

[Oberwolfach References on Mathematical Software](#)

This website is in archive mode since 1 August 2021, see [note](#) for details.

[About](#)

[Classification](#)

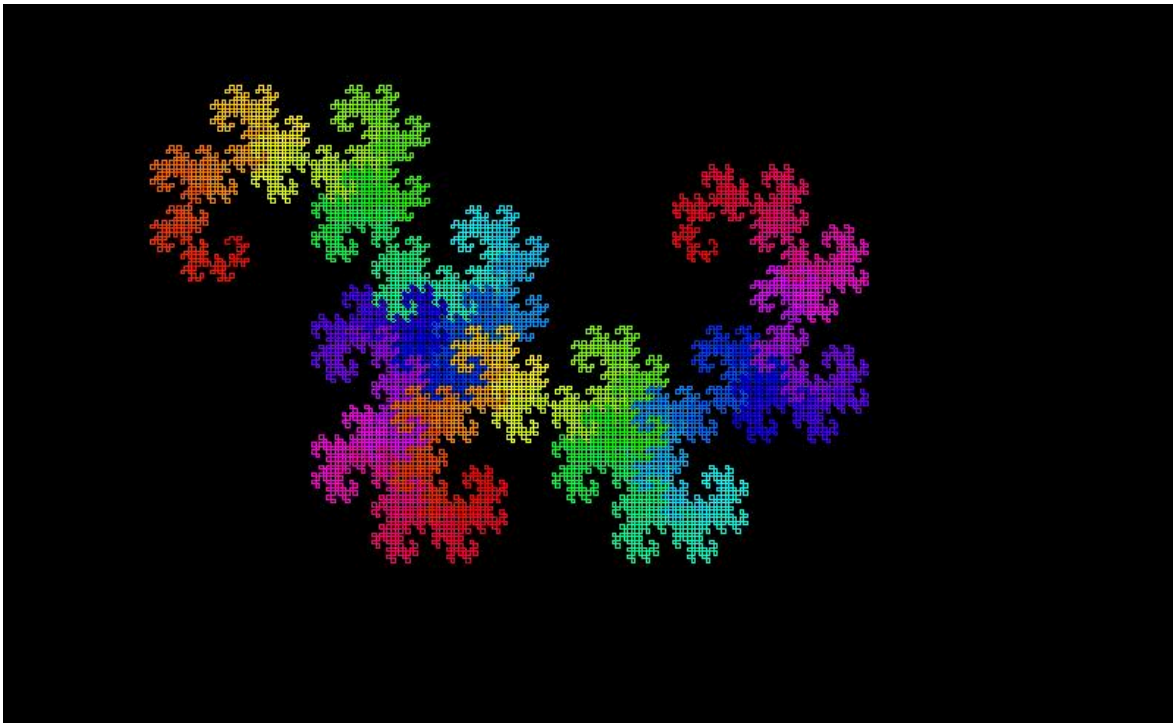
[All Software](#)

[Imprint](#)

## 95 Search Results

### [3D-XplorMath](#)

The primary goal of 3D-XplorMath is to allow users with little or no programming experience to see, with minimal effort, concrete visual representations of many different categories of mathematical objects and processes. To accomplish this, objects from each category are described internally by well-designed, parameterized data structures, and for each category a variety of rendering methods is provided to permit visualization of objects of the category in ways that are appropriate for various purposes. Each of the hundreds of built-in objects known to the program is assigned carefully chosen defaults so that, when the object is selected from a menu, the program can immediately construct a standard example of the object and render it in an optimized view. The user may then use various menus and dialogs to alter the parameters describing the shape and coloration of the object, change the viewpoint from which it is seen, select different rendering methods, etc. Moreover, as its name suggests, the program can display objects such as surfaces, space curves and polyhedra using various stereo techniques. In addition to the many built-in objects known to the program, a user can create "user-defined" objects by entering formulas using standard mathematical notation. Visualizations created by the program can be saved in jpeg and other graphic formats and the data defining 3D objects can be exported to other 3D programs (e.g., Bryce or POV-Ray) in formats such as .obj and .inc. Both built-in and user-defined objects can depend on parameters, and the program can create morphing animations by moving along a path in the parameter space, and these animations can then be saved as QuickTime movies. Each of the built-in objects has associated to it a so-called ATO (About This Object) file that provides documentation for the object. An early and more developed version of the program, written in Object Pascal, runs under the Macintosh Operating System and a Java-based cross-platform version is now also available.



[More information](#)

### [ADOL-C](#)

The package ADOL-C facilitates the evaluation of first and higher derivatives of vector functions that are defined by computer programs written in C or C++. The resulting derivative evaluation routines may be called from C/C++, Fortran, or any other language that can be linked with C. The numerical values of derivative vectors are obtained free of truncation errors at a small multiple of the run time and randomly accessed memory of the given function evaluation program.

[More information](#)

### [ATLAS](#)

The ATLAS (Automatically Tuned Linear Algebra Software) project is an ongoing research effort focusing on applying empirical techniques in order to provide portable performance. At present, it provides C and Fortran77 interfaces to a portably efficient BLAS implementation, as well as a few routines from LAPACK.

[More information](#)

### [Axiom](#)

Axiom is a general purpose Computer Algebra system. It is useful for research and development of mathematical algorithms. It defines a strongly typed, mathematically correct type hierarchy. It has a programming language and a built-in compiler.

[More information](#)

## [CASA](#)

CASA is a special-purpose system for computational algebra and constructive algebraic geometry. The system has been developed since 1990. CASA is the ongoing product of the Computer Algebra Group at the Research Institute for Symbolic Computation (RISC-Linz), the University of Linz, Austria, under the direction of Prof. Winkler. The system is built on the kernel of the widely used computer algebra system Maple.

[More information](#)

## [cdd/cddplus](#)

The program cdd+ is a C++ implementation of the Double Description Method of Motzkin et al. for generating all vertices (i.e. extreme points) and extreme rays of a general convex polyhedron in  $\mathbb{R}^d$  given by a system of linear inequalities.

[More information](#)

## [CGAL](#)

CGAL is a collaborative effort of several sites in Europe and Israel. The goal is to make the most important of the solutions and methods developed in computational geometry available to users in industry and academia in a C++ library. The goal is to provide easy access to useful, reliable geometric algorithms. The CGAL library contains: the Kernel with geometric primitives such as points, vectors, lines, predicates for testing things such as relative positions of points, and operations such as intersections and distance calculation, the Basic Library which is a collection of standard data structures and geometric algorithms, such as convex hull in 2D/3D, (Delaunay) triangulation in 2D/3D, planar map, polyhedron, smallest enclosing circle, and multidimensional query structures, the Support Library which offers interfaces to other packages, e.g., for visualisation, and I/O, and other support facilities.

[More information](#)

## [Cinderella](#)

Cinderella is a software system for doing geometry on a computer. The new version Cinderella.2 also includes physics simulations and algorithmic elements.

[More information](#)

## [CoCoA](#)

CoCoA is a system for Computations in Commutative Algebra. It is able to perform simple and sophisticated operations on multivariate polynomials and on various data related to them (ideals, modules, matrices, rational functions). For example, it can readily compute Grobner bases, syzygies and minimal free resolution, intersection, division, the radical of an ideal, the ideal of zero-dimensional schemes, Poincaré series and Hilbert functions, factorization of polynomials, toric ideals. The capabilities of CoCoA and the flexibility of its use are further enhanced by the dedicated high-level programming language. For convenience, the system offers a textual interface, an Emacs mode, and a graphical user interface common to most platforms.

[More information](#)

## [Convex](#)

Convex is a Maple package for convex geometry. It can deal with rational polytopes, cones and other polyhedra of arbitrary dimension. Polyhedral complexes and fans are also supported, as well as computations in face lattices. The integration into Maple makes Convex particularly suited for "applied" problems where polyhedra arise together with other mathematical structures.

