

The SymbolicData Project. From Data Store to a Computer Algebra Social Network

Hans-Gert Gräbe, Andreas Nareike, Simon Johanning

Leipzig University, Germany

<http://bis.informatik.uni-leipzig.de/HansGertGraebe>

DMV/PTM Joint Meeting, Poznan, 2014-09-18



Aim and Scope

SymbolicData is an

- inter-community project with roots in the activities of different Computer Algebra Communities to develop concepts and tools for profiling, testing and benchmarking Computer Algebra Software (CAS) and
- aims at interlinking these and other scientific activities using modern Semantic Web concepts.

It started at the ISSAC 1998 Special session on Benchmarking.

Tools and data are designed to be used both

- on a local site for special testing and profiling purposes
- to manage a central repository at

<http://www.symbolicdata.org>

What does SymbolicData offer?

The
SymbolicData
Project

Gräbe,
Nareike,
Johanning

Aim and
Scope

The
SymbolicData
Data Store

RDF – Basic
Concepts

SymbolicData
meets RDF

Towards a CA
Social
Network
(CASN)

Links

Data:

- Polynomial Systems Solving
- Geometry Theorem Proving
- Fano Polytopes (A. Paffenholz)
- Free Algebras
- G-Algebras
- Test Sets from Integer Programming

Draft:

- Birkhoff Polytopes (A. Paffenholz)
- Transitive Groups (J. Klüners, G. Malle)

What does SymbolicData offer?

The
SymbolicData
Project

Gräbe,
Nareike,
Johanning

Aim and
Scope

The
SymbolicData
Data Store

RDF – Basic
Concepts

SymbolicData
meets RDF

Towards a CA
Social
Network
(CASN)

Links

Tools:

SDEval Package (Albert Heinle)

- Aim: Set up, run, log, monitor standardized Computations on SD data series in a reliable way
- Technology: Python standalone on top of the OS
- <http://symbolicdata.org/wiki/SDEval>

SDSage Package (Andreas Nareike)

- Aim: Call the new Polynomial Systems format from Sagemath
- Technology: Sagemath Python Package
- <http://symbolicdata.org/wiki/PolynomialSystems.Sage>

Short demo on local data and sdsage.

RDF and Linked Data Principles

- RDF = Resource Description Framework
 - Main idea: Store pieces of information in a unified way as triples, use standard tools to manage these data.
- *Resources*: URI, HTTP access
 - URI = Unique Resource Identifier
 - Access to worldwide distributed data in a unified way
- *Resource Descriptions*: Deliver a valuable piece of information in structured RDF format, that can be combined with other pieces of information from other sources into new RDF sentences.
- Run *RDF Triple Stores* as part of a worldwide distributed data storage infrastructure
- (Federated) Query Language SPARQL
- Run *SPARQL Endpoints* on RDF triple stores

SymbolicData Infrastructure

- Main repository <http://github.com/symbolicdata> and several clones (following the Integration Master Pattern)
- A project wiki at <http://symbolicdata.org>
- A mailing list
- Web access to the XML resources
- Two centrally operated Virtuoso based RDF data stores for meta informations ('Data' and 'casn')
- Organized along Linked Data Principles
- Regular dumps of RDF data in Turtle format
- Two SPARQL endpoints to query the data
- Advise for local installation of tools and data based on Virtuoso and a local Apache Web server

SymbolicData Data Structures

Resources:

- SD provides own resources in an XML based format
 - Polynomial Systems, Geometry Theorem Proving, ...
- Draft: SD addresses other resources at different stores
 - Polytopes, Transitive Groups
- Maintenance of resources requires special semantic knowledge, semantic aware tools and semantically educated people

Resource Descriptions:

- Precomputed *fingerprints* of the different resources in RDF format to navigate and search within the data. It requires *semantic* knowledge both to compute fingerprints and to use them in an appropriate way.

