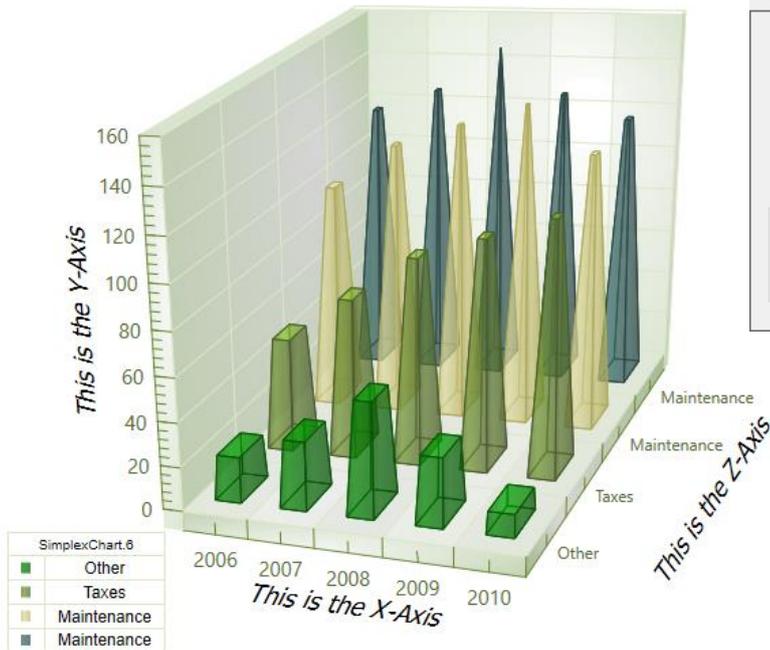
# Release Notes for Upgrade V24

## 3D Chart Bar

SimplexNumerica V24 has a new window for 3D graphics. For example, you can rotate 3D charts freely in the canvas or you can set the transparency, filling walls and floors immediately, etc.

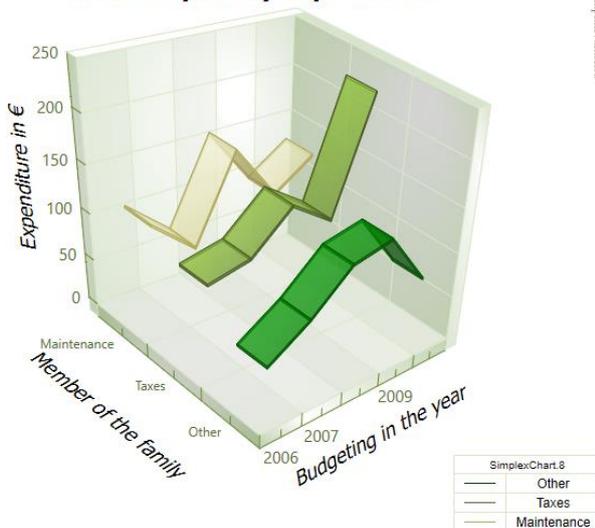
SimplexNumerica

***This is the header (Header 1)***

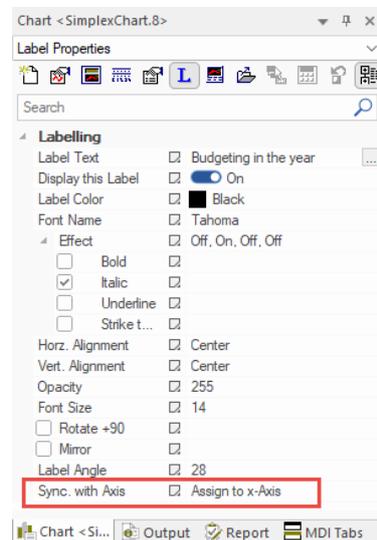


For example, to rotate a chart, click on the 'Horiz. Only' check box, move to the canvas and press the left mouse button to rotate the chart in horizontal directions, only.

