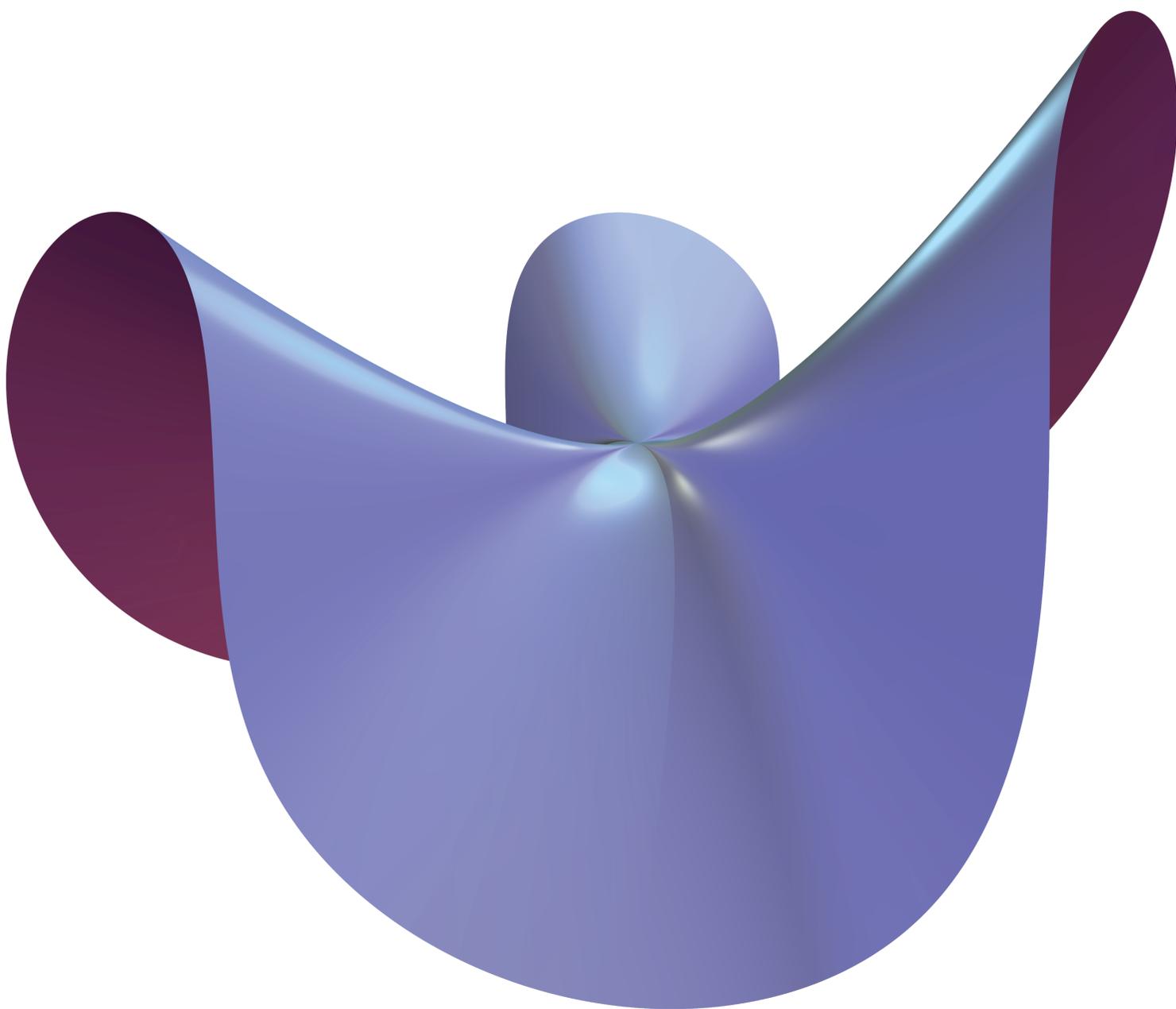


SURFER 2012

VISUALIZATION OF
ALGEBRAIC SURFACES



OVERVIEW

With SURFER you can experience the relation between formulas and forms, i.e. mathematics and art, in an interactive way. You can enter simple equations that produce beautiful images, which are surfaces in space. Mathematically, the programme visualizes real algebraic geometry in real-time. The surfaces shown are given by the zero set of a polynomial equation in 3 variables. SURFER 2012 is a new Java implementation of Surfer 2008 with a new raytracing kernel. It was mainly developed for the exhibitions and museum installations by the Mathematisches Forschungsinstitut Oberwolfach for IMAGINARY and related activities.

