

# `smglom.cls/sty`: Semantic Multilingual Glossary for Math

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## Abstract

The `smglom` package and class are part of the  $\text{\LaTeX}$  collection, a version of  $\text{\TeX}/\text{\LaTeX}$  that allows to markup  $\text{\TeX}/\text{\LaTeX}$  documents semantically without leaving the document format, essentially turning  $\text{\TeX}/\text{\LaTeX}$  into a document format for mathematical knowledge management (MKM).

This package supplies an infrastructure for writing OMDoc glossary entries.

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# 1 Introduction

We use  $\text{\LaTeX}$  as the surface language for the SMGLoM (Semantic Multilingual Glossary of Mathematics), see [Gin+16; Koh14; SMG]. The `smglom` package and class provides some infrastructure to make this more convenient.

## 2 The User Interface

The `smglom` package provides convenience macros on top of the  $\text{\LaTeX}$  infrastructure to simplify writing SMGLoM glossary modules and make them more concise for reading. The `smglom` class just sets up the necessary  $\text{\LaTeX}$  packages and loads the `smglom` package.

### 2.1 Package and Class Options

`smglom.sty` accepts all options of the  $\text{\LaTeX}$  package and passes them along to `stex.sty` [Koh20]. `smglom.cls` also does that for the classes `omdoc.cls` [Kohlhase:smomdl] and `article.cls`.

### 2.2 Convenience Macros for SMGLoM Modules

The SMGLoM source files are more regular than arbitrary  $\text{\LaTeX}$  files. In particular,

- make heavy use of the `multiling` package for multilingual  $\text{\LaTeX}$ ,
- use the `mathhub` extensions to  $\text{\LaTeX}$  for file system organization,
- enforce the one-module-one-file convention and make sure that the module name must be the same as the (base name) of the file.

This allows use to abbreviate e.g.

```
\importmhmodule[mhrepos=lib/archive,path=current/modfile]{modname}
```

```
\gimport by\gimport[lib/archive]{modname} and analogously for \guse. 1
\guse
```

### 2.3 Terminological Relations

<sup>2</sup>

### 2.4 Presenting Glossaries

`smglossary` The `smglom` package provides the `smglossary` environment for presenting glossaries. This expects a sequence of

- `smentry`      • glossary entries marked up using the `smentry` environment, which contains a definition.

`\smsynonymref`      • synonym references marked up `\smsynonymref`

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<sup>1</sup>EdNOTE: document them

<sup>2</sup>EdNOTE: document them

`\smjointdefref`      • joint definition references marked up `\smjointdefref`

The latter two mark up cross references for definitions that contain more than one `\defi*` and would otherwise result in multiple (often more than a handful) copies of the same definition and thus lead to rambling glossaries.

The following snippet is a typical example, showing all three cases.

```
\begin{smglossary}
  \smjointdefref{zero vector}{x6e12a4211dd6546c}{vector space}
  \begin{smentry}{\hypertarget{x4d4e8afd0e133715}{zerofree}}{smglom/numbers}
    \guse[smglom/numbers]{zerofree}
    An \trefi[integernumbers]{integer} whose decimal digits
    \trefi[positional-number-system]{digit} no zeros is said to be \defi{zerofree}.
  \end{smentry}
  \smsynonymref{well-ordering}{x1e9bbb88fb4d90b3}{well-order}
\end{smglossary}
```

The  $\TeX$  universe has a set of LMH scripts [] that allow to generate glossaries and dictionaries from  $\TeX$  sources, such as [SMG].

## 3 Implementation: The SMGloM Class

### 3.1 Class Options

To initialize the `smglom` class, we pass on all options to `omdoc.cls` as well as the `stex` and `smglom` packages.

```
1 <*cls>
2 \DeclareOption*{\PassOptionsToClass{\CurrentOption}{omdoc}}
3                               \PassOptionsToPackage{\CurrentOption}{stex}
4                               \PassOptionsToPackage{\CurrentOption}{smglom}}
5 \ProcessOptions
```

We load `omdoc.cls`, the `smglom` package that provides the SMGloM-specific functionality<sup>3</sup>, and the `stex` package to allow OMDoc compatibility.

```
6 \LoadClass{omdoc}
7 \RequirePackage{smglom}
8 \RequirePackage{stex}
9 \RequirePackage{amstext}
10 \RequirePackage{amsfonts}
11 </cls>
```

Now we do the same thing for the package; first the options, which we just pass on to the `stex` package. But we also make sure that the `modules` package is loaded with the `mh` option, since the `smglom` package depends on these extensions.

```
12 <*sty>
13 \PassOptionsToPackage{mh}{modules}
14 \DeclareOption*{\PassOptionsToPackage{\CurrentOption}{statements}
15                               \PassOptionsToPackage{\CurrentOption}{dcm}
16                               \PassOptionsToPackage{\CurrentOption}{cmath}
17                               \PassOptionsToPackage{\CurrentOption}{structview}
18                               \PassOptionsToPackage{\CurrentOption}{smultiling}}
19 \ProcessOptions
```

