swMATH – Challenges, Next Steps, and Outlook

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Leibniz-Institut für Informationsinfrastruktur

Agenda

- Motivation
- Mathematical software directories
- The concepts behind swMATH
  - The publication-based approach
  - The website approach
- Summary

The motivation for swMATH

The origin:
The role of mathematical software is increasing. For search, access, replication, and reuse of mathematical software a special infrastructure is necessary.
Mathematical software is written in a formal language, human readable information must be added.

Currently, the information about mathematical software is heterogeneous and widely distributed.

Information on a mathematical software package is given

- on websites of a software
- in repositories
- in directories
- in publications (journal articles and books)

Information about software

The information covers

- software code
- manuals and documentations
- languages and environments
- metadata as description, keywords, classifications, ...
- mathematical models, concepts, and algorithms which were the initial point for a software
- related data (I): benchmarks, testdata
- related data (II): developers
- related data (III): license conditions
- related data (IV): evaluation of the quality of a software
- ...

And (mathematical) software is per se dynamic (it changes with the development of hardware and software used).

What is swMATH?

swMATH is a directory of mathematical software. It was designed as a search engine for mathematical software and information service about mathematical software

Mathematical software - Wikipedia, the free encyclopedia
https://en.wikipedia.org/wiki/**Mathematical_software** ▾ Diese Seite übersetzen
Mathematical software is software used to model, analyze or calculate numeric, symbolic or ... Main article: List of **information** graphics software ...
Du hast diese Seite oft aufgerufen. Letzter Besuch: 24.05.16

SageMath - Open-Source Mathematical Software System
www.sage**math**.org/ ▾ Diese Seite übersetzen
A free **mathematics software** system licensed under the GPL. It combines the power of many existing open-source packages into a common Python-based ...
Windows · Tour · Download for Linux · Download
Du hast diese Seite 4 Mal aufgerufen. Letzter Besuch: 25.05.16

Appendix A: An Overview of Mathematical Software - UT Math...
https://www.ma.utexas.edu/CNA/.../**software**.html ▾ Diese Seite übersetzen
There is a keyword searching capability for obtaining **mathematical software** as well ... PTLib is a source of **information** about high quality software and tools for ...
Du hast diese Seite 3 Mal aufgerufen. Letzter Besuch: 25.05.16

Software for Mathematics - Math on the Web
www.**math**ontheweb.org/**math**web/mi-**software**.html ▾ Diese Seite übersetzen
15.05.2011 - This page lists **software** for **mathematics** some commercial and some just ... [See also further **information**; MAGMA: The Magma System for ...

Mathematical Resources: SOFTWARE
mathres.kevius.com/**software**.html ▾ Diese Seite übersetzen
Links to software of interest to mathematicians and students of mathematics. ... of **Math Software Information** · Google Directory - Science > Math > Software ...

GAMS : Other Sources of Math Software Information
gams.nist.gov/OtherSources.html ▾ Diese Seite übersetzen
09.08.2013 - Other Sources of **Math Software Information**. Directories; Journals; Repositories; Freely Available Packages; Software Vendors; Educational ...

Mathematics WWW Virtual Library - Department of Mathematics
www.**math**.fsu.edu/Science/index.php?f=21 ▾ Diese Seite übersetzen
Virtual Library Home : **Mathematics Software** ... Color Mathematics **Math software** does algebra, geometry, vectors. ... Computer Algebra **Information** Network. o ...

Mathematical Software
www.mat.univie.ac.at/~neum/**software**.html ▾ Diese Seite übersetzen
I link (with very few exceptions) only to public domain **mathematical software**. Please inform me ... van der Vorst) no software, but **info** on GC, BiCG and variants ...
Du hast diese Seite 2 Mal aufgerufen. Letzter Besuch: 25.05.16

Maplesoft - Technical Computing Software for Engineers ...
www.maplesoft.com/ ▾ Diese Seite übersetzen
Maplesoft is a world leader in **mathematical** and analytical **software**. ... innovative Web connectivity and a powerful 4GL language for solving a wide range of **mathematical** problems encountered in modeling and simulation. ... Contact **Info**.

swMATH: Mathematical software
www.sw**math**.org/ ▾ Diese Seite übersetzen
swMATH - a new database for references on **mathematical software**.

Google search for 'mathematical software information' (2016-07-22)

Computer Algebra Software

SIGSAM maintains this collection of references to computer algebra systems, to support our citation policy. Click the name of each system to see further information, links and a citation in BibTeX format. If you have suggestions for changes or additions to this list please contact Infodir_SIGSAM@acm.org.

