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% standard macros for CWEB listings (in addition to plain.tex)
% Version 3.0 --- June 1993
\ifx\documentstyle\undefined\else\endinput\fi % LaTeX will use other macros
\xdef\fmtversion{\fmtversion+CWEB3.0}

\let\:=\. % preserve a way to get the dot accent
% (all other accents will still work as usual)

\parskip Opt % no stretch between paragraphs
\parindent 1em % for paragraphs and for the first line of C text

\font\ninerm=cmr9
\let\mc=\ninerm % medium caps
\def\CEE/{\{\mc C\spacefactor1000}}
\def\UNIX/{\{\mc U\kern-.05emNIX\spacefactor1000}}
\def\TEX/{\TeX}
\def\CPLUSPLUS/{\{\mc C\PP\spacefactor1000}}
\def\Cee{\CEE/} % for backward compatibility
\def\9#1{#1}
\font\eightrm=cmr8
\let\sc=\eightrm % small caps (NOT a caps-and-small-caps font)
\let\mainfont=\tenrm
\let\cmntfont\tenrm
%\font\tenss=cmss10 \let\cmntfont\tenss % alternative comment font
\font\titlefont=cmr7 scaled\magstep4 % title on the contents page
\font\ttitlefont=cmtt10 scaled\magstep2 % typewriter type in title
\font\tentex=cmtex10 % TeX extended character set (used in strings)
\fontdimen7\tentex=Opt % no double space after sentences

\def\#1{\leavevmode\hbox{\it#1\kern.05em}} % italic type for identifiers
\def|#1{\leavevmode\hbox{${#1$}}} % one-letter identifiers look better this way
\def\#1{\leavevmode\hbox{\bf

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\def_{\kern.04em\vbox{\hrule width.3em height .6pt}\kern.08em}%
#1\/\kern.05em}} % boldface type for reserved words
\def.#1{\leavevmode\hbox{\tentex % typewriter type for strings
\let\=\BS % backslash in a string
\let\{=\LB % left brace in a string
\let\}=\RB % right brace in a string
\let\~=\TL % tilde in a string
\let\ =\SP % space in a string
\let\_=\UL % underline in a string
\let\&=\AM % ampersand in a string
\let\^=\CF % circumflex in a string
#1\kern.05em}}
\def)\{\discretionary{\hbox{\tentex\BS}}{-}{}}
\def\AT{@} % at sign for control text (not needed in versions >= 2.9)
\def\ATL{\par\noindent\bgroup\catcode'\_ =12 \postATL} % print @1 in limbo
\def\postATL#1 #2 {\bf letter \{\uppercase{\char"#1}}
tangles as \tentex "#2"\egroup\par}
\def\noATL#1 #2 {}
\def\noat1{\let\ATL=\noATL} % suppress output from @1
\def\ATH{\X\kern-.5em:Preprocessor definitions\X}
\let\PB=\relax % hook for program brackets |...| in TeX part or section name

\chardef\AM='& % ampersand character in a string
\chardef\BS='\ \ % backslash in a string
\chardef\LB='{ % left brace in a string
\chardef\RB='} % right brace in a string
\def\SP{{\tt\char'\ }} % (visible) space in a string
\chardef\TL='~ % tilde in a string
\chardef\UL='_ % underline character in a string
\chardef\CF='^ % circumflex character in a string