SymbolicData Data Structures

The
SymbolicData
Project

Gräbe,
Nareike,
Johanning

Aim and
Scope

The
SymbolicData
Data Store

RDF – Basic
Concepts

SymbolicData
meets RDF

Towards a CA
Social
Network
(CASN)

Links

Background information:

- *Background information:* Use RDF to manage additional data, try to interlink that data with other sources along the Linked Data Principles.
- Bibliography – bibliographical references system (to be aligned with ZBMath)
- People – different people and groups (partly aligned with ZBMath)
- Systems – list of CA software (aligned with swmath)

Upcoming – social information:

- Conferences, Groups, Dissertations

Towards a CA Social Network (CASN)

How to turn a DDS¹ into a vivid, well recognized Social Network with plenty of valuable background information?

Central observation: Valuable background information is information that people care about.

- Find out the places where such information is spread today. Usually it is *streamed*, not *stored*.
- Try to semantically annotate that information.
- Build views (web sites) that harvest such information.

¹DDS = Dead Data Store

An RDF based Road Map to a CASN

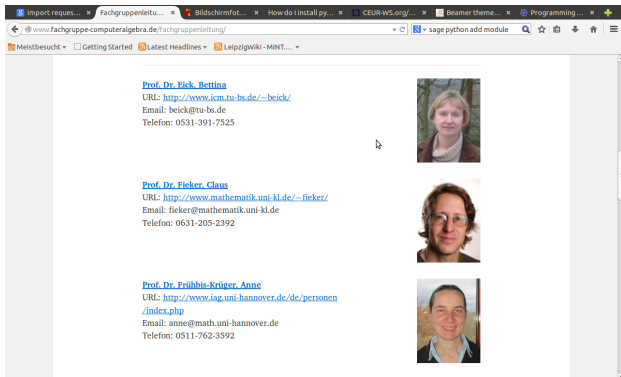
How to reach such a goal with RDF based semantic technologies?

- Main idea: Turn passive users into active ones.
- Identify and shape appropriate ontologies.
- Collect RDF data of such types, link to other sources along the Linked Data Principles.
A very first prototype is used to collect such information and to display it within the Wordpress based CAFG site.
- The stakeholders understand, that this is a techno-social, and even more a social than a technical process that is best discussed on the Symbolicdata Mailing list.
- The CASN germ at <http://symbolicdata.org/casn> matures thanks to common efforts.

What is already done?

<http://symbolicdata.org/casn/FOAF-Profiles/>

Basic information about People – more than 700 instances
foaf:Person instances (i.e., passive users) from different sources.
Partly extended to FOAF profiles and used to display people from the
CAFG Board within the Wordpress based CAFG site.



The screenshot shows a web browser window with the address bar displaying www.fachgruppe-computeralgebra.de/fachgruppenleitung/. The page content lists three individuals with their names, URLs, email addresses, and telephone numbers, each accompanied by a small portrait photograph.

- Prof. Dr. Fick, Bettina**
URL: <http://www.icm.tu-bs.de/~beick/>
Email: beick@tu-bs.de
Telefon: 0531-391-7525
- Prof. Dr. Fieker, Claus**
URL: <http://www.mathematik.uni-kl.de/~fieker/>
Email: fieker@mathematik.uni-kl.de
Telefon: 0631-205-2392
- Prof. Dr. Friibbis-Krueger, Anne**
URL: <http://www.iag.uni-hannover.de/de/personen/index.php>
Email: anne@math.uni-hannover.de
Telefon: 0511-762-3592

What is already done?

<http://symbolicdata.org/casn/WorkingGroups/>

Standard information about CA Working Groups – 17 Instances of RDF type foaf:Group and sd:WorkingGroup from the old CAFG site. Used to display that within the Wordpress based CAFG site.

Forschung im Bereich Computeralgebra

Die folgende Liste wird aus der [CASN Datenbasis](#) generiert.