General purpose commercial systems

- Maple
- Mathematica
- Magma

SIGSAM → Resources → Software
http://www.sigsam.org/Resources/Software.html

Broad purpose *free* computer algebra systems

- Axiom: a general-purpose, strongly typed, computer algebra system.
- CoCoA: a computer algebra system for doing computations in Commutative Algebra.
- Fermat: a computer algebra system oriented towards polynomial and matrix algebra over the rationals and finite fields.
- GAP: a System for Computational Discrete Algebra.
- KASH/KANT: computer algebra system for sophisticated computations in algebraic number fields and global function fields.
- Macaulay2: a system for research in algebraic geometry and commutative algebra.
- Reduce: an interactive system for general algebraic computations of interest to mathematicians, scientists and engineers.
- SageMath: an open-source general purpose computer algebra system.
- SINGULAR: a Computer Algebra System for polynomial computations with special emphasis on the needs of commutative algebra, algebraic geometry, and singularity theory.
- PARI/GP: a computer algebra system designed for for fast computations in number theory.

Special Purpose Systems, Packages and Libraries

- ACE : a Maple library providing tools useful in algebraic combinatorics.
- Albert: an interactive program to assist the specialist in the study of nonassociative algebras.
- ANUNQ: a GAP package for the computation of nilpotent factor groups of finitely presented groups.
- ANUPQ: an interactive interface to the p-quotient, p-group generation and standard presentation algorithms of the ANU pq C program.
- CALI: a REDUCE package for computational commutative algebra.
- CASA: a Computer Algebra System for Algebraic Geometry.
- CHEVIE: a computer algebra system for symbolic calculations with generic character tables of groups.
- EinS: a Mathematica package allowing one to perform symbolic calculations with indexed objects.
- Felix: a special computer algebra system for the computation in commutative and non-commutative rings and modules.
- FeynArts: a Mathematica package for the generation and visualization of Feynman diagrams and amplitudes.
- GiNaC: a system to allow the creation of integrated systems that embed symbolic manipulations together with more established areas of computer science.
- GRAPE: a GAP package for constructing and analysing graphs related to groups, finite geometries, and designs.
- GUAVA: a GAP package for computing with error-correcting codes.
- LiDIA: A C++ Library For Computational Number Theory.
- LiE: A Computer algebra package for Lie group computations.
- MOLGEN: a system for the computation of all structural formulae that correspond to a given molecular formula.
- ORME: a package for equational theoreies.
- SONATA: a system for the construction and the analysis of finite nearrings

Allgemeine Computeralgebrasysteme

axiom

"The Scientific Computation System"
Lizenz: open source

FA Fachgruppe → Computeralgebrasysteme
http://www.fachgruppe-computeralgebra.de/systeme/

Derive

Lizenzinhaber: Texas Instruments
Weiterentwicklung wurde 2007 eingestellt

MAGMA

"Computational Algebra System"
Autoren: The Computational Algebra Group, University of Sydney
Lizenz: kommerziell (Gebühren für Service und Updates)
Ansprechpartner: John Cannon, Allan Steel

Maple

"Mathematics – Modeling – Simulation"
Lizenz: kommerziell
Ansprechpartner: Thomas Richard (mathematisch), Sabine Bormann (Verkauf)

MathCad

"Der globale Standard für Konstruktionsberechnungen"
Lizenz: kommerziell

Mathematica

"Compute – Develop – Deploy"
Veröffentlicht bei Wolfram Research Inc.
Lizenz: kommerziell
Ansprechpartner: Andreas Heilemann (mathematisch), Maryam Karbalai (Verkauf)

MATLAB

"The Language Of Technical Computing"
Seit Herbst 2008 durch Übernahme von MuPAD auch mit einer Symbolic Math Toolbox
Vertrieb über The MathWorks GmbH

List of computer algebra systems

From Wikipedia, the free encyclopedia

The following tables provide a **comparison of computer algebra systems** (CAS).[1][2][3] A CAS is a package comprising a set of algorithms for performing symbolic manipulations on algebraic objects, a language to implement them, and an environment in which to use the language.[4][5] A CAS may include a user interface and graphics capability; and to be effective may require a large library of algorithms, efficient data structures and a fast kernel.[6]

Contents [hide]

1 General
  1.1 Functionality
  1.2 Operating system support
2 Graphing calculators
3 See also
4 References
5 External links

Wikipedia → list of computer algebra systems
https://en.wikipedia.org/wiki/List_of_computer_algebra_systems

General [edit]

