MOWGLI
Kick–Off Meeting —

Usability of MBase for MOWGLI

Markus Moschner

University of Saarbrücken, D-66123, Germany;
email: moschm@mathweb.org

15.March 2002

First Glance

- Management of mathematical knowledge
- Content language: **OMDoc**
- **Development Graph**
- Implementation based on the **MathWeb** infrastructure
- Demo and prerelease available

Application of MBase

- Usage for writing mathematical documents:
  - Structured repository of mathematical concepts
  - Storing and retrieving mathematical documents
- Potential use:
  - Unification of libraries
  - Repository of (standardized) **XML**–based documents
  - Semantics–based retrieval of distributed mathematical facts
- Possible use within MOWGLI:
  local repositories for a uniform data exchange
- Systems intended to use it in the near future:
  1. ActiveMath authoring tool
  2. INKA and Ωmega proof planner
  3. Other **MathWeb** systems

Features

1. Syntactic support for **OMDoc** 1.1
2. Web interface
3. XMLRPC interface
   (libraries for important programming languages exist)
4. Pattern matching (“case” in **Oz**) —
   core of semantics–oriented search
5. Content stored in SQL database
6. Distributions for Linux

Roadmap

- Current state: database for mathematical content
- Ongoing work:
  - Better support for semantics
  - Content exchange between **MBase**–servers
  - **Development Graph** integration
- Future work:
  - Fulfill proof obligations automatically (via **MathWeb**)
  - Syntax transformators
  - Logical morphisms

Development Graph

- Development by Dieter Hutter and Serge Autexier
- Directed (acyclic) graphs with
  1. theories as nodes
  2. morphisms as edges —
     Definition and Theorem Links
- Mechanism for:
  1. Formulating theory links
  2. Proving of relations between theories
- Management of Change:
  Computation of proof obligations after changes
- Realized in the **MAYA** system

URLs

- **MBase**
  - Homepage: http://www.mathweb.org/mbase
  - Demo: http://mbase.mathweb.org:8080
  - Bugtracking: http://bugzilla.mathweb.org:8000
  - Users mailing list: mbase@mathweb.org
  - Download of prereleases for Linux:
    http://www.mathweb.org/releases/mbase
    ftp://ftp.ags.uni-sb.de/mathweb.org/releases/mbase
- **OMDoc** :
  - http://www.mathweb.org/omdoc/index.html
  - Mailing list: omdoc@mathweb.org
- **Development Graph**:
  - http://www.dfki.de/~inka/maya.html

- http://www.dfki.de/vse/systems/inka/inka5.html

- **URLs for ActiveMath**
  - Homepage: http://www.mathweb.org/activemath/index.html
  - Demo: http://www.mathweb.org/activemath/demo/
  - Bugtracking: http://leibniz.ags.uni-sb.de:8000/

Idea on OMDoc

- **OMDoc** = **O**pen Markup Format for **M**athematical **Doc**uments
- **XML** based
- Extension of **OpenMath** standard
- Universal format for mathematical documents
- Flexibility for semantical notions
- Separating presentation and content

Types of OMDoc items

- Theories and inheritance
- Core mathematical objects:
  - Definitions and symbols
  - Assertions, axioms and proofs
- For Content:
  - metadata: Dublin Core
  - FMP: formal content
  - CMP: natural language content

- ADT: abstract data types
- Auxiliary elements:
  - System specific private data
  - Applets
- Presentation information

Usage of OMDoc

- Examples of use:
  - Mathematical books in **OMDoc**
  - **ActiveMath** group: a web–based learning system for mathematical courses (slightly modified version)
  - **QMath** by Alberto González Palomo — a frontend for **OMDoc** (needs development)
  - Communication standard between Ωmega and TPS
  - Various XSL style files for transformation into other formats

```
<theory id="SEMIGROUP">
  <metadata>
    <Title>The Theory SEMIGROUP</Title>
    <Creator role="aut">The OMEGA system</Creator>   Metadaten
    <Date>2001-5-28</Date>
  </metadata>
  <commonname>Semi-group theory</commonname>   Name

  <imports id="SEMIGROUP.impfrom.MAGMA"from="MAGMA"type="global">

    <morphism id="SEMIGROUP.impfrom.MAGMA.morphism"/>

  </imports>
  <symbol id="SEMIGROUP"kind="object">
    <commonname>SEMIGROUP</commonname>   Symbol-Deklaration
  </symbol>
```

```
  <definition id="def-SEMIGROUP"for="SEMIGROUP"type="simple">
    <CMP>Definition of a Semigroup.</CMP>
    <FMP logic="POST">
      <OMOBJ>
        <OMBIND>
          <OMS cd="POST"name="all-types"/>
          <OMBVAR><OMV name="AA"/></OMBVAR>
          <OMBIND>
            <OMS cd="mltt"name="lambda"/>
            <OMBVAR>
              <OMATTR>
                <OMATP><OMS cd="mltt"name="type"/>
                       <OMA><OMS cd="mltt"name="funtype"/><OMV name="AA"/>
                            <OMS cd="GENERIC"name="O"/></OMA></OMATP>
                <OMV name="S"/>
              </OMATTR>
              <OMATTR>
                <OMATP><OMS cd="mltt"name="type"/>
                       <OMA><OMS cd="mltt"name="funtype"/><OMV name="AA"/>
                            <OMA><OMS cd="mltt"name="funtype"/><OMV name="AA"/>
                                 <OMV name="AA"/></OMA></OMA></OMATP>
                <OMV name="OP"/>
              </OMATTR>
            </OMBVAR>
            <OMA>
              <OMS cd="BASE"name="AND"/>
              <OMA><OMS cd="TYPED-SET"name="NOT-EMPTY"/><OMV name="S"/></OMA>
              <OMA>
                <OMS cd="BASE"name="AND"/>
                <OMA><OMS cd="STRUCT"name="CLOSED-UNDER"/>
                     <OMV name="S"/><OMV name="OP"/></OMA>
                <OMA><OMS cd="STRUCT"name="ASSOCIATIVE"/>
                     <OMV name="S"/><OMV name="OP"/></OMA>
              </OMA></OMA>
          </OMBIND></OMBIND>
      </OMOBJ>
    </FMP>
  </definition>
</theory>
```

Definition