Typesetting Theorems Under LaTeX

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Abstract
The AlbTheorems package provides a single alb-theorems LaTeX package to provide markup for a minimal collection of theorem like environments. It provides abbreviated cross referencing commands that construct margin notes with page numbers, and places the markup in the alb namespace. Therefore, the package provides a small collection of environments. The package is supported by an emacs lisp file customising AUCTeX and RefTeX, which provides environment name completion and argument prompting, and constructs labels in the file namespace.

Version Information
Revision
Date

1 Introduction

The `alb-theorems` LaTeX package provides a group of theorem like environments for typesetting mathematical propositions. It also provides a system to construct cross reference material that can be typeset in the margin. The package is less likely to be useful to others, because it encodes decisions about the theorem numbering scheme and the types of proposition used.

This package aso includes AUCTeX code to override the built-in label generation rules for the theorem environments. The system ensures dirty labels are not reissued.

2 Using the Commands and Environments

The environments of `alb-theorems` are simple. Therefore, we can list them with little need for analysis. All the theorem like environments share the same counter which is a subcounter to the chapter counter.

`\begin{albDefinition}`[*name*] Create a definition environment with an optional name.

For example,

```
\begin{albDefinition}[Example Definition]
  \label{def:alb-theorems-documentation:example-defin}
  This is an example.  $f(x) = x^ 2$.
\end{albDefinition}
```

produces the following definition.

Definition 1 (Example Definition)**.** This is an example. $f(x) = x^2$.

`\begin{albTheorem}`[*name*] Create a theorem environment with an optional name.

For example,

```
\begin{albTheorem}[Theorem of Everything]
  \label{thm:alb-theorems-documentation:theorem-everyth}
  Every thing is something.  Consider the following.
  $f(x) = 3x^2 - 2x + 12$.
```

produces the following theorem.

Theorem 2 (Theorem of Everything)**.** *Every thing is something. Consider the following.* $f(x) = 3x^2 - 2x + 12$.

`\begin{albLemma}`[*name*] Create a lemma environment with an optional name.

For example,

```
\begin{albLemma}
  \label{lem:alb-theorems-documentation:1}
  Let $n$ be a number such that $n$ does not occur on the
  hand written bill for a hamburger with the lot.  Then $n$
  is unlikely to be the number $7.50$.
\end{albLemma}
```

produces the following lemma.

Lemma 3. *Let n be a number such that n does not occur on the hand written bill for a hamburger with the lot. Then n is unlikely to be the number* 7.50*.*

`\begin{albRemark}`[*name*] Create a remark environment with an optional name.

For example,

```
\begin{albRemark}
  \label{rem:alb-theorems-documentation:2}
  Let $x$ be the price of minimum chips at a fish and chip
  shop in rural Victoria.  Then $2x$ chips at the same shop
  is likely to be too many.
\end{albRemark}
```

produces the following remark.

Remark 4. *Let x be the price of minimum chips at a fish and chip shop in rural Victoria. Then $2x$ chips at the same shop is likely to be too many.*

`\begin{albCorollary}`[*name*] Create corollary environment with an optional name.

For example,

```
\begin{albCorollary}
\label{cor:alb-theorems-documentation:3}
It is a bad idea to order $2x$ worth of chips unless you
are accompanied by another hungry person.
\end{albCorollary}
```

produces the following corollary.

Corollary 5. *It is a bad idea to order $2x$ worth of chips unless you are accompanied by another hungry person.*

There is an additional list environment for making proposition lists inside a theorem like environment. It does not support cros-referencing. Use equation numbers instead.

`\begin{albPropositions}` Enumerate the propositions within a theorem-like environment. The label is guaranteed to be typeset in roman rather than italic, as is the mathematical convention.

In addition to the standard cross references generated by the `\ref` command, abbreviated cross reference commands are also provided. An command for an abbreviated reference exists for each theorem like environment.

`\albDRef{`*label*`}` Typeset an abbreviated reference to the *label* definition and record the cross reference for the page. The reference is prefixed by the letter D.

For example,

```
\albDRef{def:alb-theorems-documentation:example-defin}
```

produces D 1.

`\albTRef{`*label*`}` Typeset an abbreviated reference to the *label* theorem and record the cross reference for the page. The reference is prefixed by the letter T.

For example,

```
\albTRef{thm:alb-theorems-documentation:theorem-everyth}
```

produces T 2.

`\albLRef{`*label*`}` Typeset an abbreviated reference to the *label* lemma and record the cross reference for the page. The reference is prefixed by the letter L.

For example,

```
\albLRef{lem:alb-theorems-documentation:1}
```

produces L 3.

`\albRRef{`*label*`}` Typeset an abbreviated reference to the *label* remark and record the cross reference for the page. The reference is prefixed by the letter R.

For example,

```
\albRRef{lem:alb-theorems-documentation:2}
```

produces R 4.

`\albCRef{`*label*`}` Typeset an abbreviated reference to the *label* corollary and record the cross reference for the page. The reference is prefixed by the letter C.

For example,

```
\albCRef{cor:alb-theorems-documentation:3}
```

produces C 5.

3 Theorem Reference Lists

As noted above, the abbreviated reference commands have a second effect of accumulating the list of issued references. This list can be used in page layouts, such as `alb-thesis`, to display the most recently referenced theorems and their page numbers. These internal commands are briefly described here.

`\alb@ExpandTheoremRefList` Expands the theorem reference list into an index for the references.

For example,

```
\begin{quote}
  \makeatletter
  \alb@ExpandTheoremRefList
  \makeatother
\end{quote}
```

produces

D 1	1
T 2	1
L 3	2
R 4	2
C 5	2

If this list is generated per page, then care must be taken to reset the list on each page with the following code.

```
\makeatletter
\let\alb@TheoremRefList=\relax
\makeatother
```

4 AUCTeX Customisations

Under AUCTeX the file `alb-theorems.el` is automatically loaded whenever the `alb-theorems` package is used. The customisation adds the theorem environmens to AUCTeX. This provides the simple prompting for all the supplied environments.

In addition, `alb-theorems.el` causes a special theorem numbering counter to be stored as a local variable. `alb-LaTeX-theorem-counter` counts numbers assigned to theorem environments. This ensures dirty numbers are not reissued, as reissuing a number could make stale references hard to detect.

5 Makefile Targets

The `AlbLaTeXDocumentTemplate` makefile provides a target to relabel the theorem-like environments of this package. The `alb-relabel-thm` target edits the LaTeX source in an attempt to match theorem labels to theorem numbers. Labels of the form *type*`:`*identifier*`:`*number* are processed, where *type* is one of `thm`, `lem`, `rem`, or `cor`. *number* is rewritten to the last part of the theorem number. This is helpful in proof reading.