System	Creator	Development started	First public release	Latest stable version	Latest stable release date	Cost (USD)	License	Notes
Axiom	Richard Jenks	1977	1993 and 2002[7]		August 2014[8]	Free	modified BSD license	General purpose CAS. Continuous Release using Docker Containers
Cadabra	Kasper Peeters	2001	2007	1.42	November 9, 2014	Free	GNU GPL	CAS for tensor field theory
Calcinator	George J. Paulos	2013	2016	2.0	February 2015	Free	Proprietary	Browser-based CAS for desktop and mobile devices
CoCoA-4	The CoCoA Team	1987	1995	4.7.5	2009	Free for non-commercial use	own license	Specialized CAS for commutative algebra
CoCoA-5	Abbott,Bigatti,Lagorio	2000	2011	5.1.1	2014	Free	GNU GPL	Specialized CAS for commutative algebra
Derive	Soft Warehouse	1979	1988	6.1	November 2007	Discontinued	Proprietary	CAS designed for pocket calculators; it was discontinued in 2007
DataMelt (DMelt)	jWork.ORG (Sergei Chekanov)	2005	2015	1.5	May 14, 2016	Free	GNU GPL	Java-based. Runs on the Java platform. Supports Python, Ruby, Groovy, Java and Octave.
Erable (aka ALGB)	Bernard Parisse, Mika Heiskanen, Claude-Nicolas Fiechter	1993	1993	4.20060919	April 21, 2009	Free	LGPL	CAS designed for Hewlett-Packard scientific graphing calculators of the HP 48/49/40/50 series; discontinued in 2009
Fermat	Robert H. Lewis	1986	1993	5.25	July 5, 2016	$70 if grant money available, otherwise $0	Proprietary	Specialized CAS for resultant computation and linear algebra with polynomial entries

Functionality [edit]

Below is a summary of significantly developed *symbolic* functionality in each of the systems.

System	Formula editor	Arbitrary precision	Calculus		Solvers					Graph theory	Number theory	Quantifier elimination	Boolean algebra	Tensors	Probability
			Integration	Integral transforms	Equations	Inequalities	Diophantine equations	Differential equations	Recurrence relations						
Axiom	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Calcinator	Yes	No	Yes	Yes	Yes	No	Yes	No	No	No	No	No	No	No	No
Magma	No	Yes	No	No	Yes	No	Yes	No	No	Yes	Yes	No	No	No	?
Magnus	No	Yes	No	No	No	No	No	No	No	?	?	No	?	No	No
Maple	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Mathcad	Yes	No	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No
Mathematica	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes[20]	Yes
MathHandbook	No	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	Yes	No	Yes	No	Yes
Mathomatic	No	No	Yes	Yes	Yes	No	No	No	No	No	Yes	No	No	No	No
Symbolic Math Toolbox (MATLAB)	No	Yes	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No	No
Maxima	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
SageMath	No	Yes	Yes	Yes	Yes	Yes	Yes[A]	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
SymPy	No	Yes	Yes	Yes	Yes	Yes	Yes[21]	Yes	Yes	No	Yes	No	Yes	Yes	Yes
Wolfram Alpha	Pro version only	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	?
GAP	No	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Xcas/Giac	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	No	No	No	Yes
Yacas	No	Yes	Yes	No	Yes	No	No	No	No	No	No	No	No	No	?

A. ^ via SymPy

Wikipedia → list of computer algebra systems (II)
https://en.wikipedia.org/wiki/List_of_computer_algebra_systems

What is difference to swMATH?

The most important difference between swMATH and the examples presented is that these lists are manually maintained. swMATH is maintained (semi-)automatic.

Therefore two approaches are used

- the publication-based approach is the most important method in swMATH (up to now)
- the Web Archives approach is used for a more deeper analysis of the existing information of software (here we started with some experiments)