### ***Non-compulsory Expenditure***

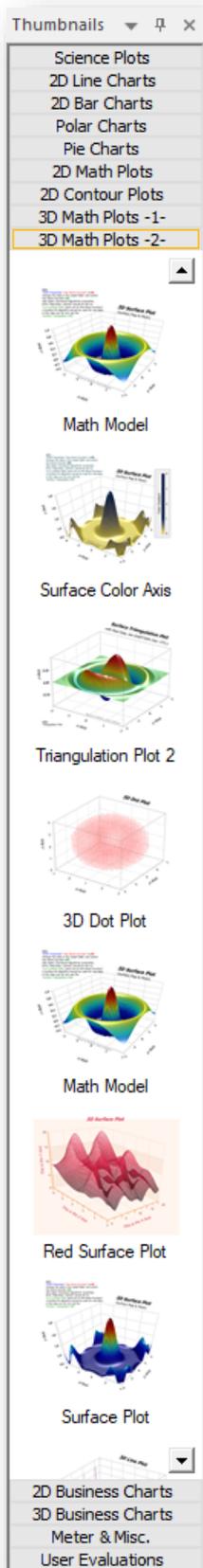


To rotate the axis legend text as well, set the 'Sync. with Axis' property.



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## Demo Mode / Real Mode



To have a nicer impression, *SimplexNumerica* shows - in the Thumbnail Window - some of the pictures based on the demo mode. In demo mode, the data are right generated by a mathematical function, like

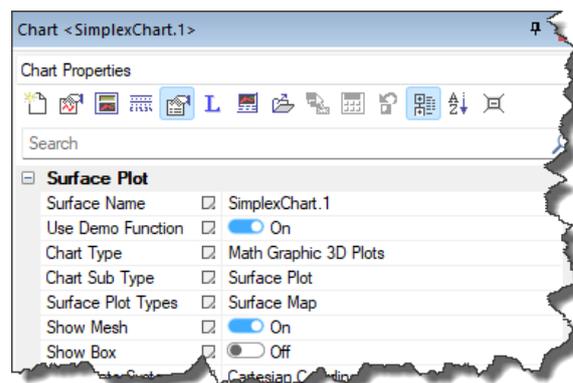
$$f(x,y) = 0.6 * \sin(2 * \pi * x) * \sin(3 * \pi * y) + 0.4 * \cos(3 * \pi * x * y); // \pi = \text{PI} = 3.14$$

Here the Thumbnail Window (expanded in the width) that shows the rubric *3D Math Plots* (page 2)

As you can see, there are many symbols with different settings for a Surface Plot and other related chart types.

To switch-off the demo mode, use the properties:

1. If 'Chart Properties' 'Use Demo Function' is ON



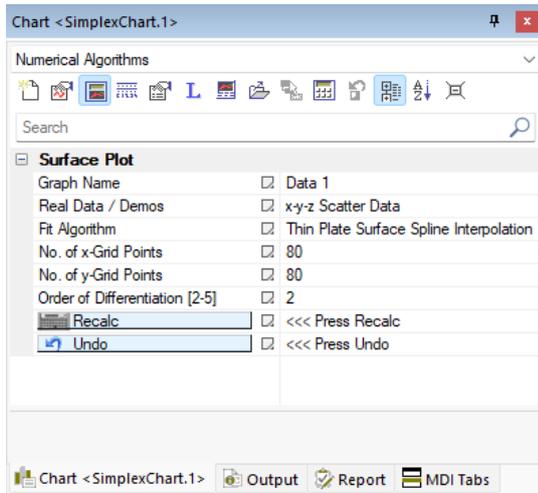
2. Change the data in the GraphTable and then switch the demo function OFF.

