

BLUe's Cross-referencing

— A one-pass approach —

Kees van der Laan

Hunzeweg 57,
9893 PB Garnwerd, The Netherlands
cgl@rc.service.rug.nl

Abstract

A one-pass semi-automatic cross-referencing scheme for math is proposed, which requires some hand adjustments when forward references are used. The method is just a little beyond manmac's approach, to assist BLUe.

Keywords: Compatible extension, cross-referencing, education, graph referencing, macro writing, math referencing, optional parameter, plain T_EX, symbolic names, table referencing.

1 Introduction

This is the fourth paper in the series where a basic approach will be demonstrated.¹

In manmac no facilities for cross-referencing have been provided. The symbolic name Sesame was defined with the page number attached. That was all. However, math authors like cross-referencing and with computer-assisted typography symbolic cross-referencing macros are wanted. L^AT_EX, L^AM_S-T_EX, the macros used for the typesetting Concrete Mathematics all provide these.

In the sequel I provide a simple suite, especially for math cross-referencing which can be customized. It makes use of the fact that all documents need proofs, therefore I could circumvent the multi-pass approach. I'll refer for citations to the list of references and touch upon cross-referencing to tables and pictures.

At the end I'll hint at other work.² In general references are written to a file and read in the next run, which is called a two-pass job. Whether authors will use my macros or not, they serve an educational purpose.

No attempt has been made to provide for references by pagenumber.³

Why? is BLUe's first question. He will say that whenever a reference is needed the number can just be inserted and that is all.⁴ Certainly that is true, so in essence there

is no problem. However, we will end up with extra work when last minute changes are made and the numbers have to be retyped.⁵

To circumvent the above mentioned inelegancies automatic symbolic cross-referencing macros are used.

2 Syntax

For the markup of math cross-referencing I only need

- `\ref`, for creation of the number, and `\ref<name>`, for attaching a name to the automatically generated number, and
- `\crsref<name>`, for cross-referencing.

Example (Automatic numbering⁶)

```
$$a+b\eqno\ref$$
```

with result

$$a + b \tag{1}$$

Example (AN and symbolic cross-referencing)

```
$$c*d\eqno\ref\cgl$$
Text, \crsref\cgl.
```

with result

$$c * d \tag{2}$$

Text, (2).

¹Earlier papers are BLUe's Bibliography, Transparencies and Verbatim, respectively.

²These notes are not meant to survey in depth other work. They try to decrease complexity, to simplify.

³A little pondering prompts me that for that a table of formulas, or a table of figures or the like will serve the purpose equally well, if not better.

⁴And I know of authors who know these numbers by heart.

⁵When suffices are added or numbers deleted this looks imperfect.

⁶Called AN hereafter.

3 Forward referencing

This kind of referencing occurs when an author refers to a document element still to come.

A remark will appear in the margin when a name is not defined, like here via `\crsref\cglx`. The idea is that this note will be circumvented (in the final stage) by attaching the number to the name via `\def\cglx{<number>}`, with `\cglx` the symbolic name.

4 Macros

The coding makes use of the assumption that after `\ref` either a \$, `\hfil` or the name will appear. No `\futurelet` was needed for this simple case. In agreement with the T_EXbook p.384, I assumed further that `\undefined` is undefined.

```
\newif\ifadvance \advance true
\newcount\frmcnt
%Default prenum and postnum
\def\prenum{(\}\def\postnum{)}
%Automatic numbering
\def\frmnum{\ifadvance\global\advance\frmcnt1
\fi\prenum\the\frmcnt\postnum}
%Automatic numbering and attaching a name
\def\ref{\frmnum\create}
%Create checks whether a $ or a\hfil follows.
%If so no name has followed. In the other case
%the name is associated with the generated
%number. Note that the $ or the \hfil had to
%be reinserted.
%\def\create#1{\ifx#1$\$else
% \xdef#1{\the\frmcnt}\fi}
%The general version also for displaylines
\def\create#1{\ifx#1$\$else\ifx#1\hfil\hfil
\else\xdef#1{\the\frmcnt}\fi\fi}
%Citation
\newif\ifproof \proof true
%If the argument of \crsref (a name) is undefined
%a note in the margin will appear.
\def\crsref#1{\ifx#1\undefined\ifproof
\ifhmode\else\leavevmode\fi
\vadjust{\rightline{\vbox to0pt{\vss
\rlap{FR: \tt\string#1}}}\fi}
\else\prenum#1\postnum\fi}
```