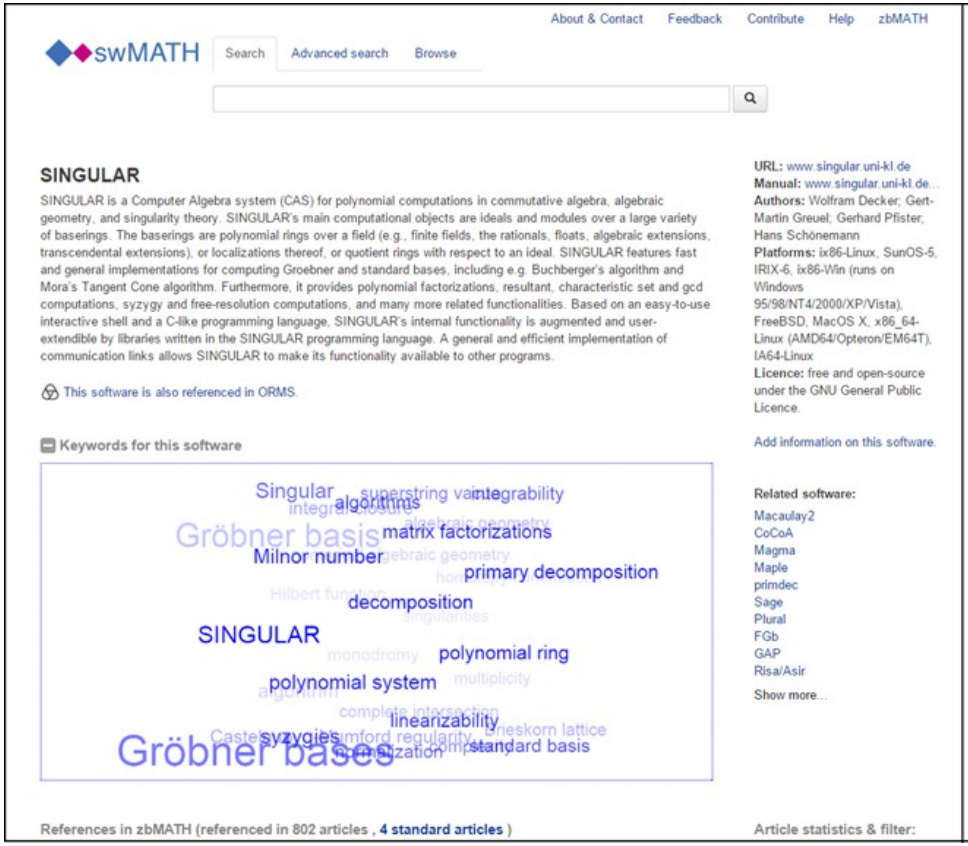
The publication-based approach

it bases on the fact that (mathematical) publications and (mathematical) software are closely related.
This is used twofold:

- for the identification of software
- to deduce information about software

Therefore the database zbMATH is used. We try to identify software in the zbMATH entries(therefore the fields title, abstract, and references are used), extract relevant information about a software and process it.

The 'Singular' website of swMATH (swmath.org)



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Identification (I)

Unfortunately, software citations are very rudimentary, in the most cases they contain not more than the name of the software:

Böhm, Janko; **Decker, Wolfram**; **Keicher, Simon**; **Ren, Yue**

Current challenges in developing open source computer algebra systems. (English) Zbl 06585009

Kotsireas, Ilias S. (ed.) et al., Mathematical aspects of computer and information sciences. 6th international conference, MACIS 2015, Berlin, Germany, November 11–13, 2015. Revised selected papers. Cham: Springer (ISBN 978-3-319-32858-4/pbk; 978-3-319-32859-1/ebook). Lecture Notes in Computer Science 9582, 3-24 (2016).

Summary: This note is based on the plenary talk given by the second author at MACIS 2015, the Sixth International Conference on Mathematical Aspects of Computer and Information Sciences. Motivated by some of the work done within the Priority Programme SPP 1489 of the German Research Council DFG, we discuss a number of current challenges in the development of Open Source computer algebra systems. The main focus is on algebraic geometry and the system Singular.

Identification (II)

That's why we use (up to now)

- Heuristic methods for identification:
  searching for characteristic text patterns, e.g., software package and an artificial word in the zbMATH entries

- Manual identification of software:
  zbMATH editors mark software within the zbMATH workflow

Problems

but:

- Not all software can be identified.
- The most entries are really mathematical software but some belong to other classes of mathematical research data (e.g. languages, benchmarks, *but until now classification scheme for mathematical reeach data is missing)*.

Of course, the publication-based approach is limited: Currently we don't get information about versions. But this information is necessary for the verification of research results and reuse of methods.

What can we do?

Development of a citation standard

A citation standard which describes exactly the used software would be a smart and fundamental solution of the problem.

A citation standard for software is discussed intensively in the Web for a long time.
A good summary about the existing practice is the blog of Mike Jackson:
http://www.software.ac.uk/how-cite-and-describe-software?mpw

Citation standard for software (I)

Moreover, he gives some recommendations. He distinguishes four scenarios:

Software purchased off-the shelf
ProductName. Version. Release Date. Publisher. Location

Software downloaded from the web
ProductName. Version. ReleaseDate. Publisher. Location (DOI or URL). DownloadDate

Software checked-out from a public repository
ProductName. (Version). Publisher. CheckoutDate. (Location (URL Repository)). RepositorySpecificCheckoutInformation

Software provided by a researcher
ProductName. (Version). Publisher. Location. ContactDetails. ReceivedDate

Citation standard for software (II)

Do we really need four different types of software?
An agreement on such a standard model would allow a precise identification of the used software.

The next step would be the implementation: In LaTeX, the BibLaTeX/Biber framework can be used. It allows the definition of arbitrary types and their corresponding features
The data model is defined in BibLaTeX in the *.dbx file.
There are some further configuration files, e.g. for the output.)

A first prototype implementation is shown on the next slide.

Citation standard for software (III)

An agreement on such a standard model would allow a precise identification of the used software.

The next step would be the implementation: In LaTeX, the BibLaTeX/Biber framework can be used. It allows the definition of arbitrary types and their corresponding features
The data model is defined in BibLaTeX in the *.dbx file.
There are some further configuration files, e.g. for the output.)

A first prototype implementation is shown on the next slide.