Legend	G0.x	G0.y	G0.z
1	-0,997	-0,705	0,4980
2	0,127	0,899	-0,7924
3	-0,613	-0,717	-0,1376
4	0,618	0,810	-0,2752
31	-0,668	0,669	-0,0025
32	0,326	-0,930	-0,7582
33	-0,098	0,034	0,0085
34	-0,296	0,326	-0,0188
35	-0,886	-0,148	0,7631
36	0,215	-0,791	-0,5787
37	0,567	0,899	-0,4866
38	0,605	0,843	-0,3440
39	0,216	0,000	0,0000

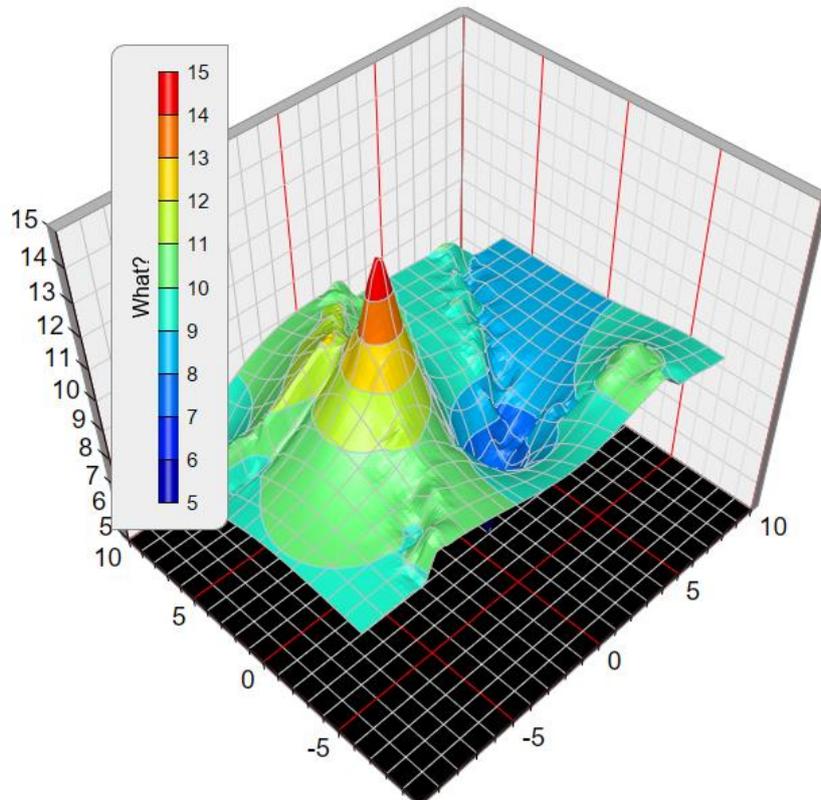
Edit your x/y/z data and go back to the Graphics View (key <F3>)

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3. Select 'Numerical Algorithms' properties.



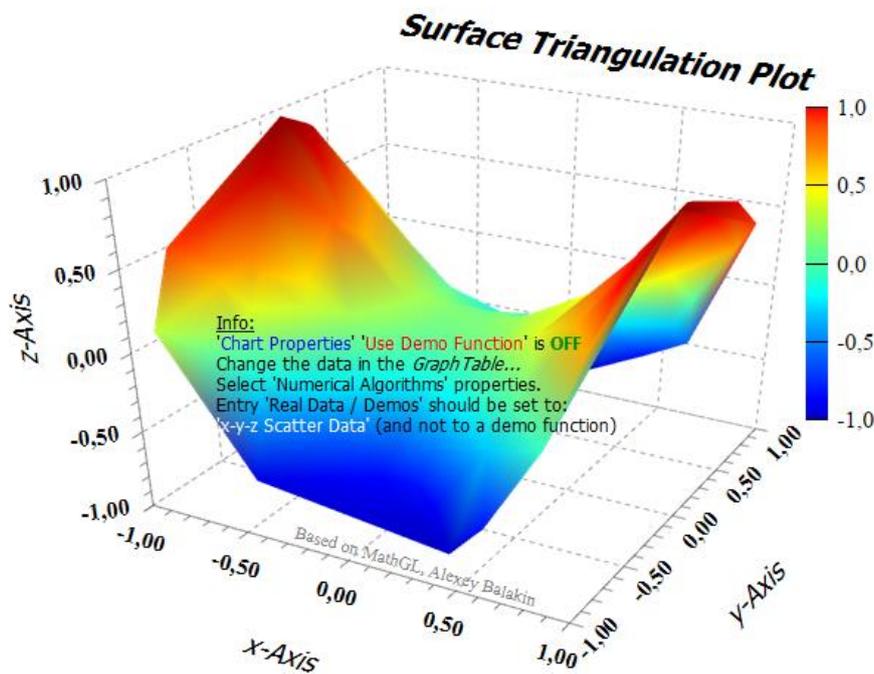
4. Entry 'Real Data / Demos' should be set to: '**x-y-z Scatter Data**' (and not to this demo function)
5. A Surface Fit Algorithm should be used for real data, in the case you do not use the 'Surface Triangulation Plot'
6. Press button '**Recalc**'