[More information](#)

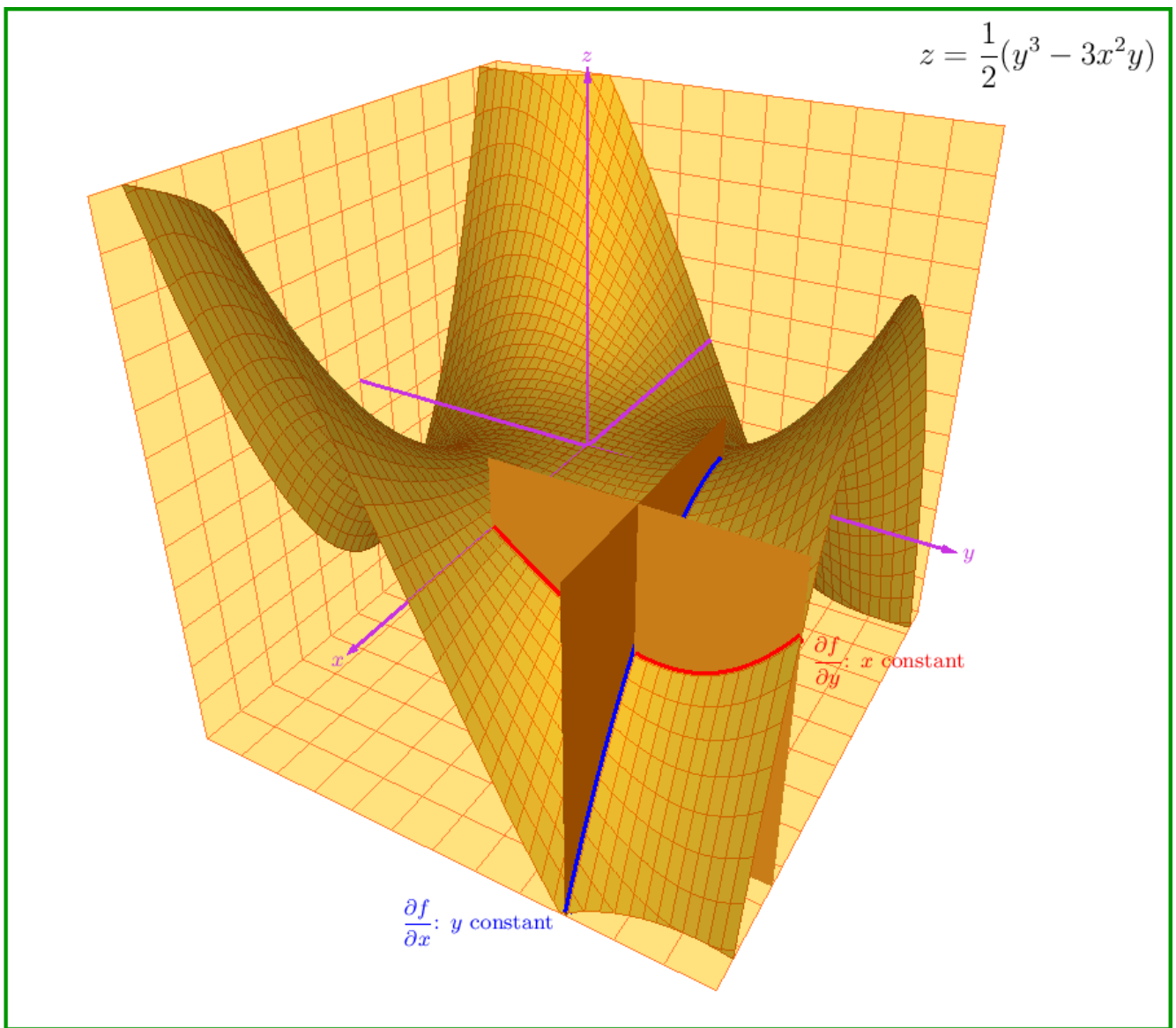
## [emgr](#)

Empirical gramians can be computed for linear and nonlinear control systems for purposes of model order reduction or system identification. Model reduction using empirical gramians can be applied to the state space, to the parameter space or to both through combined reduction. The emgr framework is a compact open source toolbox for (empirical) gramian-based model reduction and compatible with OCTAVE and MATLAB.

[More information](#)

## [ePix](#)

ePiX, a collection of batch-oriented utilities for \*nix, creates mathematically accurate line figures, plots, and movies using easy-to-learn syntax. LaTeX and dvips comprise the typographical rendering engine, while ImageMagick is used to create bitmapped images and animations. The user interface resembles that of LaTeX itself: You prepare a short scene description in a text editor, then compile the input file into a picture. Default output formats are eepic (a plain text enhancement to the LaTeX picture environment), eps, pdf, png, and mng.



[More information](#)

## EViews

EViews supports general statistical analysis and econometric analyses (cross-section, panel data analysis, time series estimation and forecasting). It combines spreadsheet and relational database technology with the traditional tasks found in statistical software. Among its numerous data formats are Excel, databases, PSPP/SPSS, DAP/SAS, Stata, RATS, and TSP. Compatible: numerous formats, including databank format, Excel formats, PSPP/SPSS, DAP/SAS, Stata, RATS, and TSP

[More information](#)

## Fast Artificial Neural Network Library

Fast Artificial Neural Network Library is a neural network library that implements multilayer artificial neural networks in C with support for both fully connected and sparsely connected networks. Cross-platform execution in both fixed and floating point are supported. It includes a framework for easy handling of training data sets. It is easy to use, versatile, well documented, and fast. PHP, C++, .NET, Python, Delphi, Octave, Ruby, Pure Data, and Mathematica bindings are available. A reference manual accompanies the library with examples and recommendations on how to use the library. A graphical user interface is also available for the library.

[More information](#)

## Fermat

Fermat is a super calculator - computer algebra system, in which the basic items being computed can be rational numbers, modular numbers, elements of finite fields, multivariable polynomials, multivariable rational functions, or multivariable polynomials modulo other polynomials. Fermat is available for Mac OS, Windows, Unix, and Linux. It is shareware. The basic "ground ring"  $F$  is the field of rational numbers. One may choose to work modulo a specified integer  $n$ , thereby changing the ground ring  $F$  from  $\mathbb{Q}$  to  $\mathbb{Z}/n$ . On top of this may be attached any number of unevaluated variables  $t_1, t_2, \dots, t_n$ , thereby creating the polynomial ring  $F[t_1, t_2, \dots, t_n]$  and its quotient field, the rational functions. Further, polynomials  $p, q, \dots$  can be chosen to mod out with, creating the quotient ring  $F[t_1, t_2, \dots]/[p, q, \dots]$ . It is possible to allow Laurent polynomials. Once the computational ring is established in this way, all computations are of elements of this ring.

[More information](#)

## FLASH Code

The FLASH code is a modular, adaptive, parallel simulation code capable of handling general compressible flow problems in astrophysical environments. It has been designed to allow users to configure initial and boundary conditions, change algorithms, and add new physical effects with minimal effort. It uses the PARAMESH library to manage a block-structured adaptive grid, placing resolution elements only where they are needed most. It uses the Message-Passing Interface (MPI) library to achieve portability and scalability on a variety of different message-passing parallel computers.

[More information](#)

## **FLINT: Fast Library for Number Theory**

FLINT is a C library for doing number theory.

[More information](#)

## **G+Smo**

G+Smo (Geometry + Simulation Modules, pronounced "gismo") is a new open-source C++ library that brings together mathematical tools for geometric design and numerical simulation. It is developed mainly by researchers and PhD students. It implements the relatively new paradigm of isogeometric analysis, which suggests the use of a unified framework in the design and analysis pipeline. G+Smo is an object-oriented, cross-platform, template C++ library and follows the generic programming principle, with a focus on both efficiency and ease of use. The library is partitioned into smaller entities, called modules. Examples of available modules include the dimension-independent NURBS module, the data fitting and solid segmentation module, the PDE discretization module and the adaptive spline module, based on hierarchical splines of arbitrary dimension and polynomial degree. The library is licenced under the Mozilla Public License v2.0. It has been developed within the homonym research network supported by the Austrian Science Fund and aims at providing access to high quality, open-source software to the forming isogeometric numerical simulation community and beyond.



[More information](#)

## **GAP**

GAP is a system for computational discrete algebra, with particular emphasis on Computational Group Theory. GAP provides a programming language, a library of thousands of functions implementing algebraic algorithms written in the GAP language as well as large data libraries of algebraic objects. GAP is used in research and teaching for studying groups and their representations, rings, vector spaces, algebras, combinatorial structures, and more. GAP is developed by international cooperation. The system, including source, is distributed freely under the terms of the GNU General Public License. You can study and easily modify or extend GAP for your special use. The current version is GAP 4, the older version GAP 3 is still available.