BRIEF INSTRUCTION

INTRODUCTION

With SURFER you can create algebraic surfaces through equations. The polynomial equations are given in the variables x , y and z . All points in space that solve the equation are displayed and form the surface. As an example look at $x^2+y^2+z^2-1=0$, the equation of a sphere. You can easily see that the point $(0,0,0)$ is not on the sphere while the points $(1,0,0)$, $(0,1,0)$ and $(0,0,-1)$ for example solve the equation. Note that a polynomial is given by variables with natural exponents, real coefficients and their multiplication and sum.

www.imaginary.org/program/surfer

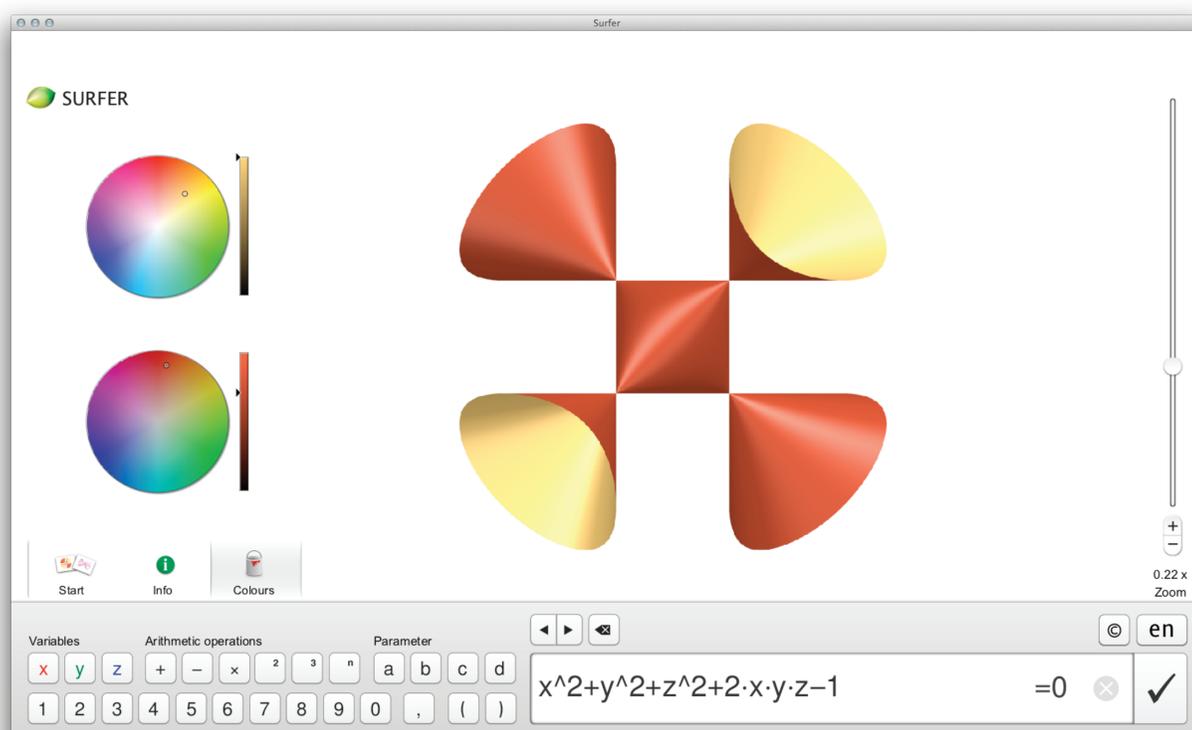
SYSTEM REQUIREMENTS

All systems with Java runtime environment, 256MB RAM, CPU 1.4 GHz or higher. Recommended screen resolution higher than 1024 x 768.

INSTALLATION

Launch the file surfer-setup.exe and follow the installation instructions. Surfer requires the following runtime components which are installed automatically: Microsoft Visual Studio 2005 SP1, GTK+and gtkmm.

Note that the program SURF will be installed along SURFER. The source code and license information can be found on the SURFER page



1. ENTRY OF POLYNOMIAL

The polynomial in the three variables x , y and z can be entered in the text field at the bottom right. If the formula is syntactically incorrect a red exclamation mark (!) pops up on the right hand side of the text field. The surface, i.e. the real zeros of the polynomial, are displayed immediately. Each surface is first shown in lower resolution and after a short time of calculation in high resolution.