This picture above shows real data interpolated by the '**Built-in Spline Interpolation**'

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Another method to fit real data is by using the **'Surface Triangulation Plot'**

By using the 'Surface Triangulation Plot' no interpolation is needed.

A triangulation of a compact surface is a finite collection of triangles that cover the surface in such a way that every point on the surface is in a triangle, and the intersection of any two triangles is either void, a common edge or a common vertex. A triangulated surface is also called tri-surface.

## Data Structure

A surface plot is constructed from three variables. The x and y (independent) variables are shown on the horizontal axes. The z variable is shown along the vertical axis. Note that all three variables are (numeric) real values (in C++ the *double* type).

Here is how *SimplexNumerica* calculates a Surface Plot from a mathematical (demo) function (in C++):

```
//Info: d3_xmin/d3_xmax are the chart border x limits; dto. for y-Axis
// Dim of the Grid Points
long NumberOfXDataPoints = 50; // get this from your program...
long NumberOfYDataPoints = 40;

double d3_xmin, d3_xmax, d3_ymin, d3_ymax;
// get this from your program...

for (long j = 0; j < NumberOfYDataPoints; j++)
{
    double y = d3_ymin + j * ((d3_ymax - d3_ymin) / (NumberOfYDataPoints - 1));

    for (long i = 0; i < NumberOfXDataPoints; i++)
    {
        double x = d3_xmin + i * ((d3_xmax - d3_xmin) / (NumberOfXDataPoints - 1));

        long i0 = i + NumberOfXDataPoints * j;
```

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```
double z = Get3DZValueFromFunction(SelectedSurface, x, y);

//
// Proceed with x, y, z...
//
}
}

double Get3DZValueFromFunction(_tagSurfaceFunctionNames SelectedSurface, double x, double y)
{
    double zValue;

    try
    {
        switch (SelectedSurface)
        {
            case surface_math_a:
                zValue = 0.6 * sin(2 * M_PI * x) * sin(3 * M_PI * y) + 0.4 * cos(3 * M_PI * x * y);
                break;
            case ...
                // more examples....
        }
    }
    catch
    {
        //....
    }

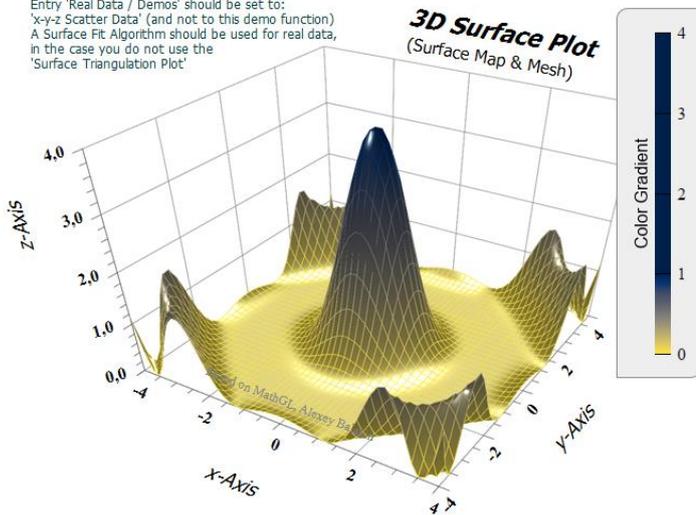
    zValue = __max(zValue, g.surface_interval.d3_zmin);
    zValue = __min(zValue, g.surface_interval.d3_zmax);