[More information](#)

## **Gauss**

Introduction: Gauss is an easy-to-use data analysis, mathematical and statistical environment based on the powerful, fast and efficient GAUSS Matrix Programming Language. It is used to solve problems of exceptionally large scale. Program development and program execution are fast. Programs in command line mode (as in DOS or Unix); a limited Windows graphical user interface. GAUSS plot features a fully functional, interactive GUI. It can be used as a tool to design their own algorithms, for doing quick simulations, to write compact programs given the number of matrix-based statistical and financial functions, to used for numerical computation, and handle matrices in the same way as scalars. It provides a C-library interface.

[More information](#)

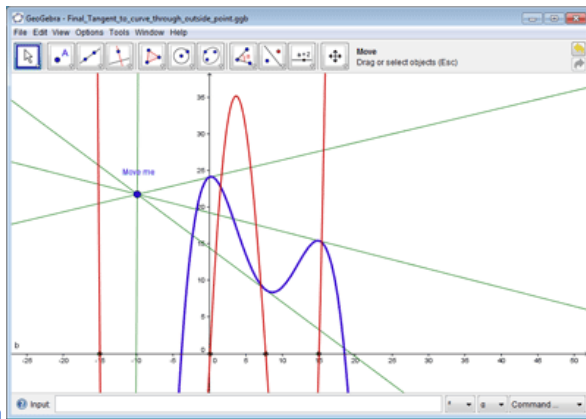
## **GELDA**

GELDA is a Fortran77 software package for the numerical integration of general linear differential-algebraic equations (DAE) with variable coefficients of arbitrary index. The implementation of GELDA is based on the construction of the discretization scheme, which first determines all the local invariants and then transforms the linear DAE into an equivalent strangeness-free DAE with the same solution set. The resulting strangeness-free system is allowed to have nonuniqueness in the solution set or inconsistency in the initial values or inhomogeneities. In the case that the DAE is found to be uniquely solvable, GELDA is able to compute a consistent initial value and apply the well-known integration schemes for DAEs. In GELDA the BDF methods and Runge-Kutta schemes are implemented.

[More information](#)

## **GeoGebra**

GeoGebra is free and multi-platform dynamic mathematics software for all levels of education that joins geometry, algebra, tables, graphing, statistics and calculus in one easy-to-use package. It has received several educational software awards in Europe and the USA. Quick Facts: \* Graphics, algebra and tables are connected and fully dynamic \* Easy-to-use interface, yet many powerful features \* Authoring tool to create interactive learning materials as web pages \* Available in many languages for our millions of users around the world \* Free and open source software



[More information](#)

## GEOMS

GEOMS is a Fortran77 software package for the numerical integration of general model equations (equations of motion) of multibody systems. The code combines a regularization technique with the Runge-Kutta method of type Radau IIa of order 5. This regularization technique reduces the index under preservation of all information of the solution manifold and, therefore, allows a robust numerical integration of the system.

[More information](#)

## GiANT

GiANT is a graphical interface for working with number fields. It dynamically provides the user with typeset information, diagrams, and drag-and-drop functionality. The result is a level of human-computer interaction which is difficult to achieve in a shell environment. GiANT is written in Java 1.4 and runs on top of the computer algebra system KASH 2.5.

[More information](#)

## Givaro

In the joint CNRS-INRIA / INPG-UJF project APACHE, Givaro is a C++ library for arithmetic and algebraic computations. Its main features are implementations of the basic arithmetic of many mathematical entities: Primes fields, Extensions Fields, Finite Fields, Finite Rings, Polynomials, Algebraic numbers, Arbitrary precision integers and rationals (C++ wrappers over gmp) It also provides data-structures and templated classes for the manipulation of basic algebraic objects, such as vectors, matrices (dense, sparse, structured), univariate polynomials (and therefore recursive multivariate). It contains different program modules and is fully compatible with the LinBox linear algebra library and the Athapascan environment, which permits parallel programming.

[More information](#)

## Global Optimization Toolbox For Maple

Optimization is the science of finding solutions that satisfy complicated constraints and objectives. In engineering, constraints may arise from technical issues. In business, constraints are related to many factors, including cost, time, and staff. The objective of global optimization is to find [numerically] the absolute best solution of highly nonlinear optimization models that may have a number of locally optimal solutions. Global optimization problems can be extremely difficult. Frequently engineers and researchers are forced to settle for solutions that are "good enough" at the expense of extra time, money, and resources, because the best solution has not been found. Using the Global Optimization Toolbox, you can formulate your optimization model easily inside the powerful Maple numeric and symbolic system, and then use world-class Maple numeric solvers to return the best answer, fast! Illustrative references: 1. Pintér, J. D. Global Optimization in Action. Springer Science, 1996, 512 p., ISBN: 978-0-7923-3757-7 Winner of the 2000 INFORMS Computing Society Prize. 2. Pintér, J. D., Linder, D. and Chin, P. Global Optimization Toolbox for Maple: An introduction with illustrative applications. Optimization Methods and Software 21 (2006) (4) 565-582.

[More information](#)

## GOBLIN Graph Library

A C++ class library including the whole bunch of standard algorithms in graph optimization and drawing. On top of this, a Tcl/Tk wrapper and a GUI for manipulating and editing of graphs.

[More information](#)

## gretl - Gnu Regression, Econometrics and Time-series Library

Gretl is a statistical package. It was developed mainly for econometrics. It has as well scripting capabilities as an easy intuitive interface. It features a wide variety of estimators, time series methods limited dependent variables. It has several times been applied in the Journal of Applied Econometrics.

[More information](#)

## HiFlow<sup>3</sup>

HiFlow<sup>3</sup> is a multi-purpose finite element software providing powerful tools for efficient and accurate solution of a wide range of problems modeled by partial differential equations. Based on object-oriented concepts and the full capabilities of C++ the HiFlow<sup>3</sup> project follows a modular and generic approach for building efficient parallel numerical solvers. It provides highly capable modules dealing with the mesh setup, finite element spaces, degrees of freedom, linear algebra routines, numerical solvers, and output data for visualization. Parallelism – as the basis for high performance simulations on modern computing systems – is introduced on two levels: coarse-grained parallelism by means of distributed grids and distributed data structures, and fine-grained parallelism by means of platform-optimized linear algebra back-ends.

[More information](#)

## HSL

HSL (formerly the Harwell Subroutine Library) is a collection of ISO Fortran codes for large scale scientific computation, written by members of the Numerical Analysis Group and other experts.

[More information](#)

## IBM SPSS Statistics

With IBM SPSS Statistics, you can get a quick look at your data, formulate hypotheses for additional testing, and then carry out a number of procedures to help clarify relationships between variables, create clusters, identify trends and make predictions.

[More information](#)

## igraph

igraph is a collection of network analysis tools with the emphasis on efficiency, portability and ease of use. igraph is a free and open source software package for creating and manipulating undirected and directed graphs. It includes implementations for classic graph theory problems like minimum spanning trees and network flow, and also implements algorithms for some recent network analysis methods, like community structure search. The efficient implementation of igraph allows it to handle graphs with millions of vertices and edges. The rule of thumb is that if your graph fits into the physical memory then igraph can handle it. igraph can be programmed in R, Python and C/C++ by virtue of R/igraph, python-igraph and C/igraph, respectively. There is also a Mathematica interface IGraph/M written by Szabolcs Horvát.

[More information](#)

## ILOG CPLEX

ILOG CPLEX is an environment for optimization problems. ILOG CPLEX algorithms can be accessed from the CPLEX Component Libraries as well as the CPLEX Interactive Optimizer, an easy-to-use interactive program. CPLEX provides all the basic features and utilities for using these solvers: sophisticated problem preprocessing; file reading and writing utilities; reporting; messaging control; interactive revision capability; efficient restart from an advanced basis; sensitivity analysis; and an infeasibility finder.

[More information](#)

## IML - Integer Matrix Library

IML is a free library of C source code which implements algorithms for computing exact solutions to dense systems of linear equations over the integers. IML is designed to be used with the ATLAS/BLAS library and GMP bignum library. Written in portable C, IML can be used on both 32-bit and 64-bit machines. It can be called from C++.

