

# Headers and footers in L<sup>A</sup>T<sub>E</sub>X

**Piet van Oostrum**\*

Dept. of Computer Science  
Utrecht University  
piet@cs.ruu.nl

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## Abstract

Standard L<sup>A</sup>T<sub>E</sub>X offers the page styles `empty`, `plain`, `headings` and `myheadings`. For simple page layouts these suffice, but they are rather rigid. A more flexible page layout may be obtained by using the `FANCYHEADINGS` package. This article describes how to create advanced page headers and footers in L<sup>A</sup>T<sub>E</sub>X documents by using this package. Some of the techniques described are also applicable with other page styles.

## 1 What is fancyheadings

The `fancyheadings` macro package allows you to customize in L<sup>A</sup>T<sub>E</sub>X your page headers and footers in an easy way. You can define:

- three-part headers and footers
- decorative lines in headers and footers
- headers and footers wider than the width of the text
- multi-line headers and footers
- separate headers and footers for even and odd pages
- different headers and footers for chapter pages

Of course, you also have complete control over fonts, uppercase and lowercase displays, etc.

## 2 Where to get it?

You only need the file `fancyheadings.sty` which you can find at the CTAN sites: `ftp.shsu.edu` (U.S.), `ftp.tex.ac.uk` (U.K.), and `ftp.dante.de` (Germany). You will find it in the directory

```
/tex-archive/macros/latex209/contrib/  
fancyheadings
```

Although `fancyheadings` is a L<sup>A</sup>T<sub>E</sub>X 2.09 style file, it will work with L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub>. Also this article and the two packages `fixmarks` and `extramarks` can be found there.

## 3 Use of fancyheadings

To use this package in a L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> document, place the file `fancyheadings.sty` in a directory/folder where T<sub>E</sub>X can find it (normally in the input directory/folder), and include in the preamble of your document after

```
\documentclass{...}
```

the commands:

```
\usepackage{fancyheadings}  
\pagestyle{fancy}
```

We can visualize the page layout we can create with `fancyheadings` as follows:

LeftHeader	CenteredHeader	RightHeader
<div style="text-align: center;">page body</div>		
LeftFooter	CenteredFooter	RightFooter

The `LeftHeader` and `LeftFooter` are left justified; the `CenteredHeader` and `CenteredFooter` are centered; the `RightHeader` and `RightFooter` are right justified.

We define each of the six ‘fields’ and the two decorative lines separately.

## 4 A simple example

K. Grant is writing a report to Dean A. Smith, on ‘The performance of new graduates’ with the following page layout:

**The performance of new graduates**

page body

From: K. Grant                      To: Dean A. Smith                      3

where ‘3’ is the page number. The title: ‘The performance of new graduates’ is bold.

This is accomplished by these commands following `\pagestyle{fancy}`:

\*A considerable part of this article was written by George Grätzer (University of Manitoba) in *Notices Amer. Math. Soc.* Thanks, George!

```
\lhead{}
\chead{}
\rhead{\bfseries The performance of new graduates}
\lfoot{From: K. Grant}
\cfoot{To: Dean A. Smith}
\rfoot{\thepage}
\setlength{\headrulewidth}{0.4pt}
\setlength{\footrulewidth}{0.4pt}
```

(The `\thepage` macro displays the current page number. `\bfseries` is the L<sup>A</sup>T<sub>E</sub>X<sub>2 $\epsilon$</sub> 's way of selecting bold face.)

This is now fine, except that the first page does not need all these headers and footers. To eliminate all but the centered page number, issue the command

```
\thispagestyle{plain}
```

after the `\begin{document}` and the `\maketitle` commands.

Alternatively, issue

```
\thispagestyle{empty}
```

if you do not want any headers or footers.

In fact the standard L<sup>A</sup>T<sub>E</sub>X classes have the command `\maketitle` defined in such a way that a `\thispagestyle{plain}` is automatically issued. So if you *do* want the fancy layout on a page containing `\maketitle` you must issue a `\thispagestyle{fancy}` after the `\maketitle`.

## 5 An example of two-sided printing

Some document classes, such as `book.cls`, print two-sided: the even pages and the odd pages have different layouts; other document classes use the `twoside` option to print two-sided.