6. GALLERY AND INFORMATION

Under menu item Start you enter the gallery of SURFER with a great choice of surfaces available to view with options to change given parameters. All surfaces are provided with additional information. There is a tutorial gallery with an introduction to SURFER and how formulas and forms are related.

7. SAVE, LOAD, PRINT AND EXPORT IMAGES

The buttons Save and Load allow saving and loading the surface as an image in the SURFER file format (.jsurf). The file includes all settings (rotation, zoom, colours, special settings, etc.). With the Export button you can save your image as png file. Resolution settings can be changed in the pop-up menu. With the Print button the image is sent to your default printer. Please consult the technical manual for details on setting up LaTeX, which is needed to display the equation at the print-out.

8. COMMAND LINE SETTINGS

The buttons Save and Load allow saving the surface as an image as SURFER file in jsurf-format. The file includes all

9. SURFER IN SCHOOL

SURFER has been used in interactive teaching. Please visit our website www.imaginary.org for ideas to use SURFER at school

10. SURFER IMAGE COMPETITIONS

We collect nice, creative, interesting, funny images generated with SURFER. Example competitions with prizes can be found on our website. Please send us your creations!

11. SPECIAL SETTINGS FOR SURFER IN MUSEUMS OR AT EXHIBITIONS

There are several command line options to customize SURFER for exhibitions or museum installations.

11.1 LANGUAGE SETTINGS:

By default all languages are displayed in the language selector. If you want to restrict the languages or fix your start language you can use the following command:

```
-Dde.mfo.jsurfer.gui.languages="en,de,es,ru,sr,pt"
```

where *en,de,es, etc.* are the respective languages for english, german, spanish, etc. The first language in the list will be the start language. If you leave the field empty all available languages are displayed with the start language of your system.

11.2 PRINT DISPLAY

To show a pop-up window with a custom text after clicking the print button you can use the following commando:

```
-Dde.mfo.jsurfer.gui.printMessage="textToDisplayDuringPrinting"
```

With this window you can inform visitors that the printing is in process or that they can pick up the print-out at a different place, etc.

11.3 SHOW/HIDE OPTIONS

With the following commands you can show/hide the various buttons, toggle full screen mode at start and show/hide the mouse pointer:

```
-Dde.mfo.jsurfer.gui.showPrintButton=true/false
-Dde.mfo.jsurfer.gui.showLoadSaveButton=true/false
-Dde.mfo.jsurfer.gui.showExportButton=true/false
-Dde.mfo.jsurfer.gui.hideCursor=true/false
-Dde.mfo.jsurfer.gui.fullscreen=true/false
```

As an example see the commando for an English only, full screen exhibition SURFER:

```
javaws -J -Dde.mfo.jsurfer.gui.languages="en" -Dde.
mfo.jsurfer.gui.showPrintButton=false -Dde.mfo.
jsurfer.gui.showLoadSaveButton=false -Dde.mfo.jsurfer.
gui.showExportButton=false -Dde.mfo.jsurfer.gui.
hideCursor=true -Dde.mfo.jsurfer.gui.fullscreen=true
SURFER.jnlp
```

For detailed information and advice on how to use SURFER as an interactive installation in museums or at exhibitions, please refer to the technical installation manual from the SURFER 2008 program. It contains hardware specifications and information on the recommended operating system and printing setup.

Klaus Tschira Stiftung
gemeinnützige GmbH



Mathematisches
Forschungsinstitut
Oberwolfach



MARTIN-LUTHER-UNIVERSITÄT
HALLE-WITTENBERG



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DOWNLOAD UND CONTACT

www.imaginary.org/program/surfer
surfer@imaginary.org

SURFER TEAM

SURFER 2012 is a programme by the Mathematisches Forschungsinstitut Oberwolfach (MFO) in collaboration with the Martin Luther University Halle-Wittenberg. SURFER is part of the travelling exhibition IMAGINARY by the Mathematisches Forschungsinstitut Oberwolfach.

Direction: Gert-Martin Greuel
Programming: Christian Stussak (Java renderer), Maik Urbanek (JavaFX), Henning Meyer (previous version)
Concept, Coordination: Anna Hartkopf,
Andreas Daniel Matt
Design: Christoph Knoth
Concept, Galleries: Oliver Labs
Galleries: Herwig Hauser
Texts: Maria Alberich, Jordi Buendía, Capi Corrales,
Lara May, Anna Sabater and Emilio Sánchez.

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