[More information](#)

## ISAAC

ISAAC (Integrated Solution Algorithm for Arbitrary Configurations) is a compressible Euler/Navier-Stokes computational fluid dynamics code. ISAAC includes the capability of calculating the Euler equations for inviscid flow or the Navier-Stokes equations for viscous flows. ISAAC uses a domain decomposition structure to accomodate complex physical configurations. ISAAC can calculate either steady-state or time dependent flow. ISAAC was designed to test turbulence models. Various two equation turbulence models, explicit algebraic Reynolds stress models, and full differential Reynolds stress models are implemented in ISAAC. Several test cases are documented in the User's Guide.

[More information](#)

## Isabelle

Isabelle is a popular generic theorem prover developed at Cambridge University and TU Munich. Existing logics like Isabelle/HOL provide a theorem proving environment ready to use for sizable applications. Isabelle may also serve as framework for rapid prototyping of deductive systems. It comes with a large library including Isabelle/HOL (classical higher-order logic), Isabelle/HOLCF (Scott's Logic for Computable Functions with HOL), Isabelle/FOL (classical and intuitionistic first-order logic), and Isabelle/ZF (Zermelo-Fraenkel set theory on top of FOL).

[More information](#)

## JMP

JMP provides a comprehensive set of statistical tools as well as design of experiments and statistical quality control in a single package. It allows for custom programming and script development via JSL, "JMP Scripting Language".

[More information](#)

## JMulTi

JMulTi is an interactive software designed for univariate and multivariate time series analysis. It has a Java graphical user interface that uses an external engine for statistical computations. It has been designed for certain econometric procedures in time series analysis, especially some of them not available in other packages, like Impulse Response Analysis with bootstrapped confidence intervals for VAR/VEC modelling.

[More information](#)

## KANT

KASH/KANT is a computer algebra system for sophisticated computations in algebraic number fields and global function fields. It has been developed under the project leadership of Prof. Dr. M. Pohst at Technische Universität Berlin.

[More information](#)

## **Kenzo**

Kenzo is a program for effective algebraic topology

[More information](#)

## **KnotPlot**

KnotPlot is a program to visualize and manipulate knots in three and four dimensions. Knots can be loaded from a database of almost 1000 knots and links or sketched by hand in three dimensions. Also, knots may be constructed via the Conway notation or using a tangle calculator. A number of special knot types (torus knots, knot chains, Lissajous knots) may be created on the fly. Finally, new knots can be created from old knots using a number of transformations.

[More information](#)

## **LAPACK**

LAPACK is written in Fortran77 and provides routines for solving systems of simultaneous linear equations, least-squares solutions of linear systems of equations, eigenvalue problems, and singular value problems. The associated matrix factorizations (LU, Cholesky, QR, SVD, Schur, generalized Schur) are also provided, as are related computations such as reordering of the Schur factorizations and estimating condition numbers. Dense and banded matrices are handled, but not general sparse matrices. In all areas, similar functionality is provided for real and complex matrices, in both single and double precision.

[More information](#)

## **LattE integrale**

LattE (Lattice point Enumeration) is a computer software dedicated to the problems of counting lattice points and integration inside convex polytopes. LattE contains the first ever implementation of Barvinok's algorithm. The latest version, LattE integrale, has the ability to directly compute integrals of polynomial functions over polytopes and in particular to do exact volume computations. Version 1.6 added the capability of computing the highest coefficients of weighted Ehrhart quasipolynomials.

[More information](#)

## **LiDIA**

LiDIA is a C++ library for computational number theory which provides a collection of highly optimized implementations of various multiprecision data types and time-intensive algorithms.

[More information](#)

## **LiE**

LiE is the name of a software package that enables mathematicians and physicists to perform computations of a Lie group theoretic nature. It focuses on the representation theory of complex semisimple (reductive) Lie groups and algebras, and on the structure of their Weyl groups and root systems. LiE does not compute directly with elements of the Lie groups and algebras themselves; it rather computes with weights, roots, characters and similar objects.

[More information](#)

## **LinBox**

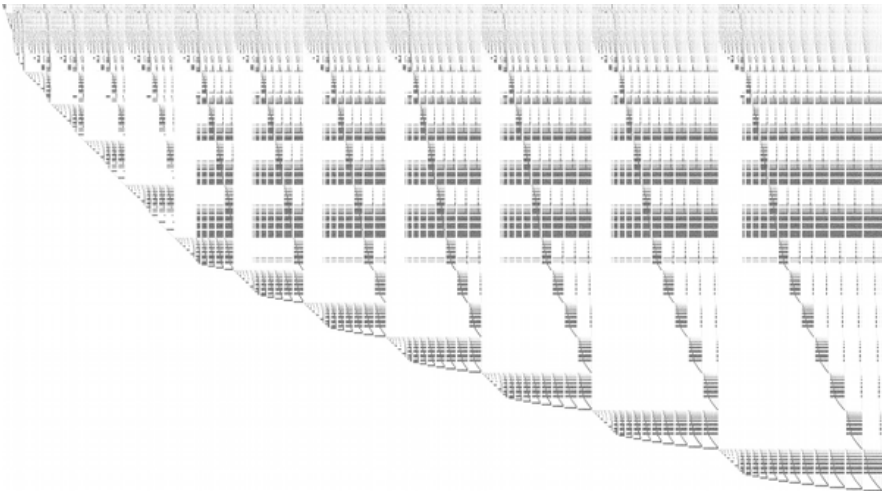
LinBox is a C++ template library for exact, high-performance linear algebra computation with dense, sparse, and structured matrices over the integers and over finite fields. LinBox has the following top-level functions: solve linear system, matrix rank, determinant, minimal polynomial, characteristic polynomial, Smith normal form and trace. A good collection of finite field and ring implementations is provided, for use with numerous black box matrix storage schemes.

[More information](#)

## **M4RI**

M4RI is a library for fast arithmetic with dense matrices over  $F_2$ .





[More information](#)

Macaulay 2

Macaulay 2 is a software system devoted to supporting research in algebraic geometry and commutative algebra, whose development has been funded by the National Science Foundation.

[More information](#)

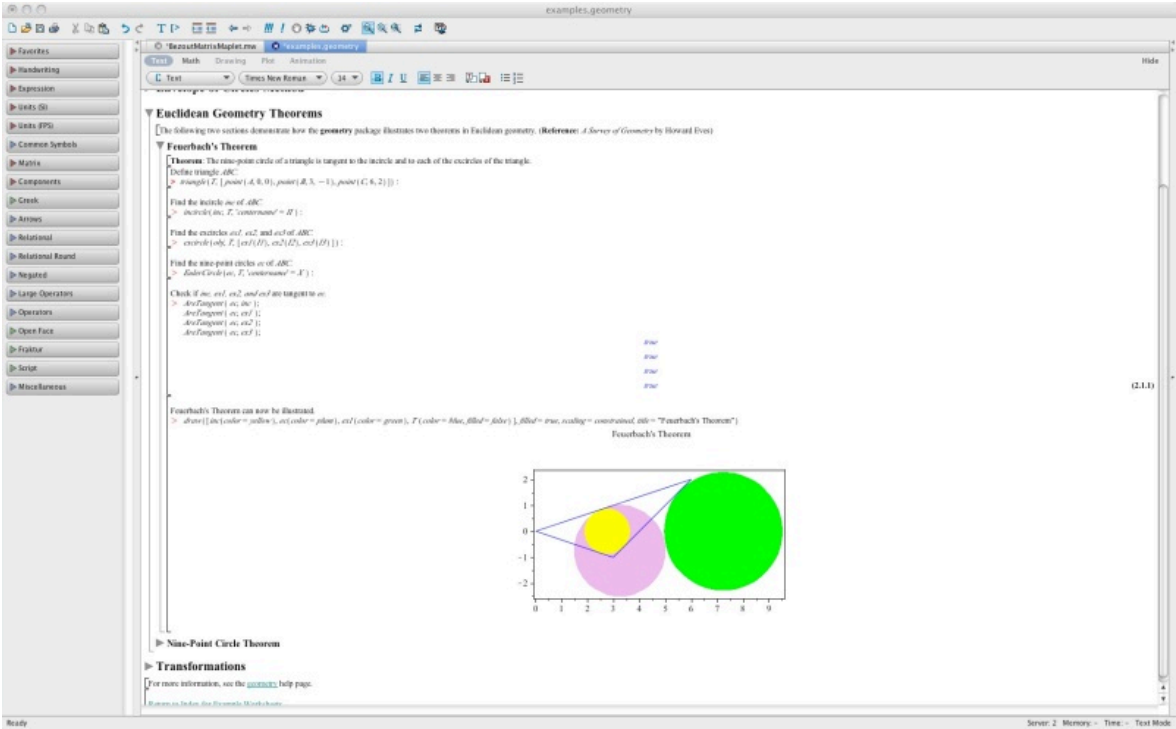
Magma

Magma is a large, well-supported software package designed to solve computationally hard problems in algebra, number theory, geometry and combinatorics. It provides a mathematically rigorous environment for computing with algebraic, number-theoretic, combinatoric and geometric objects.