We load `omdoc.cls`, and the desired packages. For the  $\text{\LaTeX}$  bindings, we make sure the right packages are loaded.

```
20 \RequirePackage{statements}
21 \RequirePackage[langfiles]{smultiling}
22 \RequirePackage{structview}
23 \RequirePackage{dcm}
24 \RequirePackage{cmath}
25 \RequirePackage[base]{babel}
```

We set up triggers for the other languages, currently only German.

```
26 \AfterBabelLanguage{ngerman}{\input{smglom-ngerman.ldf}}
```

---

<sup>3</sup>EDNOTE: MK:describe that above

### 3.2 Convenience Macros for SMGloM Modules

`\gimport` Just a shortcut, we have a starred and unstarred version, the first one is conservative. For example, if we execute:

```
\gimport[smglom/numberfields]{naturalnumbers}
```

First we are redirected to `\@gimport@nostar`, we store the `smglom/numberfields` (*the repo's path*) in `\@test`, then store `\mh@currentrepos` (*current directory*) in `\mh@repos`. If no repo's path is offered, that means the module to import is under the same directory, so we let `mhrepos=\mh@repos` and pass bunch of parameters to `\importmhmodule`, which is defined in `module.sty`. If there's a repo's path, then we let `mhrepos=<the repo's path>`. Finally we use `\mhcurrentrepos` (defined in `module.sty`) to change the `\mh@currentrepos`.

```
27 \def\gimport{\@ifstar\@gimport@star\@gimport@nostar}%
28 \newrobustcmd\@gimport@star[2] [] {\def\@test{#1}%
29 \edef\mh@repos{\mh@currentrepos}%
30 \ifx\@test\@empty%
31 \importmhmodule[conservative,mhrepos=\mh@repos,path=#2]{#2}%
32 \else\importmhmodule[conservative,mhrepos=#1,path=#2]{#2}\fi%
33 \mhcurrentrepos{\mh@repos}%
34 \ignorespacesandpars\usemodule@maybesetcodes}
35 \newrobustcmd\@gimport@nostar[2] [] {\def\@test{#1}%
36 \edef\mh@repos{\mh@currentrepos}%
37 \ifx\@test\@empty%
38 \importmhmodule[mhrepos=\mh@repos,path=#2]{#2}%
39 \else\importmhmodule[mhrepos=#1,path=#2]{#2}\fi%
40 \mhcurrentrepos{\mh@repos}%
41 \ignorespacesandpars\usemodule@maybesetcodes}
```

`guse` just a shortcut

```
42 \newrobustcmd\guse[2] [] {\def\@test{#1}%
43 \edef\mh@repos{\mh@currentrepos}%
44 \ifx\@test\@empty%
45 \usemhmodule[mhrepos=\mh@repos,path=#2]{#2}%
46 \else\usemhmodule[mhrepos=#1,path=#2]{#2}\fi%
47 \mhcurrentrepos{\mh@repos}%
48 \ignorespacesandpars}
```

`gstructure` we essentially copy over the definition of `mhstructure`, but adapt it to the SM-GloM situation.

```
49 \newenvironment{gstructure}[3] [] {\def\@test{#1}%
50 \xdef\mh@@@repos{\mh@currentrepos}%
51 \ifx\@test\@empty%
52 \gdef\@@@doit{\importmhmodule[mhrepos=\mh@@@repos,path=#3]{#3}}%
53 \else%
54 \gdef\@@@doit{\importmhmodule[mhrepos=#1,path=#3]{#3}}%
```

```

55 \fi%
56 \ifmod@show\par\noindent structure import "#2" from module #3 \@@doit\fi%
57 \ignorespacesandpars}
58 {\aftergroup\@@doit\ifmod@show end import\fi%
59 \ignorespacesandparsafterend}

```

### 3.3 Terminological Relations

\*nym

```

60 \newrobustcmd\hypernym[3] [] {\if@importing\else\par\noindent #2 is a hypernym of #3\fi}%
61 \newrobustcmd\hyponym[3] [] {\if@importing\else\par\noindent #2 is a hyponym of #3\fi}%
62 \newrobustcmd\meronym[3] [] {\if@importing\else\par\noindent #2 is a meronym of #3\fi}%

```

EdN:4

\MSC to define the Math Subject Classification, <sup>4</sup>

```

63 \newrobustcmd\MSC[1] {\if@importing\else MSC: #1\fi\ignorespacesandpars}%

```

### 3.4 For Language Bindings

Here we adapt the `smultiling` functionality to the special situation, where the module and file names are identical by design.