Arbeitsgruppe Hartmann, RWTH Aachen, Germany
URL: <http://www.algebra.rwth-aachen.de/>

Arbeitsgruppe Hiss, RWTH Aachen, Germany
URL: <http://www.math.rwth-aachen.de/>

Arbeitsgruppe Plesken, RWTH Aachen, Germany
URL: <http://wwwb.math.rwth-aachen.de/>

Arbeitsgruppe Kerber, Uni Bayreuth, Germany
URL: <http://www.mathe2.uni-bayreuth.de/oldindex.html>

Arbeitsgruppe Stoll, Uni Bayreuth, Germany
URL: <http://www.mathe2.uni-bayreuth.de/stoll/>

Bonn-Aachen International Center for Information Technology
URL: <http://cosec.bit.uni-bonn.de/cosec/members/gathen>

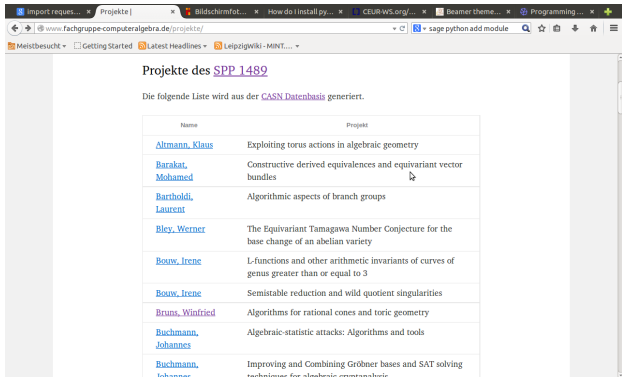
Arbeitsgruppe Algebra und diskrete Mathematik, TU Braunschweig, Germany
URL: <http://www.icm.tu-bs.de/~beick>

Arbeitsgruppe Buchmann, Uni Darmstadt, Germany

What is already done?

<http://symbolicdata.org/casn/SPP-Projekte/>

Standard information about CA Projects – 60 instances of RDF type `sd:Project`, compiled from the list of projects within the SPP 1489 priority program.



The screenshot shows a web browser window with the URL `www.fachgruppe-computeralgebra.de/projekte/`. The page title is "Projekte des SPP 1489". Below the title, it says "Die folgende Liste wird aus der CASN Datenbasis generiert." and displays a table of projects.

Name	Projekt
Altmann, Klaus	Exploiting torus actions in algebraic geometry
Barakat, Mohamed	Constructive derived equivalences and equivariant vector bundles
Bartholdi, Laurent	Algorithmic aspects of branch groups
Bley, Werner	The Equivariant Tamagawa Number Conjecture for the base change of an abelian variety
Bouw, Irene	L-functions and other arithmetic invariants of curves of genus greater than or equal to 3
Bouw, Irene	Semistable reduction and wild quotient singularities
Bruns, Winfried	Algorithms for rational cones and toric geometry
Buchmann, Johannes	Algebraic-statistic attacks: Algorithms and tools
Buchmann, Johannes	Improving and Combining Gröbner bases and SAT solving techniques for algebraic cvrntanalysis

What is already done?

<http://symbolicdata.org/casn/UpcomingConferences/>

Information about CA conferences – 12 instances of `sd:UpcomingConference` and 58 instances of `sd:PastConference`, compiled from different sources. Used as input for the printed version of the CA Rundbrief.

Tagungsankündigungen bei SymbolicData

Diese Informationen werden über den [SymbolicData](#) Sparql-Endpunkt aus den SymbolicData Tagungsinformationen inferiert. Der Link in der Überschrift der jeweiligen Tagung verweist auf den Eintrag in der SymbolicData Datenbank.

[Workshop in tropical topics and related areas](#)

Vom 26.06.2014 bis 27.06.2014 in Uni Saarbruecken, Germany.

There will be a workshop in tropical topics and related areas in Saarbruecken, June 26-27. Speakers include Andreas Gross, Milena Hering, Michael Joswig and Iliia Zharkov.

URL der Tagung: <http://www.math.uni-sb.de/wiki/doku.php?id=ag.seite:markwig.conferences:dibb>

[CICM 2014 - Conferences on Intelligent Computer Mathematics](#)

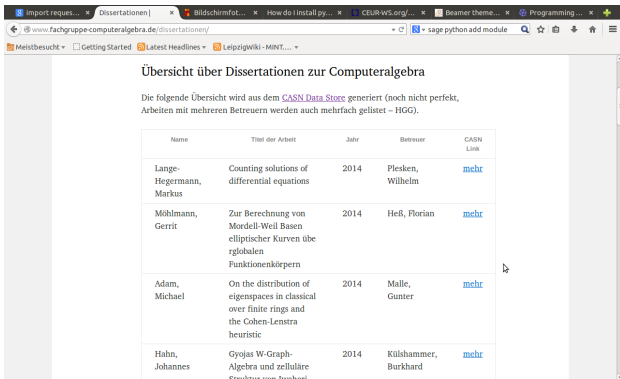
Vom 07.07.2014 bis 11.07.2014 in University of Coimbra, Portugal.