The prototype:
A configuration file *and* the resulting page

```
\ProvidesFile{swmath.dbx}

\DeclareDatamodelEntrytypes{swmath}

\DeclareDatamodelEntryfields[swmath]{
  author,
  prodname,
  creator,
  maintainer,
  version,
  releasedate,
  year,
  provider,
  publisher,
  location,
  doi,
  url,
  downloaddate}

\DeclareDatamodelFields[type=list, datatype=literal]{prodname}
\DeclareDatamodelFields[type=list, datatype=name]{creator}
\DeclareDatamodelFields[type=list, datatype=name]{maintainer}
\DeclareDatamodelFields[type=list, datatype=literal]{version}
\DeclareDatamodelFields[type=field,datatype=literal]{releasedate}
\DeclareDatamodelFields[type=field,datatype=literal]{year}
%\DeclareDatamodelFields[type=field,datatype=verbatim]{publisher}
\DeclareDatamodelFields[type=field,datatype=verbatim]{provider}
\DeclareDatamodelFields[type=list, datatype=verbatim]{location}
\DeclareDatamodelFields[type=list, datatype=verbatim]{doi}
\DeclareDatamodelFields[type=list, datatype=literal]{note}
\DeclareDatamodelFields[type=list, datatype=verbatim]{downloaddate}
\endinput
```

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. R is the base for many R packages listed in https://cran.r-project.org/

References

[swm] **Gonnet, Gaston, Morven Gentleman, and Keith Geddes** (maintained by *Maplesoft Inc.*): **Maple 2016**, Version: **2016**, Date released: 2016-03-02
(Waterloo Maple Inc., Waterloo (Ontario)),
Available at `http://www.maplesoft.com/`.

[swm] **Greyson, Daniel R. and Michael E. Stillman** (maintained by *David Eisenbud*): **Macaulay2**, Version: **1.9**, Date released: 2016-04
(Dept. Mathematics, UIUC, Urbana-Champaign),
Available at `http://www.math.uiuc.edu/Macaulay2`.

[swm] **Sperber, Wolfram** (maintained by *Wolfgang Dalitz and Hagen Chaprary*): **swMATH**, Version: **00:00:99**, Date released: 2014-07-01
(FIZ Karlsruhe, Berlin),
Available at `http://www.swmath.org/`.

[swm] **Wickham, Hadley et al.** (maintained by *R-Project*): **R**, Version: **3.3.1**, Date released: 2016-01-21
(Lucent Technologies, Murray Hill (New Jersey)),
Available at `http://www.r-project.org/`.

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An alternative solution: Web Archives

The establishment of a BibLaTeX citation standard (it's distribution and acceptance) requires time and it is no short time solution.

What can we do in the meantime?

Web Archives are a possibility to get more information about software including information about software

I will discuss (wait for a minute)

What do publications say about software?

Currently, swMATH covers more than 120,000 references to 13,500 software packages.

This allows to specify

- What are the mathematical subjects of the software? (description, keywords and MSC codes)
- What are the most important application areas? (keyword and MSC codes)
- How is the acceptance of the software? (number of references)
- What is related (similar) software? (citation profile plus MSC code)
- Is the software outdated? (citation profile)
- ...

The number of references is also an (heuristic) indicator for the quality, the subjects and the number of references for the granularity, ...