Now let us print the report two-sided. Let the above page layout be used for the odd (right-side) pages, and the following for the even (left-side) pages:

**The performance of new graduates**

---

page body

---

4                      From: K. Grant                      To: Dean A. Smith

where '4' is the page number.

Here are the commands:

```
\lhead[]{\bfseries The performance of new
                    graduates}
\chead{}
\rhead[\bfseries The performance of new
        graduates]{}
\lfoot[\thepage]{From: K. Grant}
\cfoot[From: K. Grant]{To: Dean A. Smith}
\rfoot[To: Dean A. Smith]{\thepage}
\setlength{\headrulewidth}{0.4pt}
\setlength{\footrulewidth}{0.4pt}
```

As you see, the values of the fields for the even (left-side) pages are given in the square brackets. Again, you may use `\thispagestyle{plain}` for a simple page layout for page 1.

## 6 Redefining plain style

`\thispagestyle{plain}` may not be your choice for the page style of the first page. For instance, if all the page numbers are bold, you may want this on the first page also.

`fancyheadings` allows you to also redefine the plain page style with the command

```
\pagestyle{fancyplain}
```

This command performs the function of

```
\pagestyle{fancy}
```

**and** redefines the plain page style. Note that this does not issue a

```
\pagestyle{plain} or \thispagestyle{plain}
```

command. This is either done by L<sup>A</sup>T<sub>E</sub>X<sub>2 $\epsilon$</sub>  (for instance, for the first page of a chapter in the book class), or you have to do it explicitly with the

```
\thispagestyle{plain}
```

command.

The redefinition of the plain style is done with the command

```
\fancyplain{plain_value}{normal_value}
```

inserted into all the appropriate arguments. As an example, let us redefine the plain style for the report in Section 5 by making the page number bold.

The leftheader definition:

```
\lhead[]{\bfseries The performance of new
                    graduates}
```

changes to

```
\lhead[\fancyplain{}]{\fancyplain{}{\bfseries
                    The performance of new graduates}}
```

Note that the first argument of both `\fancyplain` commands is empty, since the redefined plain style has an empty leftheader. The `\fancyplain{}{}`  is superfluous but for symmetry reasons it is given in this example.

The left- and rightfooter definitions change more. For instance, the leftfooter definition changes from

```
\lfoot[\thepage]{From: K. Grant}
```

to

```
\lfoot[\fancyplain{}]{\bfseries \thepage}
{\fancyplain{}{From: K. Grant}}
```

Carrying out these changes for all six fields, we get the code:

```
\lhead[\fancyplain{}]{\fancyplain{}{\bfseries
                    The performance of new graduates}}
\chead[\fancyplain{}]{\fancyplain{}{\bfseries
                    The performance of new graduates}}
\rhead[\fancyplain{}]{\bfseries The performance
                    of new graduates}\fancyplain{}{}
\lfoot[\fancyplain{}]{\thepage}\fancyplain{}{%
                    From: K. Grant}}
\cfoot[\fancyplain{\bfseries \thepage}{From: K.
                    Grant}]{\fancyplain{\bfseries \thepage}{To:
                    Dean A. Smith}}
\rfoot[\fancyplain{}]{To: Dean A. Smith}\fancyplain{}{%
                    \fancyplain{}{\bfseries \thepage}}
\setlength{\headrulewidth}{0.4pt}
\setlength{\footrulewidth}{0.4pt}
```

For the ‘fancy plain’ page style, the thickness of the lines is defined by

```
\plainheadrulewidth and \plainfootrulewidth
```

(both default to 0pt). Observe that you may have different ‘fancy plain’ page styles for even and odd pages.

To use the ‘fancy plain’ page style, define these macros; in the preamble, include

```
\usepackage{fancyheadings}
\pagestyle{fancyplain}
```

and invoke the page style ‘fancy plain’ with

```
\thispagestyle{plain}
```

where desired.

## 7 The default layout

Let us use the `book.cls` documentclass and the default settings for `fancyheadings`; so we only issue the commands

```
\usepackage{fancyheadings}
\pagestyle{fancy}
```

and let `fancyheadings` take care of everything. On the pages where new chapters start, we get a centered page number in the footer; there is no header, and there are no decorative lines.

