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

Hans-Gert Gräbe, Albert Heinle, Simon Johanning

Leipzig University, Germany
University of Waterloo, Canada
http://bis.informatik.uni-leipzig.de/HansGertGraebe

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The
SymbolicData
Project

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Aim and
Scope

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SymbolicData
Data Store

SymbolicData
meets RDF

Towards a CA
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(CASN)

Links

What is Computer Algebra?

1993–95 more than 200 leading edge computer algebraists compiled in a worldwide joint effort the *Computer Algebra Handbook*, a description of the CA landscape and realized for the target of CA:

> *Therefore computer algebra can be effectively employed for answering questions from various areas of computer science and mathematics, as well as natural sciences and engineering, provided they can be expressed in a mathematical model.*

Johannes Grabmeier even coined the notion of *Computer Mathematics*.

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What is Computer Algebra?

What left from such an unified view 20 years later?

A *practical incarnation* of such a vision is any of the mature General Purpose Computer Algebra Systems (or even Infrastructure), in particular the one that claims to be the worlds definitive system for modern technical computing.

Questions:

- The more powerful tools, the more specialized science?

- What's about intercommunity communication between the more and more specialized subcommunities?

- What's about *processual knowlegde* and *processual skills*, i.e., *technics*, beyond these highly specialized communities?

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SymbolicData – Aim and Scope

SymbolicData is an CA inter-community project

- to develop concepts and tools for profiling, testing and benchmarking Computer Algebra Software (CAS),

- to provide a sustainably available and semantically interlinked infrastructure for CA data,

- and aims at interlinking these and other scientific activities using modern Semantic Web concepts.

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SymbolicData – Aim and Scope

The SD project started at the ISSAC 1998 Special session on Benchmarking.

In a *first phase* (1998–2003) we concentrated on development of tools and collected data for CA benchmarks from *Polynomial Systems Solving* and *Geometry Theorem Proving*.

In a *second phase* (2003–2009) we concentrated on consolidation of the infrastructure and extended the project's scope to G-Algebras and Integer programming. In 2005 the Web site http://www.symbolicdata.org sponsored by the German CA Fachgruppe went online.

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SymbolicData – Aim and Scope

In a *third phase* (since 2009) we started a redesign of the data and infrastructure along rules of Linked Data and semantic, RDF-based technology and joined forces with the `normaliz` team (Relaunch of the Integer Programming part in May 2015) and the `polymake` team (first steps to integrate data about Fano and Birkhoff polytopes).

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What does SymbolicData offer?

Data:

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

Draft:

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

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What does SymbolicData offer?

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

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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

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Towards an *E-Science World*

SymbolicData v.3 – focus shift from the *data* to the *people and their intentions* perspective:

> *Why* they collect and manipulate such data?

We are convinced: It is time to use the *technical means* of an semantically enriched Web 2.0

- to strengthen the *social* part of our cooperation and
- to contribute to the efforts to build up an interconnected *E-Science World*.

Towards an *E-Science World*

We observed and noticed: During the last years such efforts matured within the *Science at Large*.

- Services such as MathSciNet, arXiv.org, or EasyChair.org have been established and their usefulness is widely acknowledged.

- There are plenty of new activities, in particular by the *national libraries and organizations* (VIAF), by the *Zentralblatt Mathematik* (POS-Tagging), or by the IMU, that advances the vision of a *21st Century Global Library for Mathematics Research* (GDML).

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What's about the CA *E-Science World*

It is a great challenge to smaller scientific communities to adopt such developments for its own scientific communication processes and to join forces with other scientific communities to get own requirements publicly recognised.

A first step in such a direction could be a more detailed description of ongoing scientific processes using standard RDF terminology.

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Towards a CA Social Network (CASN)

With version 3 SymbolicData started to address the technical aspects of such cooperational needs in more detail, developed a vision of a *Computer Algebra Social Network* (CASN), and started to realize it.

Our main approach: Maintain (more) valuable background information, i.e., information that people care about.

- Find out the stakeholders and 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.

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A Road Map Proposal

What's about you?

The main problem: Turn passive users into active ones.

We propose as road map:

1. Identify stakeholders.

   The SD People Database contains 812 `foaf:Person` instances (i.e., passive users) from different sources, in particular from Conference Announcements (board members and invited speakers).

2. Convince you to join efforts to build such a new Tower of Babel.

   Discuss, identify and shape appropriate ontologies as a commonly agreed way to structure information.

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A Road Map Proposal

③ 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 site of the German Fachgruppe.

④ The stakeholders realize, that this is a techno-social, and even more a social than a technical process that requires efforts, ressources and permanent discussion, e.g., on the mailing list of the SD Project.

⑤ The CASN germ matures thanks to common efforts.

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What is already done?

http://symbolicdata.org/Data/People/

- Basic information about People – 812 instances foaf:Person instances (i.e., passive users) from different sources, in particular from Conference Announcements (board members and invited speakers).

- 34 Personal Profiles, e.g., used to display people from the CAFG Board within the Wordpress based CAFG site.

- 347 matches with the Zentralblatt author's database.

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The
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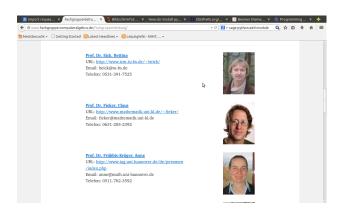Data Store

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What is already done?

The CAFG Board within the Wordpress based CAFG site, extracted
from the Personal Profile Documents of the different members at

`http://www.fachgruppe-computeralgebra.de/FOAF-Profiles/`.

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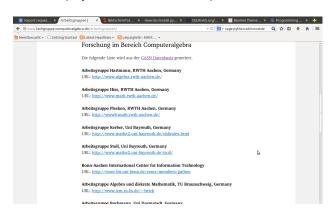
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What is already done?

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.

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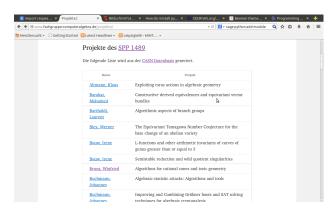Data Store

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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.

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SymbolicData
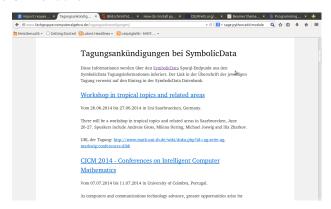Data Store

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What is already done?

`http://symbolicdata.org/casn/UpcomingConferences/`

Information about CA conferences – 17 instances of
`sd:UpcomingConference` and 72 instances of `sd:PastConference`,
compiled from different sources. Used as input for the printed version
of the CA Rundbrief.

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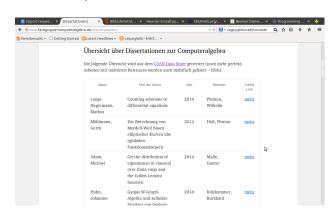Data Store

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What is already done?

`http://symbolicdata.org/casn/Dissertationen/`

Information about dissertations in CA – 29 instances of RDF type
`bibo:Thesis`, compiled from the CA Rundbrief.

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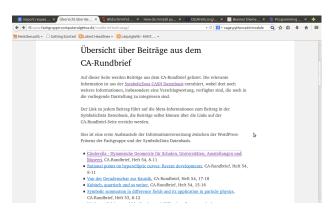Data Store

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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.

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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