[More information](#)

Maple

Maple is an environment for scientific and engineering problem-solving, mathematical exploration, data visualization and technical authoring.



[More information](#)

Mathematica

Mathematica seamlessly integrates a numeric and symbolic computational engine, graphics system, programming language, documentation system, and advanced connectivity to other applications.

[More information](#)

Mathomatic



Mathomatic is a free, portable, general-purpose CAS (Computer Algebra System) and calculator software that can symbolically solve, simplify, combine, and compare equations, perform complex number and polynomial arithmetic, etc. It does some calculus and is very easy to use.

[More information](#)

```

xterm
1-> ; This is the famous Bailey-Borwein-Plouffe (BBP) algorithm.
1-> ; Sum this n = 0 to infinity to compute pi.
1-> ; This is especially useful for calculating pi in hexadecimal.
1-> ; One hexadecimal digit of pi is generated with each iteration.
1->
1-> ((4/((8*n) + 1)) - (2/((8*n) + 4)) - (1/((8*n) + 5)) - (1/((8*n) + 6)))/(16^n)

      4           2           1           1
      -----
      ((8*n) + 1) ((8*n) + 4) ((8*n) + 5) ((8*n) + 6)
#1: -----
      (16^n)

1-> simplify

      ((120*(n^2)) + (151*n) + 47)
#1: -----
      ((16^n)*((512*(n^4)) + (1024*(n^3)) + (712*(n^2)) + (194*n) + 15))

1-> sum n 0 10 ; Sum as n goes from 0 to 10.
#2: 3.1415926535898

1-> pi ; Verify that the digits are the same.
answer = 3.1415926535898

1-> x^n/n! ; Sum this n = 0 to infinity to compute (e^x).

      (x^n)
#3: -----
      (n!)

3-> replace x with 1 ; Sum this n = 0 to infinity to compute e:

      1
#3: -----
      (n!)

3-> sum n 0 20 ; Sum as n goes from 0 to 20.
#4: 2.718281828459

3-> e ; Verify that the digits are the same.
answer = 2.718281828459

Finished reading file "pie.in".
3-> █

```

## Matlab

MATLAB is a high-level language and interactive environment that enables you to perform computationally intensive tasks faster than with traditional programming languages such as C, C++, and Fortran.

[More information](#)

## Maxima

Maxima is a system for the manipulation of symbolic and numerical expressions, including differentiation, integration, Taylor series, Laplace transforms, ordinary differential equations, systems of linear equations, and vectors, matrices, and tensors. Maxima produces high precision results by using exact fractions and arbitrarily long floating point representations, and can plot functions and data in two and three dimensions.

[More information](#)

## **MuPad**

MuPAD is a mathematical expert system for doing symbolic and exact algebraic computations as well as numerical calculations with almost arbitrary accuracy. For example, the number of significant digits can be chosen freely. Apart from a vast variety of mathematical libraries the system provides tools for high quality visualization of 2- and 3-dimensional objects. On Microsoft Windows, Apple Macintosh and Linux systems, MuPAD offers a flexible notebook concept for creating mathematical documents combining texts, graphics, formulas, computations and mathematical visualizations and animations. On Microsoft Windows MuPAD further supports the technologies OLE, ActiveX Automation, DCOM, RTF and HTML. Thus it offers a natural integration in Office applications like Word or PowerPoint as well as others.

[More information](#)

## **nauty**

Nauty is a program for computing automorphism groups of graphs and digraphs. It can also produce a canonical labelling.

[More information](#)

## **NetworkX**

NetworkX (NX) is a Python package for the creation, manipulation, and study of the structure, dynamics, and functions of complex networks.

[More information](#)

## **Normaliz**

Normaliz is a tool for computations in affine monoids, vector configurations, lattice polytopes, and rational cones. Its input data can be specified in terms of a system of generators or vertices or a system of linear homogeneous Diophantine equations, inequalities and congruences or a binomial ideal. Normaliz computes the dual cone of a rational cone (in other words, given generators, Normaliz computes the defining hyperplanes, and vice versa), a placing (or lexicographic) triangulation of a vector configuration (resulting in a triangulation of the cone generated by it), the Hilbert basis of a rational cone, the lattice points of a lattice polytope, the normalization of an affine monoid, the Hilbert (or Ehrhart) series and the Hilbert (or Ehrhart) (quasi) polynomial under a Z-grading (for example, for rational polytopes), NEW: generalized (or weighted) Ehrhart series and Lebesgue integrals of polynomials over rational polytopes via NmzIntegrate, a description of the cone and lattice under consideration by a system of inequalities, equations and congruences

[More information](#)

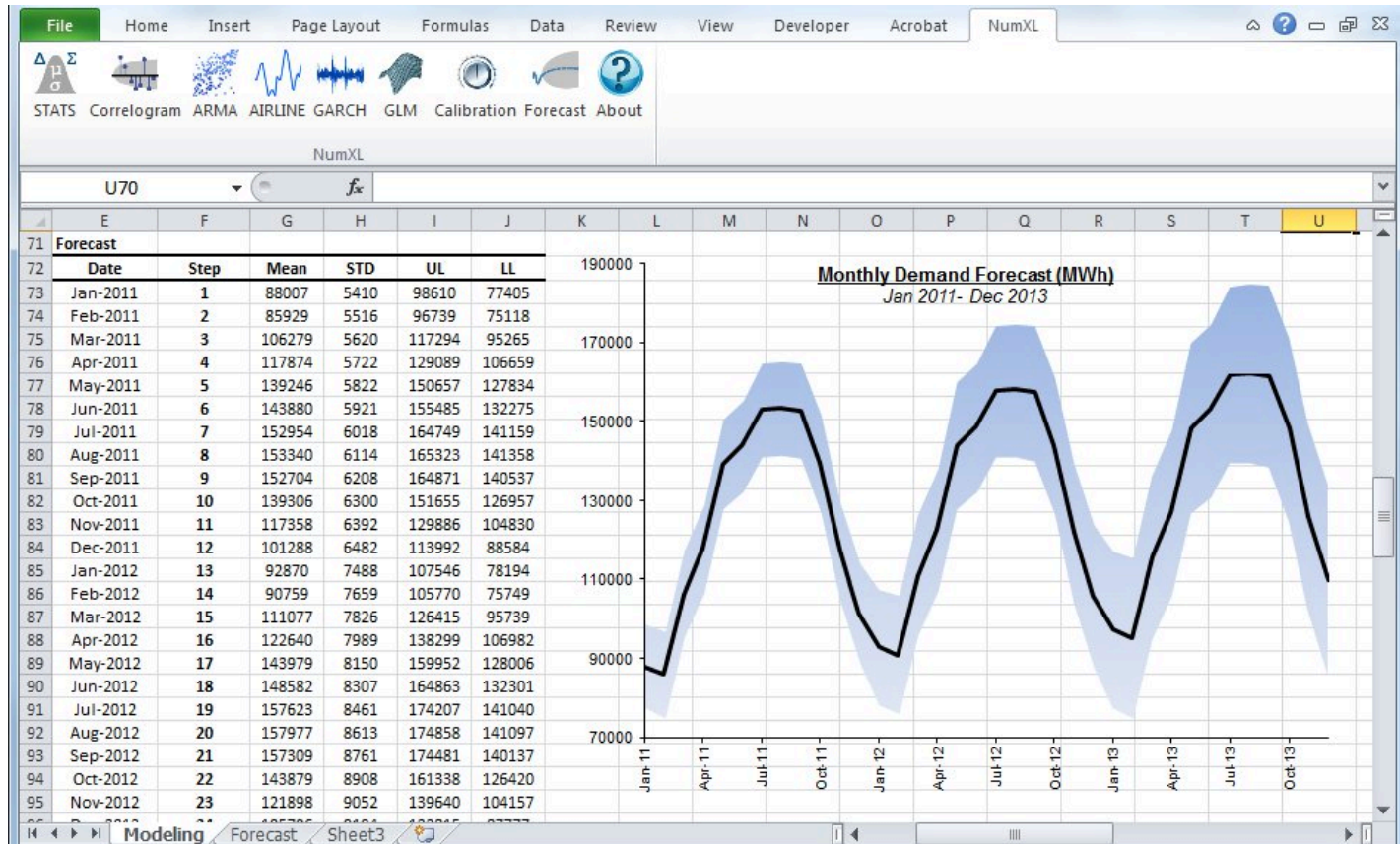
## **NTL**

NTL is a high-performance, portable C++ library providing data structures and algorithms for manipulating signed, arbitrary length integers, and for vectors, matrices, and polynomials over the integers and over finite fields.