On an even page, we get the layout:

```
1.2 EVALUATION                CHAPTER 1. INTRODUCTION
-----
                                page body
-----
                                4
```

On an odd page, we get the layout:

```
CHAPTER 1. INTRODUCTION        1.2 EVALUATION
-----
                                page body
-----
                                3
```

where the header text is slanted uppercase.

This default layout is produced by the following commands:

```
\lhead[\fancyplain{}{\slshape \rightmark}]{%
    \fancyplain{} {\slshape \leftmark}}
\chead{}
\rhead[\fancyplain{}{\slshape \leftmark}]{%
    \fancyplain{} {\slshape \rightmark}}
\lfoot{}
\cfoot{\rmfamily \thepage}
\rfoot{}
-----
```

<sup>1</sup>The names `leftmark` and `rightmark` unfortunately are very counter-intuitive

The following settings are used for the decorative lines:

```
\headrulewidth      0.4pt
\footrulewidth      0 pt
\plainheadrulewidth 0 pt
\plainfootrulewidth 0 pt
```

The header text is turned into all uppercase in `book.cls`.

## 8 Custom layouts

Usually, for documents of class `book` and `report`, you may want to use chapter and section information in the headings (chapter only for one-sided printing), and for documents of class `article`, section and subsection information (section only for one-sided printing). L<sup>A</sup>T<sub>E</sub>X uses a marker mechanism to remember the chapter and section (section and subsection) information for a page; this is discussed in detail in the *L<sup>A</sup>T<sub>E</sub>X Companion*, Section 4.3.1.

There are two ways you can utilize and change the higher- and lower-level sectioning information available to you. The macros: `\leftmark`<sup>1</sup> (higher-level) and `\rightmark` (lower-level) contain the information processed by L<sup>A</sup>T<sub>E</sub>X, and you can use them directly as shown in Section 7.

You can influence how chapter, section, and subsection information (only two of them!) is displayed by redefining the `\chaptermark`, `\sectionmark`, and `\subsectionmark` commands.

Let us illustrate this with chapter info. It is made up of three parts:

- the number (say, 2), displayed by the macro `\thechapter`
- the name (in English, Chapter), displayed by the macro `\chaptername`
- the title, contained in the first argument of `\markboth`.

Figure 1 shows some variants for ‘Chapter 2. Do it now’ (the last example is appropriate in some non-English languages).

For the lower-level sectioning information, do the same with `\markright`.

So if ‘Section 2.2. First steps’ is the current section, then

```
\renewcommand{\sectionmark}[1]{
    \markright{\thesection.\ #1}}
```

will give ‘2.2. First steps’

It should be noted that the L<sup>A</sup>T<sub>E</sub>X marking mechanism works fine with chapters (which always start on a new page) and sections (which are reasonably long). It does not work quite as well with short sections and subsections. This is a problem with L<sup>A</sup>T<sub>E</sub>X, not with `fancyheadings`.

Code:	Prints:
<pre>\renewcommand{\chaptermark}[1]{ \markboth{\chaptername\ \thechapter.\ #1}{}}</pre>	Chapter 2. Do it now
<pre>\renewcommand{\chaptermark}[1]{ \markboth{\uppercase{ \chaptername}\ \thechapter. \ #1}{}}</pre>	CHAPTER 2. Do it now
<pre>\renewcommand{\chaptermark}[1]{ \markboth{\uppercase{ \chaptername\ \thechapter.\ \ #1}}{}}</pre>	CHAPTER 2. DO IT NOW
<pre>\renewcommand{\chaptermark}[1]{ \markboth{\#1}{}}</pre>	Do it now
<pre>\renewcommand{\chaptermark}[1]{ \markboth{\thechapter.\ #1}{}}</pre>	2. Do it now
<pre>\renewcommand{\chaptermark}[1]{ \markboth{\thechapter.\ \chaptername.\ #1}{}}</pre>	2. Chapter. Do it now

Figure 1: Marker variants

## 9 Fancy layouts

You can make a multi-line field with the `\` command. It is also possible to put extra space in a field with the `\vspace` command. Note that if you do this you will probably have to increase the height of the header (`\headheight`) or of the footer (`\footskip`), otherwise you may get error messages ‘Overfull `\vbox` ... has occurred while `\output` is active’. See Section 4.1 of the *L<sup>A</sup>T<sub>E</sub>X Companion* for detail.

