

Loopy.TeX

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Recently, I encountered an application that required a set of nested loops and local-only assignments and definitions. T_EX's `\loop... \repeat` construction proved to be inadequate because of the requirement that the inner loop be grouped. To solve the problem, I wrote a general purpose integer 'for loop' macro, the syntax of which is simply:

```
\forcount\cname = start to
  finish by increment do
  body of the loop
\endfor\cname
```

The *cname* given above must be defined as a count register by a `\countdef`, `\newcount`, or `\declarecount` macro.

```
\def\forcount #1{\relax
\def
  \for #1=##1to ##2by ##3do
    ##4%
  \endfor #1%
{\relax
#1=##1\relax
\ifnum ##3>0
  \whilenot #1\ifnum ##2<#1do
    ##4%
    \advance #1 by ##3\relax
  \endwhilenot #1%
\else
  \while #1\ifnum ##2<#1do
    ##4%
    \advance #1 by ##3\relax
  \endwhile #1%
\fi
}%
\for #1%
}%
%
\let\endwhilenot=\fi
%
\def\whilenot #1{\relax
\def
  \whilenotloop#1 ##1do
    ##2%
  \endwhilenot #1%
{\relax
\expandafter\def\cname whilenotbody\string#1\endcsname{##2}%
\expandafter\def\cname whilenotloop\string#1\endcsname
{\relax
  ##1%
  \let\next=\relax
\else
```

The 'for loop' macro utilizes general-purpose while and while-not loop macros, the syntax of both is:

```
\while\cname conditional do
  body of the loop
\endwhile\cname
```

The *cname* can be any control sequence name that is locally unique.

A listing of the file `loopy.tex` is given in figure 1. An example file which generates a simple multiplication table and its output are shown in figures 2 and 3.

The definitions of a set of 'declare' macros, which function like non-global 'new' macros, is given in figure 4.

```

\csname whilenotbody\string#1\endcsname
\expandafter\let\expandafter\next
\csname whilenotloop\string#1\endcsname
\fi
\next
}%
\csname whilenotloop\string#1\endcsname
}%
\whilenotloop#1
}%
%
\let\endwhile=\fi
%
\def\while #1{\relax
\def
\whileloop#1 ##1do
##2%
\endwhile #1%
{\relax
\expandafter\def\csname whilebody\string#1\endcsname{##2}%
\expandafter\def\csname whileloop\string#1\endcsname
{\relax
##1%
\csname whilebody\string#1\endcsname
\expandafter\let\expandafter\next
\csname whileloop\string#1\endcsname
\else
\let\next=\relax
\fi
\next
}%
\csname whileloop\string#1\endcsname
}%
\whileloop#1
}

```

Figure 1. Listing of the macros for looping.

```

\beginboxes{}
\declarecount\x
\declarecount\y
\declarecount\z
\column{\leftrulewidth=1.2pt \rightrulewidth=1.2pt}
\forcount\x = 1 to 11 by 1 do
\column{\leftrulewidth=0pt \rightrulewidth=0.4pt}
\endfor\x
\column{\leftrulewidth=0pt \rightrulewidth=1.2pt}
\row{\toprulewidth=1.2pt \bottomrulewidth=1.2pt}
\entry{${\times}$}
\forcount\x = 1 to 12 by 1 do
\entry{\number\x}
\endfor\x
\forcount\y = 1 to 12 by 1 do
\ifnum\y=12

```

```

        \row{\toprulewidth=0pt \bottomrulewidth=1.2pt}
    \else
        \row{\toprulewidth=0pt \bottomrulewidth=0.4pt}
    \fi
    \entry{\number\y}
    \forcount\x = 1 to 12 by 1 do
        \z=\x
        \multiply\z by \y
        \entry{\number\z}
    \endfor\x
    \endfor\y
\endboxes

```

Figure 2. Listing of a loopy example.

| × | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|
| 1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 2 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 |
| 3 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 | 30 | 33 | 36 |
| 4 | 4 | 8 | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40 | 44 | 48 |
| 5 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 |
| 6 | 6 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60 | 66 | 72 |
| 7 | 7 | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 | 70 | 77 | 84 |
| 8 | 8 | 16 | 24 | 32 | 40 | 48 | 56 | 64 | 72 | 80 | 88 | 96 |
| 9 | 9 | 18 | 27 | 36 | 45 | 54 | 63 | 72 | 81 | 90 | 99 | 108 |
| 10 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 |
| 11 | 11 | 22 | 33 | 44 | 55 | 66 | 77 | 88 | 99 | 110 | 121 | 132 |
| 12 | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 | 132 | 144 |

Figure 3. Output of figure 2.

```

\def\declarecount {\allocate0\countdef}%
\def\declaredimen {\allocate1\dimendef}%
\def\declareskip {\allocate2\skipdef}%
\def\declaremuskip{\allocate3\muskipdef}%
\def\declarebox {\allocate4\chardef}%
\def\declaretoks {\allocate5\toksdef}%
%
\def\allocate#1#2#3{\relax
  \advance\count1#1 by 1
  \ifnum\count1#1<\count19
  \else
    \errmessage{No room for \string#3!}%
  \fi
  #2#3=\count1#1
}

```

Figure 4. Listing of the declare macros.