\newbox\PPbox % symbol for ++

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\setbox\PPbox=\hbox{\kern.5pt\raise1pt\hbox{\sevenrm+\kern-1pt+}\kern.5pt}
\def\PP{\copy\PPbox}
\newbox\MMbox \setbox\MMbox=\hbox{\kern.5pt\raise1pt\hbox{\sevensy\char0
\kern-1pt\char0}\kern.5pt}
\def\MM{\copy\MMbox}
\newbox\MGbox % symbol for ->
\setbox\MGbox=\hbox{\kern-2pt\lower3pt\hbox{\teni\char'176}\kern1pt}
\def\MG{\copy\MGbox}
\def\MRL#1{\mathrel{\let\K==#1}}
%\def\MRL#1{\KK#1}\def\KK#1#2{\buildrel\;#1\over{#2}}
\let\GG=\gg
\let\LL=\ll
\let\NULL=\Lambda
\mathchardef\AND="2026 % bitwise and; also \& (unary operator)
\let\OR=\mid % bitwise or
\let\XOR=\oplus % bitwise exclusive or
\def\CM{{\sim}} % bitwise complement
\newbox\MODbox \setbox\MODbox=\hbox{\eightrm\%}
\def\MOD{\mathbin{\copy\MODbox}}
\def\DC{\kern.1em{:}\kern.1em} % symbol for ::
\def\PA{\mathbin{.*}} % symbol for .*
\def\MGA{\mathbin{MG*}} % symbol for ->*
\def\this{\&{this}}

\newbox\bak \setbox\bak=\hbox to -1em{} % backspace one em
\newbox\bakk \setbox\bakk=\hbox to -2em{} % backspace two ems

\newcount\ind % current indentation in ems
\def\1{\global\advance\ind by1\hangindent\ind em} % indent one more notch
\def\2{\global\advance\ind by-1} % indent one less notch
\def\3#1{\hfil\penalty#10\hfilneg} % optional break within a statement
\def\4{\copy\bak} % backspace one notch

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\def\5{\hfil\penalty-1\hfilneg\kern2.5em\copy\bakk\ignorespaces}% optional break
\def\6{\ifmmode\else\par % forced break
  \hangindent\ind em\noindent\kern\ind em\copy\bakk\ignorespaces\fi}
\def\7{Y\6} % forced break and a little extra space
\def\8{\hskip-\ind em\hskip 2em} % no indentation

\newcount\gdepth % depth of current major group, plus one
\newcount\secpagedepth
\secpagedepth=3 % page breaks will occur for depths -1, 0, and 1
\newtoks\gtitle % title of current major group
\newskip\intersecskip \intersecskip=12pt minus 3pt % space between sections
\let\yskip=\smallskip
\def\?{\mathrel?}
\def\note#1#2.{Y\noindent{\hangindent2em\baselineskip10pt\eightrm#1~#2.\par}}
\def\lapstar{\rlap{*}}
\def\stsec{\rightskip=0pt % get out of C mode (cf. \B)
  \sfcode' =1500 \pretolerance 200 \hyphenpenalty 50 \exhyphenpenalty 50
  \noindent{\let*=\lapstar\bf\secstar.\quad}}
\let\startsection=\stsec
\def\defin#1{\global\advance\ind by 2 \1\&{#1 } } % begin 'define' or 'format'
\def\A{\note{See also section}} % xref for doubly defined section name
\def\As{\note{See also sections}} % xref for multiply defined section name
\def\B{\rightskip=0pt plus 100pt minus 10pt % go into C mode
  \sfcode' =3000
  \pretolerance 10000
  \hyphenpenalty 9999 % so strings can be broken (discretionary \ is inserted)
  \exhyphenpenalty 10000
  \global\ind=2 \1\ \unskip}
\def\C#1{\5\5\quad$/\ast\,${\cmntfont #1}$\,\ast/$}
\let\SHC\C % "// short comments" treated like "/* ordinary comments */"
%\def\C#1{\5\5\quad$\triangleright\,${\cmntfont#1}$\,\triangleleft$}
%\def\SHC#1{\5\5\quad$\diamond\,${\cmntfont#1}}