**gviewsig** The `gviewsig` environment is just a layer over the `mhviewsig` environment with the keys suitably adapted.

```

64 \newenvironment{gviewsig}[4] [] {% keys, id, from, to
65 \def\test{#1}%
66 \ifx\@test\@empty%
67 \begin{mhviewsig}[frompath=#3,topath=#4]{#2}{#3}{#4}%
68 \else%
69 \begin{mhviewsig}[frompath=#3,topath=#4,#1]{#2}{#3}{#4}%
70 \fi%
71 \ignorespacesandpars%
72 }{%
73 \end{mhviewsig}%
74 \ignorespacesandparsafterend%
75 }%

```

**gviewnl** The `gviewnl` environment is just a layer over the `mhviewnl` environment with the keys suitably adapted.

```

76 \newenvironment{gviewnl}[5] [] {% keys, id, lang, from, to
77 \def\@test{#1}\ifx\@test\@empty%
78 \begin{mhviewnl}[frompath=#4,topath=#5]{#2}{#3}{#4}{#5}%
79 \else%
80 \begin{mhviewnl}[frompath=#4,topath=#5,#1]{#2}{#3}{#4}{#5}%
81 \fi%
82 \ignorespacesandpars%
83 }{%
84 \end{mhviewnl}%

```

---

<sup>4</sup>EdNOTE: MK: what to do for the LaTeXML side?

EdN:5

```

85 \ignorespacesandparsafterend%
86 }%

\gincludeview 5
87 \newcommand\gincludeview[2][\ignorespacesandpars]%

3.5 Authoring States, etc

We add a key to the module environment.
88 \addmetakey{module}{state}%

3.6 Shadowing of repositories

\repos@macro \repos@macro parses a GitLab repository name  $\langle group \rangle / \langle name \rangle$  and creates an
internal macro name from that, which will be used
89 \def\repos@macro#1/#2;{#1@shadows@#2}%

\shadow \shadow{ $\langle orig \rangle$ }{ $\langle fork \rangle$ } declares a that the private repository  $\langle fork \rangle$  shadows the
MathHub repository  $\langle orig \rangle$ . Internally, it simply defines an internal macro with
the shadowing information.
90 \def\shadow#1#2{\@namedef{\repos@macro#1;}{#2}}%

\MathHubPath \MathHubPath{ $\langle repos \rangle$ } computes the path of the fork that shadows the MathHub
repository  $\langle repos \rangle$  according to the current \shadow specification. The computed
path can be used for loading modules from the private version of  $\langle repos \rangle$ .
91 \def\MathHubPath#1{\@ifundefined{\repos@macro#1;}{#1}{\@nameuse{\repos@macro#1;}}}%

3.7 Building Glossaries

smentry
92 \newenvironment{smentry}[2]%
93 {\item[\textbf{#1}]\mhcurrentrepos{#2}\begin{module}[id=foo]\begin{definition}[display=flow]}
94 {\end{definition}\end{module}}

smglossary
95 \newenvironment{smglossary}{\begin{itemize}}{\end{itemize}}

\smsynonymref
96 \newcommand\smglom@synonymref@kw{See}
97 \newcommand\smsynonymref[3]{\item[\textbf{#1}] \smglom@synonymref@kw\ \textcolor{blue}{\hyperlin

\smjointdefref
98 \newcommand\smglom@jointref@kw{Defined along with}
99 \newcommand\smjointdefref[3]{\item[\textbf{#1}] \smglom@jointref@kw\ \textcolor{blue}{\hyperlin
100 \</sty>

```

---

<sup>5</sup>EDNOTE: This is fake for now, needs to be implemented and documented

## References

- [ ] *LMH Scripts*. GitHub repository at <https://github.com/sLaTeX/lmhtools>. accessed 15. 11. 2019. URL: <https://github.com/sLaTeX/lmhtools>.
- [Gin+16] Deyan Ginev et al. “The SMGloM Project and System. Towards a Terminology and Ontology for Mathematics”. In: *Mathematical Software - ICMS 2016 - 5th International Congress*. Ed. by Gert-Martin Greuel et al. Vol. 9725. LNCS. Springer, 2016. DOI: 10.1007/978-3-319-42432-3. URL: <https://kwarc.info/kohlhase/papers/icms16-smglom.pdf>.
- [Koh14] Michael Kohlhase. “A Data Model and Encoding for a Semantic, Multilingual Terminology of Mathematics”. In: *Intelligent Computer Mathematics*. Conferences on Intelligent Computer Mathematics (Coimbra, Portugal, July 7–11, 2014). Ed. by Stephan Watt et al. LNCS 8543. Springer, 2014, pp. 169–183. ISBN: 978-3-319-08433-6. URL: <https://kwarc.info/kohlhase/papers/cicm14-smglom.pdf>.
- [Koh20] Michael Kohlhase. *sTeX: Semantic Markup in T<sub>E</sub>X/L<sup>A</sup>T<sub>E</sub>X*. Tech. rep. 2020. URL: <https://github.com/sLaTeX/sTeX/raw/master/sty/stex.pdf>.
- [SMG] *SMGloM: A Semantic Multilingual Glossary Resource for Mathematics*. URL: <http://gl.mathhub.info/smgloM> (visited on 07/10/2019).