From the macros it can be read that they are flexible with respect to your representation and what you wish to insert before and after the number.⁷

Note the peculiar test for `\hfil` in `\create`. This is because of the insertion of this token in the template of the `\halign` invoked in `\displaylines`.

5 On second thoughts

In earlier work⁸ I enumerated the following characteristic math constructs

```
\begin{itemize}
\item Labeled 1-line
$$\sin 2x=2\sin x\cos x \quad \eqno\ref\cglx$$
\item Three lines, second flushed right
(relevant for 2-column printing)
$$\displaylines{F(z)=
a_0+\frac{a_1}{z}+\frac{a_2}{z^2}+\cdots}
```

⁷For example when the math mode must be circumvented for formatting the reference 'numbers.'

⁸Math into BLUes, and What is T_EX and METAFONT all about?

```
+{\a_{n-1}\over z^{n-1}}+R_n(z),\cr
\hfill n=1,2,\dots\,,\cr
\hfill F(z)\sim\sum_{n=0}^{\infty}a_{nz}^{-n},
\quad z\to\infty\hfill\ref\cglb\cr}$$
\item Two lines aligned, with middle
labeling
```

```
$$\eqalign{\cos 2x&=2\cos^2x-1\cr
&=\cos^2x-\sin^2x\cr}
\eqno\ref$$
```

```
\item Two lines aligned, with labeling
per line
```

```
$$\eqalignno{\cosh 2x&=2\cosh^2x-1& \quad \ref\cgl d\cr
&=\cosh^2x+\sinh^2x\cr}$$
\end{itemize}
```

```
and citations \crsref\cgl a, \crsref\cgl b,
\crsref\cgl d
```

with result

- Labeled 1-line

$$\sin 2x = 2 \sin x \cos x \quad (3)$$

- Three lines, second flushed right (relevant for 2-column printing)

$$F(z) = a_0 + \frac{a_1}{z} + \frac{a_2}{z^2} + \cdots + \frac{a_{n-1}}{z^{n-1}} + R_n(z),$$

$$n = 1, 2, \dots,$$

$$F(z) \sim \sum_{n=0}^{\infty} a_n z^{-n}, \quad z \rightarrow \infty \quad (4)$$

- Two lines aligned, with middle labeling

$$\begin{aligned} \cos 2x &= 2 \cos^2 x - 1 \\ &= \cos^2 x - \sin^2 x \end{aligned} \quad (5)$$

- Two lines aligned, with labeling per line

$$\begin{aligned} \cosh 2x &= 2 \cosh^2 x - 1 \\ &= \cosh^2 x + \sinh^2 x \end{aligned} \quad (6)$$

and citations (3), (4), (6).

The above representative examples have been modified with markup for automatic numbering and symbolic cross-referencing included.

Note. For an out-of-sequence reference just insert the reference, and forget about `\ref` and `\crsref`. The extras of the automatisms don't hinder. A compatible extension!

6 Related work

First of all an important other class of referencing is to refer to publications in the list of references. This has been dealt with in BLUe's Bibliography, and references to related work has been incorporated in that note.

For tables and graphics I prefer to use terminology like 'in the accompanying table,' or give these document elements a description and refer to the description.