The first step: standard and user publications

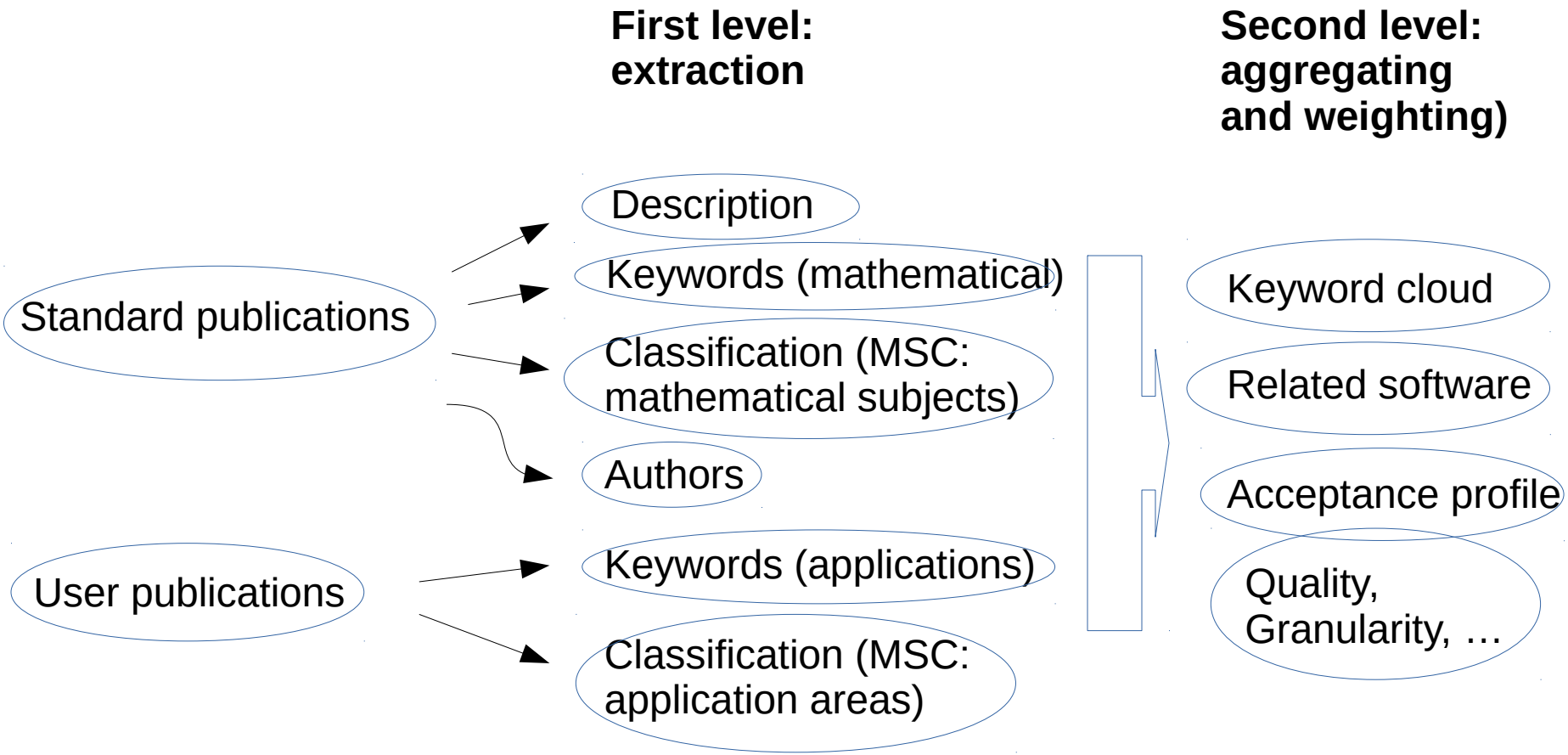
We distinct between

- standard publications
  and
- user publications
  of a software

A standard publication has the software as main subject. Other publications which use the cited software are named as user publications.
Standard and user publications provide different information about software.

A lot of open questions, e.g., How can we classify the type of the swMATH entries with the aid of publications?

The first step: standard and user publications



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Further enhancement of information in swMATH

by using Internet resources, for CAS especially

- search engines
- websites of a software
- mathematical software journals
- Web Archives

to

- identify a URL of websites and the source code of a software
- get more specific information about the available information of a software, especially source code, versions, documentations, authors, license conditions, and further context information (e.g. publications, algorithms, test data, ...)

Web Archives

- Archiving of (selected) web sites with the goal to have a consistent state at any time (this cannot always be achieved).
- Alternative to existing web archives: archiving on demand, e.g. to ensure a consistent state among all information of the software
- Allows preserving descriptions, change logs, documentation, …
  - Source code in case of open source software
  - Even binaries if freely available on the web
  - The website where bought / downloaded the artifact
- Even external resources, such as discussions on forums, tutorials, etc

Web Archives

- Challenges
  - Not all pages archived at the exact same time / state / version
  - Mathematical software and its related websites not always easy to discover (the list of swMATH resources was used as a seed list)
- Questions
  - How well do websites represent software?
  - What does the web tell us about software?
  - What has already been archived?
  - What can we recover from the past?
  - What are we losing?

The experiments were done by Helge Holzmann (L3S), a cooperation partner of swMATH.