For instance, the following code will place the section title and the subsection title of an article in two lines in the upper right hand corner:

```
\documentclass{article}
\usepackage{fancyheadings}
\pagestyle{fancy}
\addtolength{\headheight}{\baselineskip}
\renewcommand{\sectionmark}[1]{\markboth{\#1}{}}
\renewcommand{\subsectionmark}[1]{\markright{\#1}}
\rhead{\leftmark\rightmark}
```

You can customize the decorative lines. You can make the decorative line in the header quite thick with

```
\setlength{\headrulewidth}{0.6pt}
```

or you can make the decorative line in the footer disappear with

```
\setlength{\footrulewidth}{0pt}
```

The decorative lines, themselves, are defined in the two macros `\headrule` and `\footrule`. For instance, if you want a dotted line rather than a solid line in the header, redefine the command `\headrule`:

```
\renewcommand{\headrule}{\vbox to 0pt{\hbox
to\headwidth{\dotfill}\vss}}
```

## 10 Two book examples

The following definitions give an approximation of the style used in L. Lamport’s *L<sup>A</sup>T<sub>E</sub>X book*.

Lamport’s header overhangs the outside margin. This is done as follows.

The width of headers and footers is `\headwidth`, which by default equals the width of the text: `\textwidth`. You can make the width wider (or narrower) by redefining `\headwidth` with the `\setlength` and `\addtolength` commands. To overhang the outside margin where the marginal notes are printed, add both `\marginparsep` and `\marginparwidth` to `\headwidth` with the commands:

```
\addtolength{\headwidth}{\marginparsep}
\addtolength{\headwidth}{\marginparwidth}
```

You must issue these commands *after* the first `\pagestyle{fancy}` or `\pagestyle{fancyplain}` command as this will establish the default for `\headwidth`.

And now a complete definition of Lamport’s book style:

```

\documentclass{book}
\usepackage{fancyheadings}
\pagestyle{fancyplain}
\addtolength{\headwidth}{\marginparsep}
\addtolength{\headwidth}{\marginparwidth}
\renewcommand{\chaptermark}[1]{\markboth{#1}{}}
\renewcommand{\sectionmark}[1]{\markright{%
\thesection\ #1}}
\lhead[\fancyplain]{\bfseries\thepage}
{\fancyplain}{\bfseries\rightmark}}
\rhead[\fancyplain]{\bfseries\leftmark}
{\fancyplain}{\bfseries\thepage}}
\cfoot{}

```

Notice that the `\chaptermark` and `\sectionmark` commands have been redefined to eliminate the chapter numbers and the uppercaseness. However this example does not eliminate all uppercaseness. E.g. the bibliography will have a title of BIBLIOGRAPHY in the header, as the `\uppercase` is explicitly given in the definition of `\thebibliography`. If you don't want to redefine this command (and maybe others also), you can use an ugly hack like the following:

```

\lhead{\let\uppercase\relax\rightmark}
\rhead{\let\uppercase\relax\leftmark}

```

For the second example, we take the  $\mathcal{A}\mathcal{M}\mathcal{S}$ -L<sup>A</sup>T<sub>E</sub>X book.

Chapter pages have no headers or footers. So we declare

```
\thispagestyle{empty}
```

for every chapter page, and we do not need fancyplain.

Chapter and section titles appear in the form: 2. DO IT NOW, so we have to redefine `\chaptermark` and `\sectionmark` as follows (see Section 8):

```

\renewcommand{\chaptermark}[1]{%
\markboth{\uppercase{\thechapter.\ #1}}{}}
\renewcommand{\sectionmark}[1]{%
\markright{\uppercase{\thesection.\ #1}}

```

In an even-header, the page number is printed as the LeftHeader and the chapter info as the RightHeader; in an odd-header, the section info is printed as the LeftHeader and the page number as the RightHeader. The Centered-Headers are empty. There are no footers.