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\def\D{\defin{#define}} % macro definition
\let\E=\equiv % equivalence sign
\def\ET{ and~ } % conjunction between two section numbers
\def\ETs{, and } % conjunction between the last two of several section numbers
\def\F{\defin{format}} % format definition
\let\G=\ge % greater than or equal sign
% \H is long Hungarian umlaut accent
\let\I=\ne % unequal sign
\def\J{\.@&} % TANGLE's join operation
\let\K== % assignment operator
%\let\K=\leftarrow % "honest" alternative to standard assignment operator
% \L is Polish letter suppressed-L
\outer\def\MN#1{\MN{#1}\ifon\vfil\penalty-100\vfilneg % beginning of section
  \vskip\interseckskip\startsection\ignorespaces}
\outer\def\N#1#2#3.{\gdepth=#1\gttitle={#3}\MN{#2}% beginning of starred section
  \ifon\ifnum#1<\secpagedepth \vfil\eject % force page break if depth is small
    \else\vfil\penalty-100\vfilneg\vskip\interseckskip\fi\fi
  \message{* \secno} % progress report
  \edef\next{\write\cont{\ZZ{#3}{#1}{\secno}% write to contents file
    {\noexpand\the\pageno}}}\next % \ZZ{title}{depth}{sec}{page}
  \ifon\startsection{\bf#3.\quad}\ignorespaces}
\def\MN#1{\par % common code for \M, \N
  {\xdef\secstar{#1}\let*=\empty\xdef\secno{#1}}% remove \* from section name
  \ifx\secno\secstar \onmaybe \else\ontrue \fi
  \mark{{{\tensy x}\secno}{\the\gdepth}{\the\gttitle}}}
% each \mark is {section reference or null}{depth plus 1}{group title}
% \O is Scandinavian letter O-with-slash
% \P is paragraph sign
\def\Q{note{This code is cited in section}} % xref for mention of a section
\def\Qs{note{This code is cited in sections}} % xref for mentions of a section
\let\R=\lnot % logical not
% \S is section sign

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\def\T#1{\leavevmode % octal, hex or decimal constant
\hbox{${\def\?{\kern.2em}}%
\def\##1{\egroup_{\,\rm##1}\bgroup}}% suffix to constant
\def\_{{\cdot 10^{\aftergroup}}}% power of ten (via dirty trick)
\let\~=\oct \let\^=\hex {#1}$}}
\def\U{note{This code is used in section}} % xref for use of a section
\def\Us{note{This code is used in sections}} % xref for uses of a section
\let\V=\lor % logical or
\let\W=\land % logical and
\def\X#1:#2\X{\ifmmode\gdef\XX{\null$\null}\else\gdef\XX{\fi % section name
\XX$\langle\,${#2\eightrm\kern.5em#1}$\,\rangle$\XX}
\def\Y{\par\yskip}
\let\Z=\le
\let\ZZ=\let % now you can \write the control sequence \ZZ
\let\*=\*

%\def\oct{\hbox{\rm\char'23\kern-.2em\it\aftergroup\?\aftergroup}} % WEB style
%\def\hex{\hbox{\rm\char"7D\tt\aftergroup}} % WEB style
\def\oct{\hbox{${\circ}\kern-.1em\it\aftergroup\?\aftergroup}}% CWEB style
\def\hex{\hbox{${\scriptscriptstyle\#}\$}\tt\aftergroup}} % CWEB style
\def\vb#1{\leavevmode\hbox{\kern2pt\vrule\vtop{\vbox{\hrule
\hbox{\strut\kern2pt\.{#1}\kern2pt}}
\hrule}\vrule\kern2pt}} % verbatim string

\def\onmaybe{\let\ifon=\maybe} \let\maybe=\iftrue
\newif\ifon \newif\iftitle \newif\ifpagesaved

\def\lheader{\mainfont\the\pageno\eightrm\qqquad\grouptitle\hfill\title\qqquad
\mainfont\topsecno} % top line on left-hand pages
\def\rheader{\mainfont\topsecno\eightrm\qqquad\title\hfill\grouptitle
\qqquad\mainfont\the\pageno} % top line on right-hand pages
\def\grouptitle{\let\i=I\let\j=J\uppercase\expandafter{\expandafter