6.1 L^AT_EX's approach

For markup `\ref` (`\pageref`) and `\label` are used for citation and attaching a symbolic name to the automatically generated number.⁹ Multi-pass jobs are required. It is just a pity that plain's inner math macros are not available within L^AT_EX.¹⁰

6.2 Spivak's method

For math he introduced `\tag` to abstract from `\(1)eqno`. It is in the style file whether the numbers appear at the left or at the right. For the representation he used `\style`. Customization can be done via `\newstyle\tag{...}` and `\newfontstyle\tag{...}`. There is the option to provide a string, for example `\tag"A"`, to specify an out of range tag, to overrule the default and provide just the string. The counter can be controlled via `\Reset` and `\Offset`. He was the first to introduce pre- and posttag, as far as I know. Customization goes via `\newpre\tag{...}`, and `\newpost\tag{...}`. The L^AM_S-T_EX manual chapter 9 'Automatically numbering anything' is about cross-referencing. When you need a newcounter, just say `\count\newcount` and all the operators for counters are inherited.

All-in-all his approach is very general and flexible. My only problem is that it is too general and part of L^AM_S-T_EX.¹¹ His L^AM_S-T_EX book is very well written and when people like his approach just buy the book. The software is freely available from the CTANs.

6.3 gkp macros

For the Concrete Mathematics book cross-referencing was used, with a multi-pass job. From the file I borrowed

- `\ref{value}|name|` gives value to |name|
- `\eqref|name|` gives `\eqcount` to |name|
- `\exref|name|` gives `\excount` to |name|
- `\tabref|name|` gives page number to |name|
- `\refin foo` inputs references from job foo (other than this job)
- `\showmissestrue` if you want to see missing references.

Some 40 lines of code. I don't know whether the file of the book is available. If not I'm not aware of examples of use.

6.4 Reference assembler

A preprocessor approach has been treated by Aho and Sethi. Their so-called reference assembler consists just of a few lines of GREP, AWK, and SED code.¹²

7 Acknowledgements

Erik Frambach and Jos Winnink commented the manuscript. The latter moreover adapted the markup into maps.sty. Thank you.

8 Conclusion

Some macros have been provided to assist an author in cross-referencing math as an extension to plain and manmac.

As markup tags have been provided: `\ref` for automatic numbering—and optionally attach a name—and `\crsref` for citation.

At a lower level customizations can be done via redefinitions of for example `\prenum` and `\postnum`.

The proposed codes have been tested on characteristic math examples, that is in display after `\eqno`, within `\displaylines`, and within `\(1)equalign`.

A very special technique has been applied to allow for an optional parameter.

References

- [1] *The T_EXbook* and the L^AT_EX Manual. (Omnipresent.)
- [2] Aho A.V, R Sethi (1988): Maintaining cross references in manuscripts. *Softw.pract.exp.*, 18, 1, 1–14.
- [3] Barlett F.H (1991): Contra-L^AT_EX, or what really works in the publishing world. TUG '91, *TUGboat* 1, no. 2(3), 367–371. (For forward referencing a note is printed in the margin.)
- [4] Beebe N.H.F (1991): The TUGlib server. MAPS 91.2, 117–123. (Also T_EXline 11.)
- [5] Laan C.G van der (1993): BLUe's Bibliography—a generic approach. MAPS 93.2, 205–210. (Selective loading has been added in MAPS 94.1.)
- [6] Laan C.G van der (1993): What is T_EX and METAFONT all about? MAPS 93.2, 67–87. (Also proceedings 'PD, Shareware, Freeware' meeting NLUUG, November 1993.)
- [7] Spivak M.D (1989): L^AM_S-T_EX—The Synthesis. T_EXplorators Corporation.
- [8] Spivak M.D (1991): L^AM_S-T_EX—The wizards manual. T_EXplorators Corporation. (As far as I know no longer available.)

⁹The `\cite` command is used for bibliography citation.

¹⁰And when these are inserted note the difference between `\centering` in L^AT_EX and in plain.

¹¹For example the out-of-sequence label can be provided just as such after plain's `\(1)eqno`, but mind the math mode. As usual fancy mechanisms introduce problems which were not there before.

¹²These are UNIX tools. GREP is a pattern-matching command that prints all input lines matched by its regular expression argument. AWK is a programming language that is well suited for data processing and string manipulation. SED is a stream editor that uses a script to transform its input.