There is a decorative line in the header. It is 0.5pt wide, so we need the commands:

```

\setlength{\headrulewidth}{0.5pt}
\setlength{\footrulewidth}{0pt}

```

The font used in the headers is 9 pt bold Helvetica. The PSNFSS system by Sebastian Rahtz uses the short (Karl Berry) name `phv` for Helvetica, so this font is selected with the commands:

```

\fontfamily{phv}\fontseries{b}\fontsize{9}{11}%
\selectfont

```

(See Sections 7.6.1 and 11.9.1 of the L<sup>A</sup>T<sub>E</sub>X Companion.)

Let us define a shorthand for this:

```

\newcommand{\helv}{%
\fontfamily{phv}\fontseries{b}\fontsize{9}{11}%
\selectfont}

```

Now we are ready for the page layout:

```

\lhead[\helv \thepage]{\helv \rightmark}
\rhead[\helv \leftmark]{\helv \thepage}
\cfoot{}

```

Putting this all together:

```

\documentclass{book}
\usepackage{fancyheadings}
\pagestyle{fancy}
\renewcommand{\chaptermark}[1]{%
\markboth{\uppercase{\thechapter.\ #1}}{}}
\renewcommand{\sectionmark}[1]{%
\markright{\uppercase{\thesection.\ #1}}
}
\setlength{\headrulewidth}{0.5pt}
\setlength{\footrulewidth}{0pt}
\newcommand{\helv}{%
\fontfamily{phv}\fontseries{b}\fontsize{9}{11}%
\selectfont}
\lhead[\helv \thepage]{\helv \rightmark}
\rhead[\helv \leftmark]{\helv \thepage}
\cfoot{}

```

## 11 Dictionary style headers

Dictionaries and concordances usually have a header containing the first word defined on the page or both the first and the last words. This can easily be accomplished with fancyheadings and L<sup>A</sup>T<sub>E</sub>X's mark mechanism. Of course if you use the marks for dictionary style headers, you cannot use them for chapter and section information, so if there are also chapters and sections present, you must redefine the `\chaptermark` and `\sectionmark` to make them harmless:

```

\renewcommand{\chaptermark}[1]{}
\renewcommand{\sectionmark}[1]{}

```

Now you do a `\markboth{#1}{#1}` for each dictionary or concordance entry #1 and use `\rightmark` for the first entry defined on the page and `\leftmark` for the last one.

If you want to use a header entry of the form *firstword–lastword* it would be nice if this would be reduced to just the form *firstword* if both are the same. This could happen if there is just one entry on the page. In this case a test must be made to check if the marks are the same. However, T<sub>E</sub>X's marks are strange beasts, which cannot be compared out of the box with the plain T<sub>E</sub>X `\if` commands. Fortunately the `ifthen` package works well:

```

\newcommand{\mymarks}{%
\ifthenelse{\equal{\leftmark}{\rightmark}}
{\rightmark}
{\rightmark--\leftmark}}
\lhead[\rm \mymarks]{\rm \thepage}
\rhead[\rm \thepage]{\rm \mymarks}

```

Dictionaries are often done with two columns. Unfortunately there is a bug in L<sup>A</sup>T<sub>E</sub>X's `twocolumn` option which causes some marks to be lost. If you use the following package (see figure 2), this will be solved in all except a few pathological cases.

```

% fixmarks.sty:
% Patch LaTeX's output routine to handle marks correctly with two columns.
% Joe Pallas <pallas@edu.stanford.neon>
% Corrected by Piet van Oostrum <piet@cs.ruu.nl> on Feb 5, 1993

\def\@outputdblcol{\if@firstcolumn \global\@firstcolumnfalse
% Remember the marks from the first column
  \global\setbox\@leftcolumn\vsplit\@outputbox to\ht\@outputbox
  \expandafter\gdef\expandafter\@firstcoltopmark\expandafter{\topmark}%
  \expandafter\gdef\expandafter\@firstcolfirstmark
    \expandafter{\splitfirstmark}%
  \ifx\@firstcolfirstmark\empty\global\let\@setmarks\relax\else
  \gdef\@setmarks{\let\firstmark\@firstcolfirstmark
    \let\topmark\@firstcoltopmark}%
  \fi
% End of change
  \else \global\@firstcolumntrue
  \setbox\@outputbox\vbox{\hbox to\textwidth{\hbox to\columnwidth
    {\box\@leftcolumn \hss}\hfil \vrule width\columnseprule\hfil
    \hbox to\columnwidth{\box\@outputbox \hss}}}\@combinedblfloats
% Override current first and top with those of first column if necessary
  \@setmarks
% End of change
  \@outputpage \begingroup \@dblfloatplacement \@startdblcolumn
  \@whiles\if@fcolmade \fi{\@outputpage\@startdblcolumn}\endgroup
  \fi}

\def\toprightmark{\expandafter\@rightmark\topmark}