An example: The Singular website of swMATH

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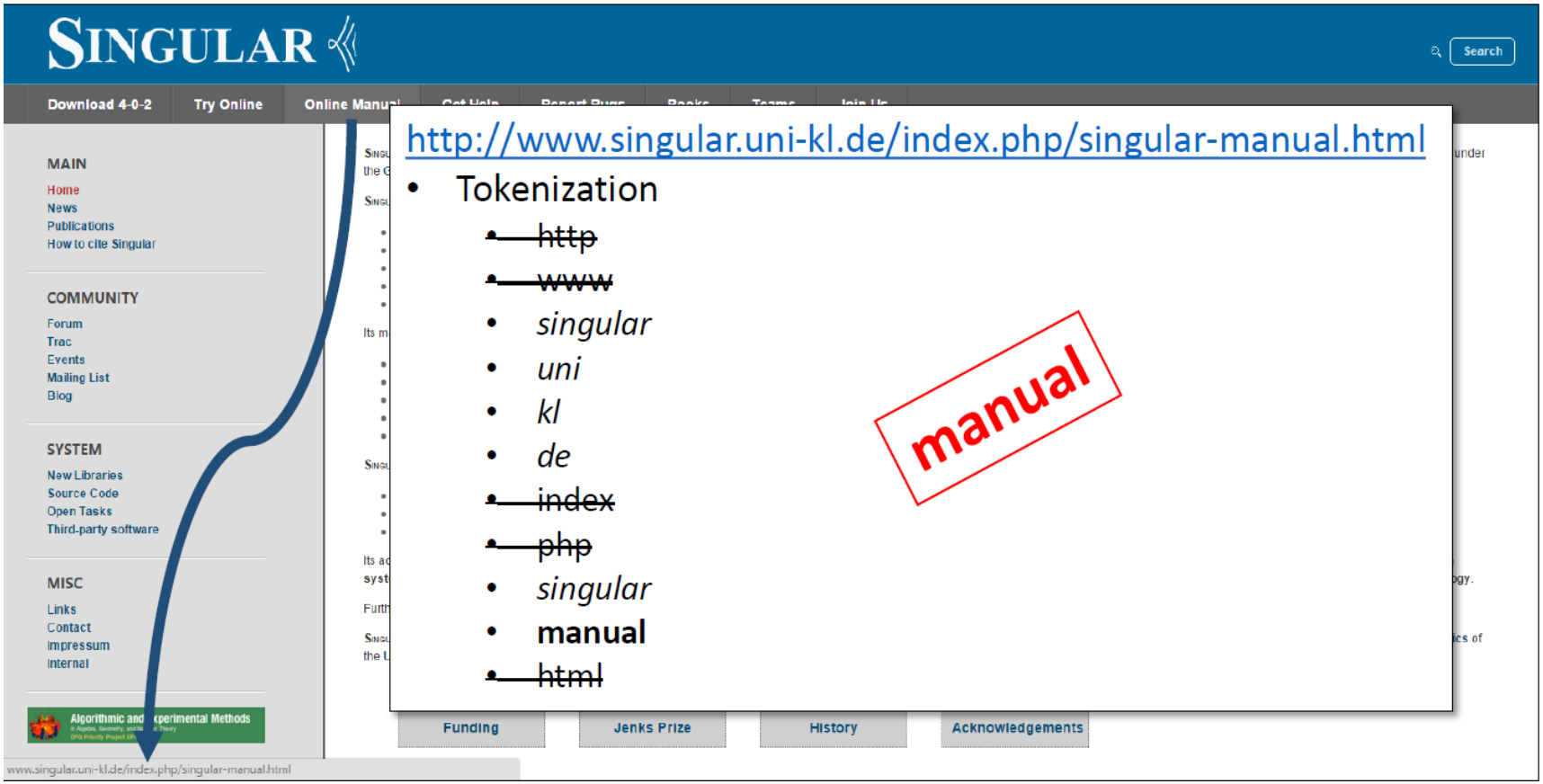
An example: Analysis of the archived websites (by some heuristics)



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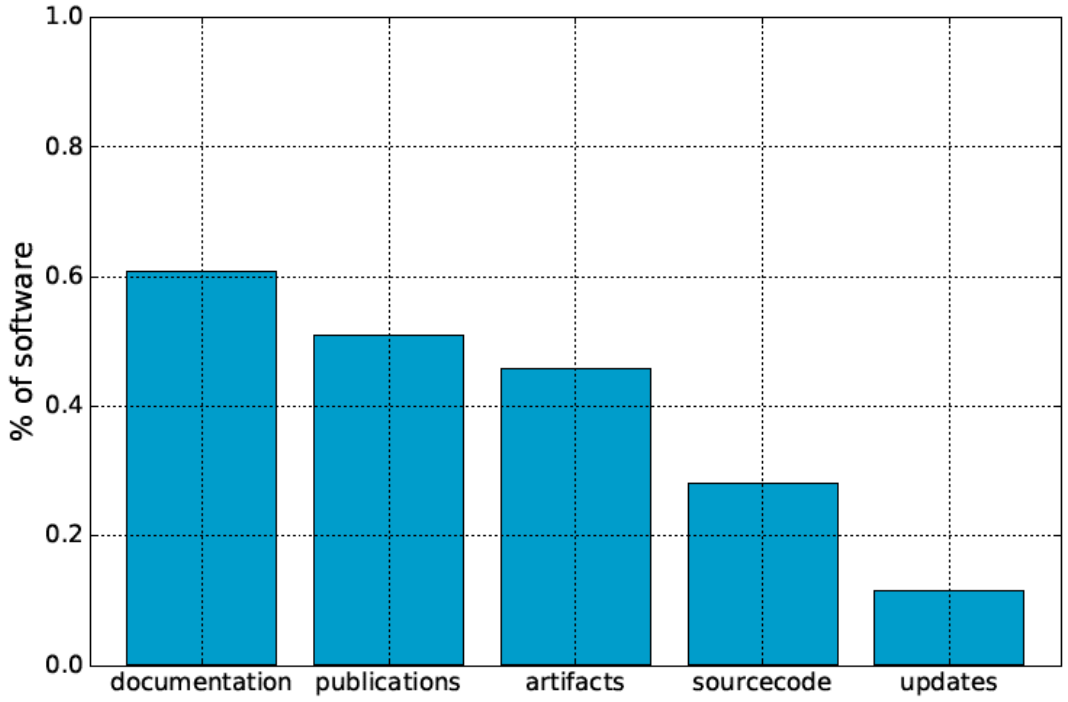
First results: What kind of information can be found on the websites?



gnuplot

Gnuplot is a portable command-line driven graphing utility for Linux, OS/2, MS Windows, OSX, VMS, and many other platforms. The source code is copyrighted but freely distributed (i.e., you don't have to pay for it). It was originally created to allow scientists and students to visualize mathematical functions and data interactively, but has grown to support many non-interactive uses such as web scripting. It is also used as a plotting engine by third-party applications like Octave. Gnuplot has been supported and under active development since 1986.