    return zValue;
}
```

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## Examples

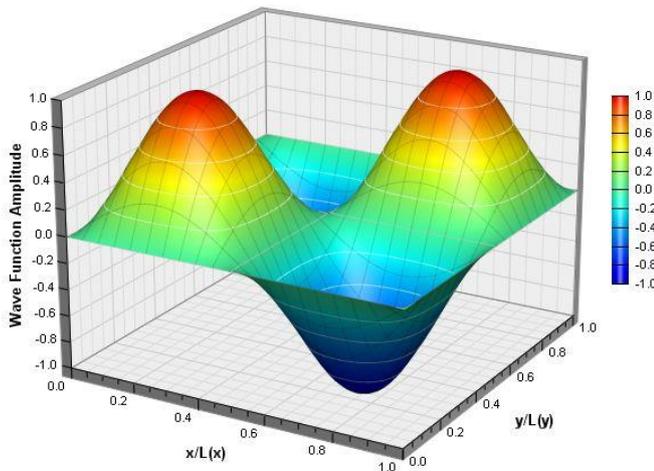
**Info:**  
"Chart Properties" "Use Demo Function" is **ON**  
Change the data in the *Graph Table* and switch the demo function **OFF**.  
Also select "Numerical Algorithms" properties.  
Entry "Real Data / Demos" should be set to:  
'x-y-z Scatter Data' (and not to this demo function)  
A Surface Fit Algorithm should be used for real data,  
in the case you do not use the  
'Surface Triangulation Plot'



Here are some examples of 3D plots integrated into SimplexNumerica, but please have a look at the 3D thumbnail window in SimplexNumerica, there you will find many more 3D variations.

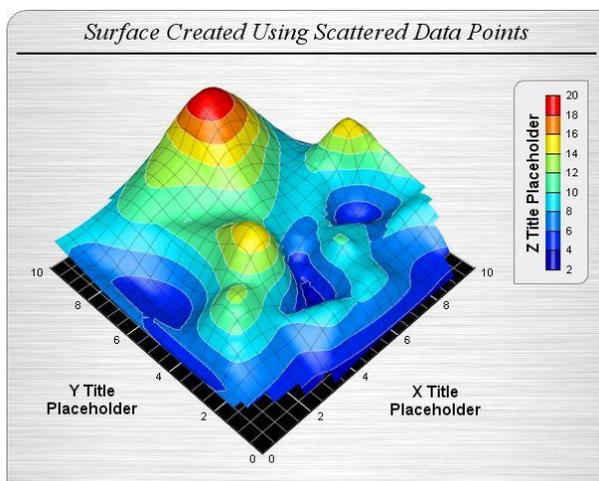
A surface chart with lighting effects. The smooth surface is created using spline surface fitting of the data points.

*Quantum Wave Function*



