Mainly, though, these macros were written just as a challenge. I learned quite a lot about \TeX{} and needed some \TeX{}nicities I'd never seen before. It was also quite pleasing to see that \TeX{} code can be formally verified, albeit in a rather noddy way. Without some sort of abstract view of lists, these \TeX{} macros could not have been written.

8 Acknowledgements

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A Nestable Verbatim Mode

Philip Taylor

A few months ago, Sebastian Rahtz asked me if I could make some changes to the verbatim code which he was currently using, and sent me the source. I found it so opaque that I decided to write my own, and the following evolved over a period of a couple of weeks. I would like to acknowledge my debt to Sebastian, and also to Chris Rowley, without whose helpful comments and criticism the code could never have evolved. Of course, the code is now ten times as opaque as that originally used by Sebastian, but at least I understand it (on a good day, when the moon is the seventh house, and Jupiter \aligns with Mars).

The idea is as follows: having said
\begin{verbatim}
\input verbatim
\end{verbatim}
at the beginning of one’s document, one invokes verbatim mode by
\begin{verbatim}
verbatim (char)
\end{verbatim}
What follows can then contain any character, with the single exception of (char), and all such text will be copied verbatim, with leading spaces retained but invisible, and all embedded spaces retained and shewn. If (char) is encountered, \TeX{} enters a new inner group (the verbatim environment is itself a group), within which the preceding meaning (i.e. \texttt{\catcode}) of all characters is reinstated. This new inner group continues typesetting in the normal (non-verbatim) manner until a further (char) is encountered, whereupon it reverts to verbatim mode; the inner ‘normal’ mode can itself be interrupted by a further
\begin{verbatim}
verbatim (char)
\end{verbatim}
where (char) can be the same or a different escape character. There is no theoretical limit on the level of nesting, but \TeX{} implementations will invariably run out of space (usually save-stack space) if too many levels are attempted.

To end verbatim mode, one enters inner ‘normal’ mode through the escape character and then says \texttt{\mitabrev}. Note that this is not a reserved string, but simply a macro which expands to \texttt{\endgroup \endgroup}; any other name can be chosen if one finds “\texttt{\mitabrev}” unappealing. Thus, at the outermost level, the call and end to \texttt{verbatim} look like:
\begin{verbatim}
verbatim (char)
\end{verbatim}
\begin{verbatim}
\end{verbatim}
\begin{verbatim}
\aftergroup (char) \mitabrev
\end{verbatim}
Finally, a mechanism is provided for listing arbitrary files in verbatim mode. If, while in inner ‘normal’ mode, one says
\begin{verbatim}
\aftergroup \{\texttt{\input (filename)}\}
\end{verbatim}
(note the case of \texttt{\aftergroup}), the \texttt{(balanced text)} will be re-inserted with its original catcodes immediately after the closing (char) which terminates inner ‘normal’ mode. Thus it will not itself be listed \texttt{verbatim}, but will be elaborated according to \TeX{}’s normal conventions. Thus if one says
\begin{verbatim}
\aftergroup \{\input (filename)\}
\end{verbatim}
the contents of the file will be listed in verbatim mode. For example, to list this file itself, one can say
\begin{verbatim}
verbatim
\aftergroup \{\input verbatim.tex\}
\mitabrev
\end{verbatim}
There remains an anomaly at present: “\texttt{"} cannot form the escape-character as it will automatically form a \texttt{(control sequence)} with the following character(s) when called with
\begin{verbatim}
verbatim \texttt{"}
\end{verbatim}
I will endeavour to rectify this deficiency in a future release.
The source of \texttt{Verbatim}.\TeX\ follows.