[More information](#)

## **NumXL**

NumXL is a suite of time series Excel add-ins. It transforms your Microsoft Excel application into a first-class time series software and econometrics tool, offering the kind of statistical accuracy offered by the leading statistical packages. NumXL integrates natively with Excel, adding scores of econometric functions, a rich set of shortcuts, and intuitive user interfaces to guide you through the entire process.

[More information](#)


## Octave

GNU Octave is a high-level language, primarily intended for numerical computations. It provides a convenient command line interface for solving linear and nonlinear problems numerically, and for performing other numerical experiments using a language that is mostly compatible with Matlab. It may also be used as a batch-oriented language. Octave has extensive tools for solving common numerical linear algebra problems, finding the roots of nonlinear equations, integrating ordinary functions, manipulating polynomials, and integrating ordinary differential and differential-algebraic equations. It is easily extensible and customizable via user-defined functions written in Octave's own language, or using dynamically loaded modules written in C++, C, Fortran, or other languages.

[More information](#)

## OxMetrics

The family of software packages for the econometric analysis of time series, forecasting, econometric model selection and for the statistical analysis of cross-section data and panel data.

[More information](#)

## PARI/GP

PARI/GP is a widely used computer algebra system designed for fast computations in number theory (factorizations, algebraic number theory, elliptic curves...), but also contains a large number of other useful functions to compute with mathematical entities such as matrices, polynomials, power series, algebraic numbers, etc., and a lot of transcendental functions. PARI is also available as a C library to allow for faster computations.

[More information](#)

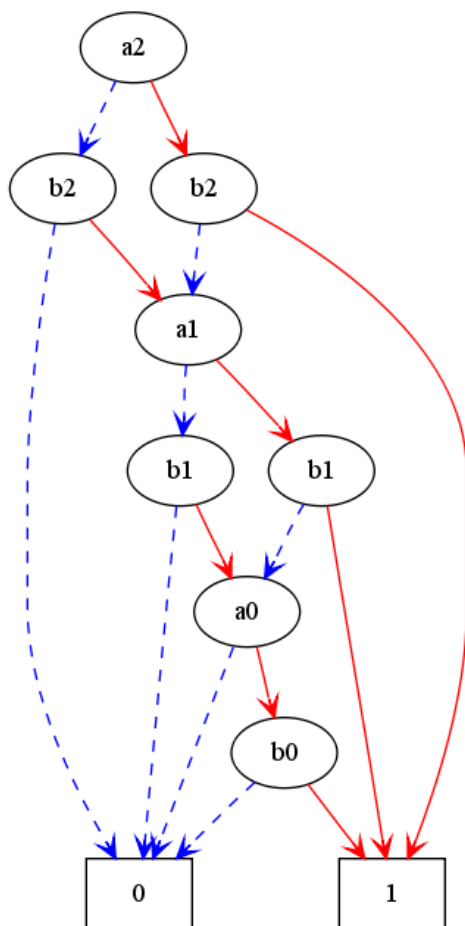
## PLTMG

PLTMG is a package for solving elliptic partial differential equations in general regions of the plane. It is based on continuous piecewise linear triangular finite elements, and features adaptive local mesh refinement, multigraph iteration, and pseudo-arclength continuation options for parameter dependencies. It also provides options for solving several classes of optimal control and obstacle problems. The package includes an initial mesh generator and several graphics packages. Support for the Bank-Holst parallel adaptive meshing strategy is also provided. PLTMG is provided as Fortran (and a little C) source code, in both single and double precision versions. The code has interfaces to X-Windows, MPI, and Michael Holst's OpenGL image viewer SG. The X-Windows, MPI, and SG interfaces require libraries that are NOT provided as part of the PLTMG package.

[More information](#)

## PolyBoRi

The core of PolyBoRi is a C++ library, which provides high-level data types for Boolean polynomials and monomials, exponent vectors, as well as for the underlying polynomial rings and subsets of the powerset of the Boolean variables. As a unique approach, binary decision diagrams are used as internal storage type for polynomial structures. On top of this C++-library we provide a Python interface. This allows parsing of complex polynomial systems, as well as sophisticated and extendable strategies for Gröbner base computation. PolyBoRi features a powerful reference implementation for Gröbner basis computation.



[More information](#)

## polymake

polymake is an object-oriented system for experimental discrete mathematics. The typical working cycle of a polymake user starts with the construction of an object of interest, such as a convex polytope, a finite simplicial complex, a graph, etc. It is then possible to ask the system for some of the object's properties or for some form of visualization. Further steps might include more elaborate constructions based on previously defined objects. Each class of polymake objects comes with a set of rules which describe how a new property of an object can be derived from previously known ones. It is a key feature that the user can extend or modify the set of rules, add further properties or even new classes of objects (with entirely new rule bases). The functions provided include: several convex hull algorithms, face lattices of convex polytopes, Voronoi diagrams and Delaunay decompositions (in arbitrary dimensions), simplicial homology (with integer coefficients), simplicial cup and cap products, intersection forms of triangulated 4-manifolds. Several forms of (interactive) visualization via interfaces to Geomview, JavaView and other programs.

[More information](#)

## PSPP

PSPP is a program for statistical analysis of sampled data. It is a Free replacement for the proprietary program SPSS.

[More information](#)

## QPA = Quivers and Path Algebras

QPA provides software for doing computations over finite dimensional quotients of path algebras. QPA has data structures for quivers, quotients of path algebras, and modules, homomorphisms and complexes of modules over quotients of path algebras. It has implementations for computing homomorphism spaces, projective resolutions, extension groups, generators of Ext-algebras, almost split sequences and more.

[More information](#)

## R

R is a language and environment for statistical computing and graphics. It is a GNU project which is similar to the S language and environment which was developed at Bell Laboratories (formerly AT&T, now Lucent Technologies) by John Chambers and colleagues. R can be considered as a different implementation of S. There are some important differences, but much code written for S runs unaltered under R. R provides a wide variety of statistical (linear and nonlinear modelling, classical statistical tests, time-series analysis, classification, clustering, ...) and graphical techniques, and is highly extensible. The S language is often the vehicle of choice for research in statistical methodology, and R provides an Open Source route to participation in that activity. One of R's strengths is the ease with which well-designed publication-quality plots can be produced, including mathematical symbols and formulae where needed. Great care has been taken over the defaults for the minor design choices in graphics, but the user retains full control.

[More information](#)

## RATS

RATS (Regression Analysis of Time Series) is a fast, efficient, and comprehensive econometrics and time series analysis software package.

[More information](#)

rbMIT

The rbMIT © MIT software package implements in Matlab® all the general reduced basis algorithms. The rbMIT © MIT software package is intended to serve both (as Matlab® source) "Developers" — numerical analysts and computational tool-builders — who wish to further develop the methodology, and (as Matlab® "executables") "Users" — computational engineers and educators — who wish to rapidly apply the methodology to new applications. The rbMIT software package was awarded with the Springer Computational Science and Engineering Prize in 2009.

[More information](#)

RCWA

RCWA is a package for the computer algebra system GAP. It provides implementations of algorithms and methods for computing in certain infinite permutation groups. The class of groups which RCWA in principle can deal with includes the finite groups, the free groups of finite rank, the free products of finitely many finite groups, certain infinite simple groups, certain divisible torsion groups and groups of many further types. It is closed under taking direct products and under taking wreath products with finite groups and with the infinite cyclic group  $(\mathbb{Z}, +)$ .