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        \takethree\topmark}}
\def\topsecno{\expandafter\takeone\topmark}
\def\takeone#1#2#3{#1}
\def\taketwo#1#2#3{#2}
\def\takethree#1#2#3{#3}
\def\nullsec{\eightrm\kern-2em} % the \kern-2em cancels \qqad in headers

\let\page=\pagebody \raggedbottom
% \def\page{\box255 } \normalbottom % faster, but loses plain TeX footnotes
\def\normaloutput#1#2#3{\shipout\vbox{
  \ifodd\pageno\hoffset=\pageshift\fi
  \vbox to\fullpageheight{
    \iftitle\global\titelfalse
    \else\hbox to\pagewidth{\vbox to10pt{} \ifodd\pageno #3\else#2\fi}\fi
  \vfill#1}} % parameter #1 is the page itself
\global\advance\pageno by1}

\gtitle={\.{CWEB} output} % this running head is reset by starred sections
\mark{\noexpand\nullsec0{\the\gtitle}}
\def\title{\expandafter\uppercase\expandafter{\jobname}}
\def\topofcontents{\centerline{\titlefont\title}\vskip.7in
  \vfill} % this material will start the table of contents page
\def\botofcontents{\vfill
  \centerline{\covernote}} % this material will end the table of contents page
\def\covernote{}
\def\contentspagenumber{0} % default page number for table of contents
\newdimen\pagewidth \pagewidth=6.5in % the width of each page
\newdimen\pageheight \pageheight=8.7in % the height of each page
\newdimen\fullpageheight \fullpageheight=9in % page height including headlines
\newdimen\pageshift \pageshift=0in % shift righthand pages wrt lefthand ones
\def\magnify#1{\mag=#1\pagewidth=6.5truein\pageheight=8.7truein
  \fullpageheight=9truein\setpage}

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\def\setpage{\hsize\pagewidth\vsize\pageheight} % use after changing page size
\def\contentsfile{\jobname.toc} % file that gets table of contents info
\def\readcontents{\input \contentsfile}
\def\readindex{\input \jobname.idx}
\def\readsections{\input \jobname.scn}

\newwrite\cont
\output{\setbox0=\page % the first page is garbage
  \openout\cont=\contentsfile
    \write\cont{\catcode '\noexpand\@=11\relax} % \makeatletter
  \global\output{\normaloutput\page\lheader\rheader}}
\setpage
\ vbox to \vsize{} % the first \topmark won't be null

\def\ch{\note{The following sections were changed by the change file:}
  \let*=\relax}
\newbox\sbox % saved box preceding the index
\newbox\lbox % lefthand column in the index
\def\inx{\par\vskip6pt plus 1fil % we are beginning the index
  \def\page{\box255 } \normalbottom
  \write\cont{} % ensure that the contents file isn't empty
    \write\cont{\catcode '\noexpand\@=12\relax} % \makeatother
  \closeout\cont % the contents information has been fully gathered
  \output{\ifpagesaved\normaloutput{\box\sbox}\lheader\rheader\fi
    \global\setbox\sbox=\page \global\pagesavedtrue}
  \pagesavedfalse \eject % eject the page so far and predecessors
  \setbox\sbox\vbox{\unvbox\sbox} % take it out of its box
  \vsize=\pageheight \advance\vsize by -\ht\sbox % the remaining height
  \hsize=.5\pagewidth \advance\hsize by -10pt
    % column width for the index (20pt between cols)
  \parfillskip 0pt plus .6\hsize % try to avoid almost empty lines
  \def\lr{L} % this tells whether the left or right column is next