\begin{verbatim}
\catcode `\@ = 11
\chardef \Letter = 11
\chardef \Other = 12
\newcount \c@unt
\newcounter \ch@rcode
\newif \ifdebugging
\newif \ifsheweleadingspaces\sheweleadingspacestrue
\ifdebugging
  \let \m@ssage = \message
\else
  \def \m@ssage #1{}%
\fi
%
\def \verbatim #1{%
  \begingroup
\def \n@sted
\let \n@sted
  = \endgroup
\@environment
\ignorespaces
}%
\tt
\edef \@environment
{\parindent =
  \the \parindent
  \parskip =
  \the \parskip
\space
%}
\parindent = 0 pt
\parskip = 0 pt
\c@unt = 0
\loop
\ifnum \c@unt < \@A%  \\
\s@ve \catcode \c@unt = \Other
\% we use commercial-at as a letter throughout;
% and introduce synonyms for the \texttt{\catcodes} for
% \texttt{(letter)} and \texttt{(other)};
% a loop-counter;
% this will hold the character-code of the
% escape character;
% set \texttt{(true)} if you want to watch the
% \texttt{finite-state automaton at work};
% set \texttt{(true)} if you want to see leading spaces
% shewn as inverted square cup (explicit);
% set \texttt{(false)} if you want to see embedded
% spaces shewn as white space (implicit);
% if \texttt{(debugging)},
% \texttt{\m@ssage} is synonymous with \texttt{\message}
% otherwise
% it simply throws its parameter away;
% the \texttt{\verbatim} macro takes one parameter
% and immediately starts a nested group
% within which \texttt{\n@sted} is defined
% to start a further group within which
% \texttt{\n@sted} becomes a synonym for \texttt{\endgroup}
% and the environment is restored to that
% which obtained two levels of nesting out;
% for tidyness, we ignore any \texttt{(lwsp)}
% which follows the escape character;
% we assume Knuth's font-selectors and
% select the 'typewriter' font;
% we initialise \texttt{\@environment}
% to prepare to restore \texttt{\parindent}
% \texttt{\parindent} and \texttt{\parskip};
% and ensure that the value to be assigned to
% \texttt{\parskip} is properly terminated;
% we then set \texttt{\parindent} and
% \texttt{\parskip} to 0 pt;
% and initialise \texttt{\c@unt} to 0;
% this loop checks the \texttt{\catcode} of each
% character code in the range 0...127
% (or 0...255 for \TeX\ V3) and if it
% is other than \texttt{(letter)} or \texttt{(other)}, as
% appropriate, saves the current value in
% \texttt{\@environment} for subsequent restoration
% within an inner group; it then sets the
% \texttt{\catcode} to either \texttt{(letter)} or \texttt{(other)};
\end{verbatim}
\else \ifnum \c@unt > \textbackslash z\% \\
  \s@ve \catcode \c@unt = \other \\
\else \ifnum \c@unt > \textbackslash z\% \\
  \ifnum \c@unt < \textbackslash a\% \\
  \s@ve \catcode \c@unt = \other \\
\else \s@ve \catcode \c@unt = \l@tter \fi \\
\else \s@ve \catcode \c@unt = \l@tter \fi \\
\fi \\
\advance \c@unt by 1 \\
\ifnum \c@unt < 128 \% or 256 for the V3 sites ... \\
\repeat \\
\ch@rcode = \l@tter \textbackslash #: \% we next save the character code of the \textbackslash character which has been specified as the \textbackslash escape character in \ch@rcode; \\
\def \@nvironment \lbrace \envi\nvironment \rbrace \\
\catcode \the \ch@rcode = \active \textbackslash \% and append code to \envi\nvironment \\
\{\envi\nvironment \% to make the escape character active; \\
\catcode \the \ch@rcode = \active \textbackslash \% (space) separates list items in \envi\nvironment \\
\rbrace \\
\catcode \ch@rcode = \active \textbackslash \% the escape character is made active; \\
\uccode \l@tter \m a \ch@rcode \textbackslash \% and the upper-case code of \langle return \rangle is made \textbackslash \% equal to the character-code of the escape \textbackslash \% character; this is necessary because only \textbackslash \% \langle return \rangle can be guaranteed to be active at \textbackslash \% this point, and we need an active character \textbackslash \% to form the primary operand of \def; \textbackslash \% the \@x\s below are \expandafters, \textbackslash \% and the effect is to upper-case \langle return \rangle \\
\% (yielding the escape character), then \def \% (an active instance of) this character as \textbackslash \% \n@sted, which has been defined above; \\
\% \@x \uppercase \@x \lbrace \@x \def \r@turn \lbrace \n@sted \rbrace \rbrace \\
\% \uccode \l@tter \m a \ch@rcode \textbackslash \% the upper-case code of \langle return \rangle is then re- \\
\% instated (not strictly true; it is set to 0, \textbackslash \% which is assumed to be its previous value \textbackslash \% could be improved here); \\
\@xctivecr \textbackslash \% \langle return \rangle is made active; \\
\@xctivespace \textbackslash \% and so is \langle space \rangle (to avoid space-elision); \\
\@xvid \textbackslash \% finally, the finite-state automaton which \\
\rbrace \% \textbackslash \% processes \langle space \rangle s is set to \langle void \rangle; \\
\% this ends the definition of \verbatim. \\
\% \def \s@ve \#1\#2=#3\% \textbackslash \% \s@ve minimises the \catcode restoration \\
\lbrace \ifnum \#1\#2 = \#3\% \textbackslash \% work of \envi\nvironment by saving only the \\
\% \catcode of characters whose \catcode \textbackslash \% is to be changed; it then changes the \\
\% \catcode of those characters.
the code which follows implements the finite
state automaton which determines whether
(space)s are ignored, shown explicitly or
implied, and which ensures that blank
lines are reproduced correctly.