```

Figure 2: Fix marks in twocolumn style

## 12 Special page layout for float pages

Some people want to have a special layout for float pages (pages only containing floats). As these pages are generated autonomically by L<sup>A</sup>T<sub>E</sub>X, the user doesn't have any control over them. There is no `\thispagestyle` for float pages and any change of the page style will at least also affect the page before the float page. With fancyheadings you can give the following definition in your preamble<sup>2</sup>:

```

\makeatletter
\def\iffloatpage#1#2{\if@fcolmade #1\else #2\fi}
\makeatother

```

In each of the header- or footer fields you can now specify

```

\iffloatpage{value for float page}{value for other pages}

```

You can even use this to get rid of the decorative line on float pages only by defining:

```

\renewcommand{\headrulewidth}{%
  \iffloatpage{0pt}{0.4pt}}

```

Note that `\renewcommand` is used rather than the usual `\setlength` command to change the `\headrulewidth`. Changing it with `\setlength` will not work<sup>3</sup>.

After this `\renewcommand` it will no longer be possible to change the `\headrulewidth` with `\setlength`, you will have to use `\renewcommand` in the rest of the document.

Sometimes you may want to change the layout also for pages that contain a float on the top of the page or a float on the bottom of the page.

Enter the following definitions in a style file (or between `\makeatletter` and `\makeatother` in your preamble:

```

\let\latex@makeecol\@makeecol
\def\@makeecol{\let\topfloat\@toplist%
  \let\botfloat\@botlist\latex@makeecol}
\def\iftopfloat#1#2{\ifx\topfloat\empty #2%
  \else #1\fi}
\def\ifbotfloat#1#2{\ifx\botfloat\empty #2%
  \else #1\fi}

```

You can then use `\iftopfloat` and `\ifbotfloat` in the same way as `\iffloatpage`.

## 13 Those blank pages

In the book class when the `openany` option is not given or in the report class when the `openright` option is given, chapters start at odd-numbered pages, half of the time causing a blank page to be inserted. Some people prefer this page to be completely empty, i.e. without headers and footers. This cannot be done with `\thispagestyle` as this command would have to be issued on the *previous* page. There is, however, no magic necessary to get this done:

```

\clearpage
\pagestyle{empty}
\cleardoublepage
\pagestyle{fancy} % or whatever pagestyle was
                  % in force

```

You can of course put the above in a private command. If you want to have this done automatically or when you want some other text on the page then you must redefine the `\cleardoublepage` command.

<sup>2</sup>If you have fancyheadings version 1.5 or higher these commands are already included

<sup>3</sup>It was probably a dumb decision to define the width parameters as lengths. There is no need to and I may change this in a future version of fancyheadings

```
\makeatletter
\def\cleardoublepage{\clearpage\if@twoside
                        \ifodd\c@page\else
\hbox{}
\vspace*{\fill}
\begin{center}
  This page intentionally contains only
  this sentence.
\end{center}
\vspace{\fill}
\thispagestyle{empty}
\newpage
\if@twocolumn\hbox{} \newpage\fi\fi}
\makeatother
```