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\output{\if L\lr\global\setbox\lbox=\page \gdef\lr{R}
  \else\normaloutput{\vbox to\pageheight{\box\sbbox\vss
    \hbox to\pagewidth{\box\lbox\hfil\page}}}\lheader\rheader
  \global\vsizel\pageheight\gdef\lr{L}\global\pagesavedfalse\fi}
\message{Index:}
\parskip Opt plus .5pt
\outer\def\I##1, {\par\hangindent2em\noindent##1:\kern1em} % index entry
\def\[#1]{$\underline{##1}$} % underlined index item
\rm \rightskipOpt plus 2.5em \tolerance 10000 \let\*=\lapstar
\hyphenpenalty 10000 \parindent0pt
\readindex}
\def\fin{\par\vfill\eject % this is done when we are ending the index
  \ifpagesaved\null\vfill\eject\fi % output a null index column
  \if L\lr\else\null\vfill\eject\fi % finish the current page
  \parfillskip Opt plus 1fil
  \def\grouptitle{NAMES OF THE SECTIONS}
  \let\topsecno=\nullsec
  \message{Section names:}
  \output={\normaloutput\page\lheader\rheader}
  \setpage
  \def\note##1##2.{\quad{\eightrm##1~##2.}}
  \def\Q{\note{Cited in section}} % crossref for mention of a section
  \def\Qs{\note{Cited in sections}} % crossref for mentions of a section
  \def\U{\note{Used in section}} % crossref for use of a section
  \def\Us{\note{Used in sections}} % crossref for uses of a section
  \def\I{\par\hangindent 2em}\let\**
  \readsections}
\def\con{\par\vfill\eject % finish the section names
% \ifodd\pageno\else\titltrue\null\vfill\eject\fi % for duplex printers
  \rightskip Opt \hyphenpenalty 50 \tolerance 200
  \setpage \output={\normaloutput\page\lheader\rheader}
  \titltrue % prepare to output the table of contents

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\pageno=\contentspagenumber
\def\grouptitle{TABLE OF CONTENTS}
\message{Table of contents:}
\topofcontents
\line{\hfil Section\hbox to3em{\hss Page}}
\let\ZZ=\contentsline
\readcontents\relax % read the contents info
\botofcontents \end} % print the contents page(s) and terminate
\def\contentsline#1#2#3#4{\ifnum#2=0 \smallbreak\fi
  \line{\consetup{#2}#1
    \rm\leaders\hbox to .5em{.\hfil}\hfil\ #3\hbox to3em{\hss#4}}}
\def\consetup#1{\ifcase#1 \bf % depth -1 (@**)
  \or % depth 0 (@*)
  \or \hskip2em % depth 1 (@*1)
  \or \hskip4em % depth 2 (@*2)
  \or \hskip6em % depth 3 (@*3)
  \or \hskip8em % depth 4 (@*4)
  \or \hskip10em % depth 5 (@*5)
  \else \hskip12em \fi} % depth 6 or more
\def\noinx{\let\inx=\end} % no indexes or table of contents
\def\nosecs{\let\FIN=\fin \def\fin{\let\parfillskip=\end \FIN}}
  % no index of section names or table of contents
\def\nocon{\let\con=\end} % no table of contents
\def\today{\ifcase\month\or
  January\or February\or March\or April\or May\or June\or
  July\or August\or September\or October\or November\or December\fi
  \space\number\day, \number\year}
\newcount\twodigits
\def\hours{\twodigits=\time \divide\twodigits by 60 \printtwodigits
  \multiply\twodigits by 60 \advance\twodigits by\time :\printtwodigits}
\def\gobbleone1{}
\def\printtwodigits{\advance\twodigits100

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\expandafter\gobbleone\number\twodigits
\advance\twodigits-100 }
\def\TeX{{\ifmmode\it\fi
  \leavevmode\hbox{T\kern-.1667em\lower.424ex\hbox{E}\hskip-.125em X}}}}
\def\,{\relax\ifmmode\mskip\thinmuskip\else\thinspace\fi}
\def\datethis{\def\startsection{\leftline{\sc\today\ at \hours}\bigskip
  \let\startsection=\stsec\stsec}}
% say '\datethis' in limbo, to get your listing timestamped before section 1
\def\datecontentspage{%
  \def\topofcontents{\leftline{\sc\today\ at \hours}\bigskip
  \centerline{\titlefont\title}\vfill}} % timestamps the contents page

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