[More information](#)

Reduce

REDUCE is an interactive system for general algebraic computations of interest to mathematicians, scientists and engineers. It has been produced by a collaborative effort involving many contributors. It is often used as an algebraic calculator for problems that are possible to do by hand. However, REDUCE is designed to support calculations that are not feasible by hand. Many such calculations take a significant time to set up and can run for minutes, hours or even days on the most powerful computers.

[More information](#)

Regina

Regina is a suite of mathematical software for 3-manifold topologists. It focuses upon the study of 3-manifold triangulations and includes support for normal surfaces and angle structures.

[More information](#)

file/home/bab/source/regina/examples/sample-misc.rqs - Regina

File Edit Packet Tree Docked Packet Tools Settings Help

Container

- Sample Data File
  - Triangulations
    - Figure 8 Knot Complement
      - Tri-Quad Normal Surface
      - Quad Normal Surface
      - Angle Structures
    - Layered Solid Torus
    - Poincare Homology Sphere
    - RP2xS1
    - Tori, Annuli and Discs
    - Homology Summary

Angle Structures (Angle Structure List)

5 vertex angle structures  
Span includes: Strict, Taut

Type	0: 01/23	0: 02/13	0: 03/12	1: 01/23	1: 02/13	1: 03/12
Taut	Pi				Pi	
Taut		Pi		Pi		
Taut			Pi			Pi
Taut	Pi/2	Pi/2		Pi/2	Pi/2	Pi

Regina <3>

Viewer Packet Help

(4,7,11) Layered Solid Torus (Triangulation)

Add Tet Remove Tet Simplify

Real Bdry, Orientable, Connected

Gluing Skeleton Algebra Composition Surfaces

Homology Fund. Group Iuraev-Viro

H1(M) Z  
H1(M, Bdry M) 0  
H1(Bdry M) 2Z  
H2(M) 0  
H2(M : Z\_2) 0

Regina

Viewer Packet Help

Normal Surfaces (Normal Surface List)

12 embedded normal surfaces  
Enumerated in standard normal (tri-quad) coordinates.

Surface Coordinates Matching Equations

Display coordinates: Standard normal (tri-quad) Apply filter: <None>

Euler	Orient	Sides	Bdry	Link	Crush	Type	0: 0	0: 1	0: 2	0: 3	0: 01/23	0: 0
-1	Non-orbl	1	Real Bdry		Unknown	Splitting						
-2	Orbl	2	Real Bdry		Unknown				1	1	1	
-2	Orbl	2	Real Bdry		Unknown							2
0	Non-orbl	1	Real Bdry		Unknown		2	2				
-1	Orbl	2	Real Bdry	Thin edge 5	Unknown		1	1	1	1		
0	Orbl	2	Real Bdry	Thin edge 0	Unknown				1	1	1	
0	Orbl	2	Real Bdry	Thin edge 1	Unknown							2
1	Orbl	2	Real Bdry	Vertex 0	Unknown		1	1	1	1		
0	Orbl	2	Real Bdry	Thin edge 3	Unknown							

Commit Refresh Close

Regina <3>

Viewer Packet Help

(4,7,11) Layered Solid Torus (Triangulation)

Add Tet Remove Tet Simplify

Real Bdry, Orientable, Connected

Gluing Skeleton Algebra Composition Surfaces

Isomorphism / subcomplex test:  
Compare with T = Figure 8 Knot Complement  
Result: No relationship

Triangulation composition:

Components

- Layered solid torus LST(4,7,11)
  - Base: tet 3
  - Top level: tet 0
  - Weight 4 edge: 0 (03) = 0 (12)
  - Weight 7 edge: 0 (13) = 0 (02)
  - Weight 11 edge: 0 (01)
- Spiralled solid torus Spiral(2)

Commit Refresh Close

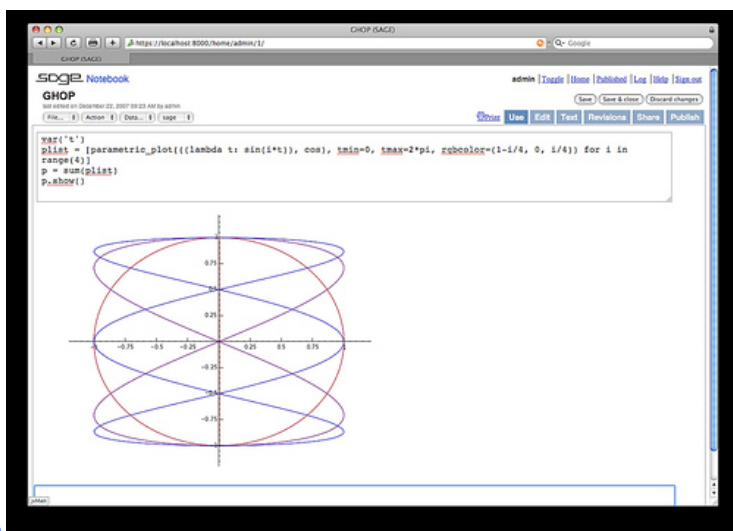
## Risa/Asir

Risa/Asir is a general computer algebra system and also a tool for various computation in mathematics and engineering. The development of Risa/Asir started in 1989 at FUJITSU. Binaries have been freely available since 1994 and now the source code is also free. Currently Kobe distribution is the most active branch of its development. We characterize Risa/Asir as follows: (1) An environment for large scale and efficient polynomial computation. (2) A platform for parallel and distributed computation based on OpenXM protocols.

[More information](#)

## Sage

SAGE is a framework for number theory, algebra, and geometry computation. It is open source and freely available under the terms of the GNU General Public License (GPL). SAGE is a Python library with a customized interpreter. It is written in Python, C++, and C (via Pyrex). Python (<http://www.python.org>) is an open source object-oriented interpreted language, with a large number of libraries, e.g., for numerical analysis, which are available to users of SAGE. Python can also be accessed in library mode from C/C++ programs. SAGE provides an interface to several important open source libraries, including Cremona's MWRANK library for computing with elliptic curves, the PARI library ([pari.math.u-bordeaux.fr](http://pari.math.u-bordeaux.fr)) for number theory, Shoup's number theory library NTL (<http://www.shoup.net/ntl/>), SINGULAR (<http://www.singular.uni-kl.de>) for commutative algebra, GAP (<http://www.gap-system.org>) for group theory and combinatorics, and maxima (<http://maxima.sourceforge.net>) for symbolic computation and calculus.



[More information](#)

## Scilab

Scilab is a numerical computation system similar to Matlab or Simulink. Scilab includes hundreds of mathematical functions, and programs from various languages (such as C or Fortran) can be added interactively. It has sophisticated data structures (including lists, polynomials, rational functions, and linear systems), an interpreter, and a high-level programming language. Scilab has been designed to be an open system where the user can define new data types and operations on these data types by using overloading. A number of toolboxes are available with the system.

[More information](#)

## Scilab Image Processing Toolbox

SIP provides image processing, pattern recognition, and computer vision routines for Scilab, a Matlab-like matrix-oriented programming environment. SIP is able to read/write images in almost 90 major formats, including JPEG, PNG, BMP, GIF, FITS, and TIFF. It includes routines for filtering, segmentation, edge detection, morphology, curvature, fractal dimension, distance transforms, multiscale skeletons, and more.

[More information](#)

## ShearLab 3D

ShearLab 3D is a MATLAB Library, developed for processing two- and three-dimensional signals using a certain class of basis functions named shearlets. These functions were developed with the goal of constructing systems of basis-functions nicely suited for representing anisotropic features (e.g. curvilinear singularities) that often are present in multivariate data. ShearLab 3D is optimized for GPU computing with CUDA and contains examples for applications like image and video denoising or image and video inpainting.





[More information](#)

## SingSurf

An online Java applet for calculation of singular algebraic surfaces.

[More information](#)

## SINGULAR

SINGULAR is a Computer Algebra system for polynomial computations in commutative algebra, algebraic geometry, and singularity theory. SINGULAR's main computational objects are ideals and modules over a large variety of baserings. The baserings are polynomial rings over a field (e.g., finite fields, the rationals, floats, algebraic extensions, transcendental extensions), or localizations thereof, or quotient rings with respect to an ideal. SINGULAR features fast and general implementations for computing Groebner and standard bases, including e.g. Buchberger's algorithm and Mora's Tangent Cone algorithm. Furthermore, it provides polynomial factorizations, resultant, characteristic set and gcd computations, syzygy and free-resolution computations, and many more related functionalities. Based on an easy-to-use interactive shell and a C-like programming language, SINGULAR's internal functionality is augmented and user-extendible by libraries written in the SINGULAR programming language. A general and efficient implementation of communication links allows SINGULAR to make its functionality available to other programs.