A surface chart with continuous coloring and lighting effects, and with white contour lines and grey grid lines. The smooth surface is created using spline surface fitting of the data points.

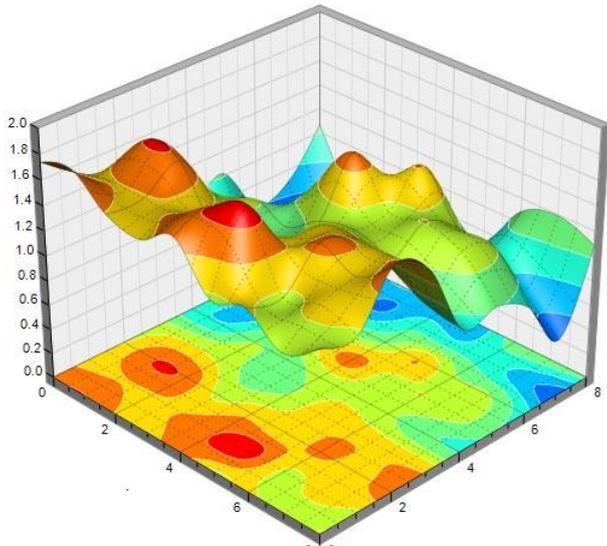
*Surface Created Using Scattered Data Points*



A surface chart created using scattered data (data points are randomly distributed rather than lying on a grid), with the vertical walls hidden.

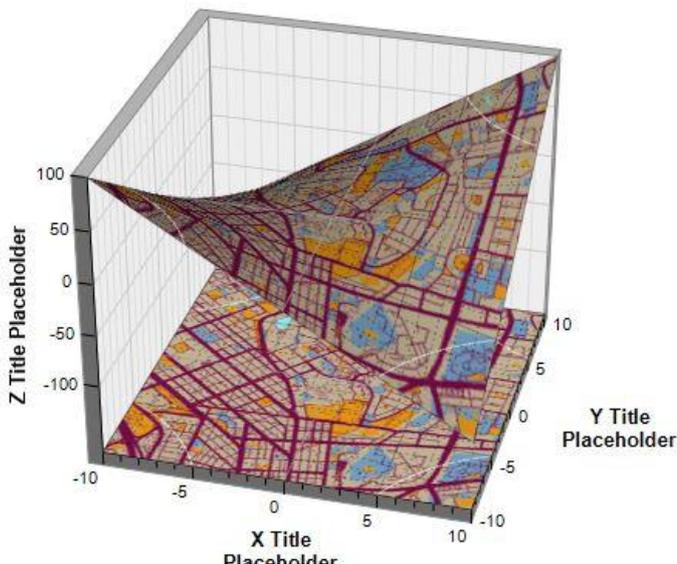
# Release Notes for Upgrade V24

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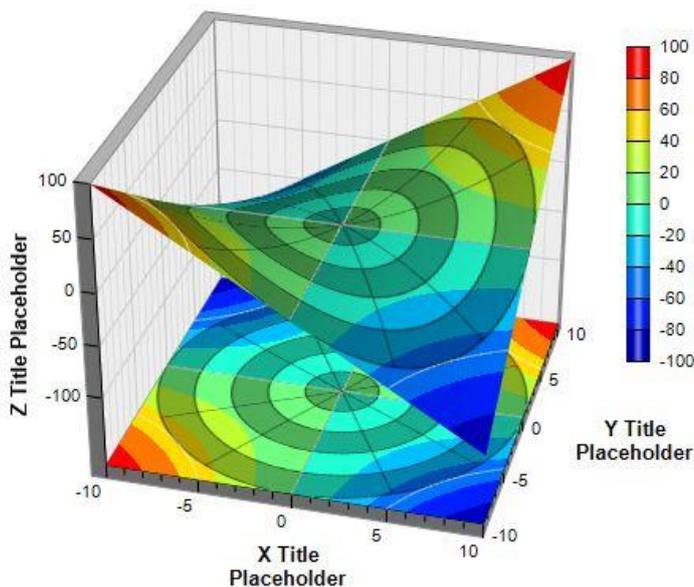
**Image Texture**

**Surface Projection:** The surface can be projected onto the XY plane to visualize the contour chart of the surface.



**Polar Chart Texture**

**Custom Surface Texture:** For maximum flexibility, you can overlay a custom image on the surface. With this method, you can color the surface in any way you like.



**Dynamic Image as Texture:** The texture image can be dynamically generated. In this example, a semi-transparent polar chart is overlaid on the surface.