URL: www.gnuplot.info/
Authors: Williams, T.; Kelley, C.

Add information on this software.

Related software:

R
GridBench
critic
Globus Toolkit
DiPerF
Lua
WIEN2k
Kan
GEPASI
Zebra

Show more...

Keywords for this software

References in zbMATH (referenced in 33 articles)

Showing results 1 to 20 of 33.

Sorted by year (citations) 20

1 **2** **next**

1. Faraway, Julian J.: Linear models with R (2015)
2. Garrido, José M.: Introduction to computational modeling using C and open-source tools (2014)
3. Zok, Tomasz; Popenda, Mariusz; Szachniuk, Marta: MCQ4Structures to compute similarity of molecule structures (2014)
4. Aniszewski, W.; Bogusławski, A.; Marek, M.; Tyliszczak, A.: A new approach to sub-grid surface tension for LES of two-phase flows (2012)
5. Feret, Jerome; Henzinger, Thomas; Koeppl, Heinz; Petrov, Tatjana: Lumpability abstractions of rule-based systems (2012)

Article statistics & filter:

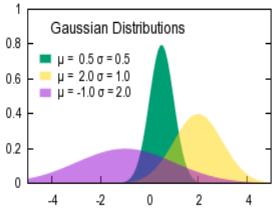
Search for articles

Clear

MSC classification

- Top MSC classes
  - **65** Numerical analysis
  - **68** Computer science
  - **76** Fluid mechanics
  - **81** Quantum Theory
  - **92** Applications of...
- Other MSC classes

gnuplot version 4.6 released!



FAQ
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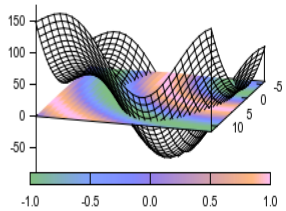
Documentation
External Links
Contributed scripts

Tutorials, learning, and help
Building from CVS source
More on patching and building



Gnuplot is a portable command-line driven graphing utility for Linux, OS/2, MS Windows, OSX, VMS, and many other platforms. The source code is copyrighted but freely distributed (i.e., you don't have to pay for it). It was originally created to allow scientists and students to visualize mathematical functions and data interactively, but has grown to support many non-interactive uses such as web scripting. It is also used as a plotting engine by third-party applications like Octave. Gnuplot has been supported and under active development since 1986.

Gnuplot supports many different types of 2D and 3D plots

Please see demos here.

Gnuplot supports many different types of output

interactive screen display:	cross-platform (Qt, wxWidgets, x11) or system-specific (MS Windows, OS/2)
static screen display:	system-specific (OSX(aqua), svga, ...)
direct output to file:	postscript (including eps), pdf, png, gif, jpeg, LaTeX, metafont, emf, svg, ...
mouseable web display formats:	HTML5, svg

Current release is 4.6 (patchlevel 0)

- Download from SourceForge
- Release Notes
- User Manual (PDF)
- version 4.6 demo gallery.

The Development version is gnuplot 4.7 (CVS)

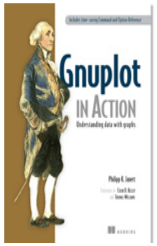
- New features are being added regularly. You are welcome to build gnuplot from the CVS source code. Instructions here.
- Version 4.7 Documentation (PDF), including new features.
- Version 4.7 demo gallery.

News

- 08.03.2012: Release gnuplot 4.6.0.
- 14.11.2011: Release gnuplot 4.4.4.
- 01.03.2011: Release gnuplot 4.4.3.
- 26.09.2010: Release gnuplot 4.4.2.
- 11.09.2010: Release gnuplot 4.4.1.
- 13.03.2010: Release gnuplot 4.4.0.

Copyright/licensing

Gnuplot's copyright.



Now available: A book on gnuplot!

Gnuplot in Action
Understanding Data with Graphs
by Philipp K. Janert

Manning Publications (2009)
ISBN: 1933988398
ISBN-13: 978-1933988399

Summary

We have presented some concepts and methods which were used for developing the swMATH for mathematical software.

swMATH aims to provide information for all mathematical software.

A core feature of swMATH is the analysis of mathematical literature.

Standards, especially for software citation, would be very helpful for the further development of service for mathematical software (but also for reputation of software development).

The swMATH approach allows a smart and (semi-)automatic generating and Maintaining of this service.

Check us: www.swmath.org

and

Thanks for your patience!

FIZ Karlsruhe

Leibniz-Institut für Informationsinfrastruktur