[More information](#)

## SOFA

SOFA - Statistics Open For All The user-friendly, open-source statistics, analysis, and reporting package.

[More information](#)

## STATGRAPHICS Online

STATGRAPHICS Online is a statistical package that runs within a web browser. You can enter data directly into the data editor or read data from text files, Excel files, or other common formats. The calculations are performed remotely on a web server and the results returned to your browser as HTML with imbedded graphics images.

[More information](#)

## STATISTICA

STATISTICA provides a comprehensive array of data analysis, data management, data visualization, and data mining procedures. Its techniques include a wide selection of predictive modeling, clustering, classification, and exploratory techniques in one software platform.

[More information](#)

## Steenrod

Steenrod is a Maple package for doing computations in the mod 2 Steenrod algebra. It computes the product and coproduct of elements, converts between various bases, computes the action of the elements on polynomials, and does several other specialized calculations related to the mod 2 Steenrod algebra.

[More information](#)

## Sums over integral points of a polygon

Maple program for computing the sum of values of a polynomial function over the set of integral points of a polygon and the corresponding weighted Ehrhart quasi-polynomial.

[More information](#)

## SuperLU

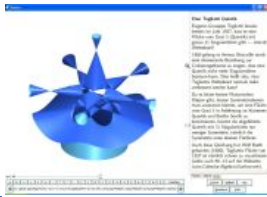
SuperLU is a general purpose library for the direct solution of large, sparse, nonsymmetric systems of linear equations on high performance machines. The library is written in C and is callable from either C or Fortran. The library routines will perform an LU decomposition with partial pivoting and triangular system solves through forward and back substitution. The LU factorization routines can handle non-square matrices but the triangular solves are performed only for square matrices. The matrix columns may be preordered (before factorization) either through library or user supplied routines. This reordering for sparsity is completely separate from the factorization. Working precision iterative refinement subroutines are provided for improved backward stability. Routines are also provided to equilibrate the system, estimate the condition number, calculate the relative backward error, and estimate error bounds for the refined solutions.



[More information](#)

## Surfer

Surfer is a programme to visualize real algebraic surfaces in an intuitive and fast way



[More information](#)

## SYMMETRICA

Symmetrica is a program developed by Lehrstuhl Mathematik II of the University of Bayreuth. It has routines to handle the following topics: ordinary representation theory of the symmetric group and related groups, ordinary representation theory of the classical groups, modular representation theory of the symmetric group, projective representation theory of the symmetric group, combinatorics of tableaux, symmetric functions and polynomials, commutative and non commutative Schubert polynomials, operations of finite groups, ordinary representation theory of Hecke algebras of type  $A_n$

[More information](#)

## SymPy

SymPy is a Python library for symbolic mathematics. It aims to become a full-featured computer algebra system (CAS) while keeping the code as simple as possible in order to be comprehensible and easily extensible. SymPy is written entirely in Python and does not require any external libraries.

[More information](#)

## SYNAPS

SYNAPS (Symbolic and Numeric APplicationS) is a library developed in C++. The aim of this open source project is to provide a coherent and efficient library for symbolic and numeric computation. It implements data-structures and classes for the manipulation of basic objects, such as (dense, sparse, structured) vectors, matrices, univariate and multivariate polynomials. It also provides fundamental methods such as algebraic number manipulation tools, different types of univariate and multivariate polynomial root solvers, resultant computations, ...

[More information](#)

## The Tensor Library

TTL (The Tensor Library) facilitates the translation of tensor expressions into C++ without compromising speed. A Tensor here can be any multidimensional array, including vectors and matrices. Expressions including several indices can be written in C++, removing the need for explicit loops. Expression templates and similar techniques are used to achieve this goal.

[More information](#)

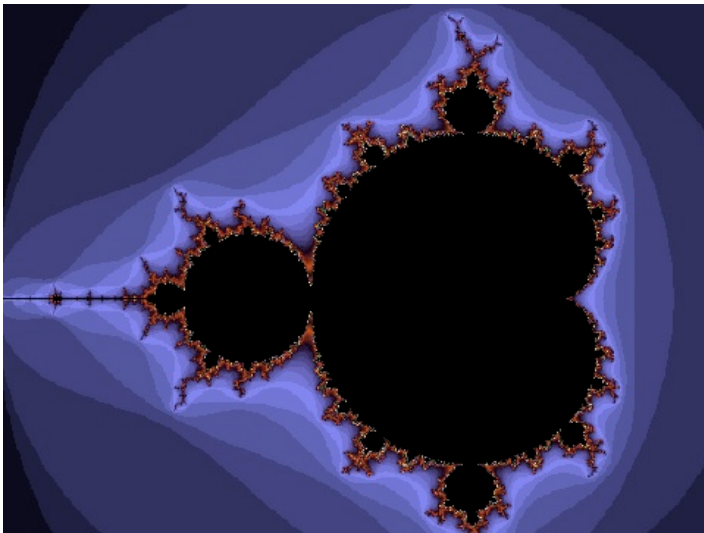
## Theorema

The Theorema project aims at extending current computer algebra systems by facilities for supporting mathematical proving. The present early-prototype version of the Theorema software system is implemented in Mathematica. The system consists of a general higher-order predicate logic prover and a collection of special provers that call each other depending on the particular proof situations. The individual provers imitate the proof style of human mathematicians and produce human-readable proofs in natural language presented in nested cells. The special provers are intimately connected with the functors that build up the various mathematical domains. The long-term goal of the project is to produce a complete system which supports the mathematician in creating interactive textbooks, i.e. books containing, besides the ordinary passive text, active text representing algorithms in executable format, as well as proofs which can be studied at various levels of detail, and whose routine parts can be automatically generated. This system will provide a uniform (logic and software) framework in which a working mathematician, without leaving the system, can get computer-support while looping through all phases of the mathematical problem solving cycle.

[More information](#)

## XaoS

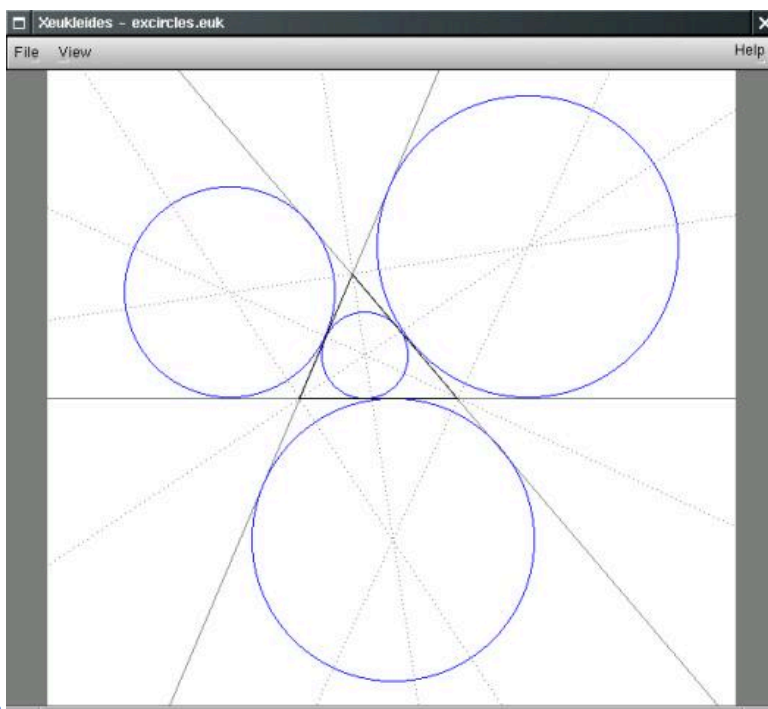
XaoS is a fast, portable, real-time, and interactive fractal zoomer. It displays the Mandelbrot set (among other escape time fractals) and allows you zoom smoothly into the fractal. Various coloring modes are provided for both the points inside and outside the selected set. In addition, switching between Julia and Mandelbrot fractal types and on-the-fly plane switching is provided.



[More information](#)

### **Xeukleides**

Xeukleides is a frontend for editing and viewing figures described by the language Eukleides (which provides simple and powerful commands for creating elementary Euclidean geometry figures).



[More information](#)