Automatic Numbering Using the Nashboro Press Macros

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Abstract. The purpose of this note is to discuss how to use the automatic numbering macros contained in the Nashboro Press macros.

§1. Introduction

In typesetting mathematics using TEX, it is very useful to dynamically label

1) equations,

2) proclamations (Lemmas, Theorems, Corollaries, etc.),

3) figures,

4) tables,

5) references.

The idea is to assign (easy-to-remember) labels to each of these items, and to refer to the items by label. We then rely on TEX to automatically associate numbers with the labels. If labels are added or deleted, the numbers will be automatically adjusted.

Many people who are familiar with automatic numbering in LaTEX think that it cannot be done in plain TEX. Nothing could be further from the truth, and in fact it can be achieved with a small set of macros. Here we discuss how to do it using macros created by Carl de Boor and included in the macro files `nash03.tex`. To use these macros, you will have to input both `at03.tex` and `nash03.tex` into your TEX file.

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§2. Equations

In this section, we discuss how to label equations. The idea is very simple. Every time you introduce an equation into a manuscript which you want to number, use `\en`. If you write `\en{}`, the equation will be given the next number in sequence. If you write `\en{name}`, the equation will be given the next number, and also assigned the label "name". This label can be used in referring to the equation. For example, if you type

```
$$ x = y.  \en{xy}$$
```

you get

$$x = y. \tag{1}$$

Here `\en` is the macro ("en" stands for equation name), and `xy` is the label.

The situation is slightly different when you are using `\eqalignno`. Then you have to use `\enn{name}` as shown in the following example:

$$a = b, \tag{2}$$
$$u = v. \tag{3}$$

To get these equations, you have to type

```
$$ \eqalignno{
        a &= b, & \enn{ab} \cr
        u &= v. & \enn{uv} \cr}$$
```

To refer to a labeled equation, use the macro `\er`, where "er" stands for equation reference. Thus, to refer to the above equation labeled xy, we write `\er{xy}`. For example, if the TEX file includes the sentence

```
The equations \er{xy}, \er{ab}, and \er{uv} are important,
```

we get

The equations (1), (2), and (3) are important.

Here is how it works. Suppose the name of your TEX file is `jobname.tex`, and that it inputs both `at03.tex` and `nash03.tex`. Then in processing `jobname.tex`, a new file called `jobname.aux` is automatically created. Information about labels is written to this file. Now every time you TEX the file `jobname.tex`, the file `jobname.aux` is read in. Thus, whatever labels you have defined the last time `jobname.aux` was written will be used.

As your file is processed, `jobname.aux` is rewritten to reflect any changes you have made to the labels. Every time the macro `\en` is encountered, a counter called `\eqnum` is advanced, and a definition is created and inserted in `jobname.aux` which associates the label with the number.

Note that if you try to cite an equation with a label which has not been defined, you will get a message in your log file `jobname.log` telling you which labels are not defined, and reminding you to TEX your document again. Moreover, it is easy to find the references to undefined labels in your TEX file `jobname.tex`, since the name of each such undefined label will appear in the TEX'ed material between easy-to-locate black boxes.

Note that the citation process works even if the citation of something with a given label appears before the label itself has been defined. This is called *forward referencing*. Here is an example of a forward reference (4) to the following equation:

$$y = x. \tag{4}$$

If you use forward referencing, the first time you TEX your document, you will get a pair of black boxes marking each forward citation, and a warning message telling you which labels are not defined. But if you TEX your file again, the boxes and the warning should disappear. If they do not, then probably you are trying to cite something that you never defined.

§3. Definitions, Lemmas, Theorems, and Corollaries

We prefer that you number definitions, lemmas, theorems, and corollaries (so-called proclamations) consecutively throughout the paper. This can be done automatically using the macro `\pn` (here "pn" stands for proclaim name). This gives each proclamation a label which can then be referred to using `\pr`.

Lemma 1. *This is a lemma labeled "prelim".*

Theorem 2. *This is the theorem labeled "main".*

In the TEX file `autonumber.tex` for this document, we label this lemma by writing `\proclaim Lemma~\pn{prelim}`. To refer to this lemma, we write `Lemma~\pr{prelim}`. Thus, if we insert the sentence

```
Lemma~\pr{prelim} immediately implies Theorem~\pr{main}.
```

into our TEX file, we get

Lemma 1 immediately implies Theorem 2.

Note that in *assigning* the label for a Lemma and in *referring* to it, we insert the symbol ~ between the word Lemma and the macro `\pn` or `\pr`, respectively. TEX interprets the symbol ~ as a space, but does not allow a line break at this point. This is a useful tool when you want to keep things together. You should routinely use it with numbered items. Thus, for example, in referring to Fig. 1 and Tab. 2, you should type `Fig.~1` and `Tab.~2`.

If you want to number all equations and proclamations consecutively, you can add the command `\let\proclaimnum = \eqnum` to your file.

§4. Labelling Figures and Tables

Use `\fn` to label figures, and `\fr` to refer to them. Here "fn" stands for "figure name", and "fr" stands for "figure reference".

Similarly, use `\tn` to label tables, and `\tr` to refer to them. Here "tn" stands for "table name", and "tr" stands for "table reference".

§5. Labelling References

If you want to label references, use `\rn` instead of `\ref` to introduce each reference. Here "rn" stands for "reference name". You write `\rn` followed by the label (in curly brackets) that you want to assign to the reference. Here is an example of an entry with an assigned label:

```
\rn{S1}
Schumaker, L. L., Inserting postscript files using the
Nashboro Press macros, available on the conference
web site.
```

This is the first entry in the reference list below. To cite this reference (which is labeled `S1`), simply type `\cite{S1}`. This gives [1]. Note that the macro `\cite` automatically creates brackets around the number of the cited article. To cite several papers at one time, use the macro `\cit` which does not automatically create the brackets. For example, you type `[\cit{S1},\cit{S2}]` to get [1,2].

§6. How to Fix a Contaminated jobname.aux File

If your file fails to TEX and you get an error message related to the file `jobname.aux`, where `jobname.tex` is the name of your tex file, probably the file `jobname.aux` has somehow become contaminated. Simply delete it from your directory, and TEX `jobname.tex` twice.

§7. Draft Mode

If you use a lot of labels, you may find it hard to remember how you labeled various equations, figures, tables, proclamations, and references. You can find out by inserting the command `\draft` into your TEX file right after `\input nash03`. This causes the labels to appear in small print just following the equation numbers. For figures, tables, proclamations, and references, the label appears in the left margin. To see how this works, try it on the file `autonumber.tex` which generated this document.

Acknowledgments. My thanks to Carl de Boor for creating these numbering macros, and for comments on a draft of this note.

References

1. Schumaker, L. L., Inserting postscript files using the Nashboro Press macros, available on the conference web site.
2. Schumaker, L. L., Sample paper and tutorial on the Nashboro Press Macros, available on the conference web site.

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