As computers and communications technology advance, greater opportunities arise for

What is already done?

<http://symbolicdata.org/casn/Dissertationen/>

Information about dissertations in CA – 28 instances of RDF type `bibo:Thesis`, compiled from the CA Rundbrief.



The screenshot shows a web browser window with the URL `www.fachgruppe-computeralgebra.de/dissertationen/`. The page title is "Übersicht über Dissertationen zur Computeralgebra". Below the title, there is a paragraph stating: "Die folgende Übersicht wird aus dem CASN Data Store generiert (noch nicht perfekt, Arbeiten mit mehreren Betreuern werden auch mehrfach gelistet – HGG)." Below this text is a table with five columns: "Name", "Titel der Arbeit", "Jahr", "Betreuer", and "CASN Link". The table contains four rows of data.

Name	Titel der Arbeit	Jahr	Betreuer	CASN Link
Lange-Hegermann, Markus	Counting solutions of differential equations	2014	Plesken, Wilhelm	mehr
Möhlmann, Gerrit	Zur Berechnung von Mordell-Weil Basen elliptischer Kurven über globalen Funktionenkörpern	2014	Heß, Florian	mehr
Adam, Michael	On the distribution of eigenspaces in classical over finite rings and the Cohen-Lenstra heuristic	2014	Malle, Gunter	mehr
Hahn, Johannes	Gyojas W-Graph-Algebra und zelluläre Struktur von Twisted...	2014	Külshammer, Burkhard	mehr

What is already done?

<http://symbolicdata.org/casn/CAR-Beitraege/>

Information about articles in the CA Rundbrief – 75 instances of RDF type `sd:Reference` to be displayed at the website of the German Fachgruppe.

The screenshot shows a web browser window with the URL `www.fachgruppe-computeralgebra.de/rundbrief-beitraege/`. The page title is "Übersicht über Beiträge aus dem CA-Rundbrief". The main content includes:

- A paragraph stating that contributions are listed on this page, extracted from the `SymbolicData CASN Datenbasis`.
- A paragraph explaining that links to each contribution lead to meta-information in the `SymbolicData` database.
- A paragraph indicating this is the first stage of information networking between the WordPress presence of the Fachgruppe and the `SymbolicData` database.
- A list of article references with their titles and issue numbers.

References listed:

- [Cinderella - Dynamische Geometrie für Schulen, Universitäten, Ausstellungen und Museen](#), CA-Rundbrief, Heft 54, 8-11
- [Rational points on hyperelliptic curves: Recent developments](#), CA-Rundbrief, Heft 54, 8-11
- [Von der Geradenschar zur Kaustik](#), CA-Rundbrief, Heft 54, 17-18
- [Kubisch, quartisch und so weiter](#), CA-Rundbrief, Heft 54, 15-16
- [Symbolic summation in difference fields and its application in particle physics](#), CA-Rundbrief, Heft 53, 8-12

What is already done?

<http://symbolicdata.org/casn/News/>

A first approach to Annotated News – 2 instances of RDF types `sioc:BlogPost` and `bibo:Document` related to blog posts on the website of the German Fachgruppe.

No picture – pure harvesting functionality
to be used with SPARQL querying.

Links

- <http://wiki.symbolicdata.org> – the SD Wiki
- <http://symbolicdata.org/XMLResources> – the SD XML Resources
- <http://symbolicdata.org/RDFData> – the SD RDF Data Turtle Files
- <http://symbolicdata.org/Data> – the SD OntoWiki view on the basic RDF data
- <http://symbolicdata.org/casn> – the SD OntoWiki view on the CASN RDF data
- <https://github.com/symbolicdata> – the SD Repository at github