% \def \vQid (\futurelet \nQxt \vOidifspace)
% \def \Mad (\lQadingspace \futurelet \nQxt \lQadifspace)
% \def \skQp (\vskip \baselineskip \futurelet \nQxt \lQadifspace)
% \def \embQd (\emb@ddedspace)
% \def \sh@wspace (\char 32 \relax)
% \def \lQadingspace (\ifshewleadingspaces \shQwspace \else \hQdespace \fi)
% \def \embQddedspace (\ifshewembeddedspaces \shQwspace \else \hQdespace \fi)
% \def \vQidifspace (\testnQxt (\afterassignment \vQid))
% \def \lQadifspace (\testnQxt (\afterassignment \skQp))
% 
% \% \testnQxt provides a common look-ahead for \vQidifspace and \lQadifspace, and also
% \% implements some essential debugging hooks.
% \\def \testnQxt #I%
% \% We next tamper with the \catcode of (space)
% \% and (return), while defining macros and
% \% synonyms which require them to be active;
% \% the \catcode is then restored to its default
% \% (not necessarily the previous value —
% \% could be improved). \Octivespace makes
% \% (space) active, then defines (space) as
% \% \vQid with a synonym \sp@ce. This code is
% \% used by the finite-state automaton.
% \\catcode '{' = \active%
% \\def \sp@ce { }
% \\\catcode '{' = \active%
% \\def \r@turn { ^M}
% \\let \r@t@rn = { ^M}
\def \activecr \% \% make \( \text{return} \) active, then
\def \M \% \% define \( \text{return} \) to manipulate the
\% finite-state automaton and ...
\% \Ox \def \spce \{\l@ad\}\%
\Ox \let \Ox \spce \Ox = \spce \%
\%
\% \endgraf \% \% insert a \par primitive (for blank lines).
\%
\futurelet \n@xt \l@adifspace \%
\%
\let \stern = \M \%
\% \r@t@rn is synonymous with active (return)
\%
\catcode \'\M = 5 \%
\% finally, the \catcode of \( \text{return} \) is
\% restored to its normal value;
\%
\% the \AfterGroup macro is intended for
\% use within a nested normal environment,
\% and causes (a concealed macro defined as)
\% its parameter text to be inserted into
\% \TeX{}'s input stream when the nested normal
\% group terminates.
\%
\def \AfterGroup #1{\global \def \@ftergroup {#1}\@ftergroup}
\%
\let \Ox = \expandafter
\% \Ox is a brief synonym for \expandafter;
\%
\catcode \'\O = \other
\% commercial-at is restored to its normal
\% \other{} catcode (not necessarily the
\% previous value — could be improved);
\%
\def \mitabrev
\% and \mitabrev defined as the closure for
\% \verbatim; any other name could be used,
\% as the code performs no look-ahead for
\% any particular string.
\%
\message {Verbatim environment loaded;}
\message {usage: \texttt{\noexpand \verbatim <char> \ldots <char> \noexpand \mitabrev}}

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