## 14 N of M style page numbers

Some document writers prefer the pages to be numbered as  $n$  of  $m$  where  $m$  is the number of pages in the document. There is a package `nofm.sty` available, but some versions of it are defective, and most don't work with `fancyheadings` because they take over the complete page layout. For L<sup>A</sup>T<sub>E</sub>X<sub>2 $\epsilon$</sub>  there is a package `lastpage` available which you can use with `fancyheadings` as follows:

```
\usepackage{lastpage}
...
\cfoot{\thepage\ of \pageref{LastPage}}
```

If you are still using L<sup>A</sup>T<sub>E</sub>X<sub>2.09</sub> and you are not able to switch to L<sup>A</sup>T<sub>E</sub>X<sub>2 $\epsilon$</sub>  you can define a L<sup>A</sup>T<sub>E</sub>X<sub>2.09</sub> compatible `lastpage.sty` as follows:

```
\let\origenddocument=\enddocument
\def\enddocument{\clearpage\if@filesw
  {\addtocounter{page}{-1}
   \immediate\write\@mainaux
   {\string\newlabel{LastPage}{\the
   page}}}\origenddocument}
```

With some trickery<sup>4</sup> the value of the `LastPage` label can be used to make different headers or footers on the last page of a document. E.g. if you want the footer of every odd page, except if it is the last one, to contain the text 'please turn over', this can be done as follows:

```
\usepackage{lastpage}
\usepackage{ifthen}
...
\makeatletter
\def\LastPageNum{\ifundefined{r@LastPage}{0}{%
  \expandafter\expandafter
  \expandafter\c@r
  \csname r@LastPage\endcsname\@nil\null} }
\makeatother
\rfoot{\ifthenelse{\isodd{\value{page}} \and \not
  \value{page}=\LastPageNum}{please turn
  over}{}}
```

## 15 Headers and footers induced by the text

We have seen how we can use L<sup>A</sup>T<sub>E</sub>X's marks to get information from the document contents to the headers and footers. The marks are the only mechanism that you can use to get changing information to the headers or footers. This is because L<sup>A</sup>T<sub>E</sub>X may be processing your document

ahead before deciding to break the page. Only in cases where you know for sure that a page break will not occur you can communicate information to the headers and footers by storing it in regular commands or by calling one of the `fancyheadings` commands in the middle of the text. The start of a chapter would be such an occasion for example. So if you have a book where each chapter is written by a different author and you want the name of the author in the lower left-hand corner you can use the following commands:

```
\newcommand{\Author}{}
\lfoot{\Author}
```

and start each chapter with the command `\renewcommand\Author{Real Name}`. If however, the author name could change in the middle of the text you must use either the `\leftmark` or the `\rightmark` as described in section 8.

Sometimes the two marks that L<sup>A</sup>T<sub>E</sub>X offers are not enough. An example is the following:

If a solution to an exercise goes across a page break, then I would like to have '(Continued on next page...)' at the bottom of the first page and '(Continued...)' at the top in the margin of the next page.

You cannot use L<sup>A</sup>T<sub>E</sub>X's mark mechanisms for this if you also want to use chapter and section information.

The code from figure 3 constitutes a package that gives you two extra marks that can be used in this situation.

Here is a way to use this package:

```
\usepackage{extramarks}
...
\pagestyle{fancy}
\lhead{\firstxmark}
\rfoot{\lastxmark}
...
\extramarks{}{Continued on next page\ldots}
Some text that may or may not cross a page
boundary...
\extramarks{Continued\ldots}{}
```

Note that the `\extramarks` command must be close to the text, i.e. no empty lines (paragraph boundaries) should intervene. Otherwise the page may be broken at that boundary and the `extramarks` would come on the wrong page.

There are two new marks that can be used in the page layout with this package: If commands of the form `\extramarks{ $m_1$ }{ $m_2$ }` are given `\firstxmark` gives you the first  $m_1$  value and `\lastxmark` gives you the last  $m_2$  value of the current page.

To stress the point that marks are the correct way to do this, let me give you a 'solution' that will not work<sup>5</sup>:

```
\lhead{Continued}
\rfoot{Continued on next page\ldots}
Some text that may or may not cross a page
boundary...
\lhead{}
\rfoot{}
```

<sup>4</sup>If you have a recent version of the `ifthen` package the tricks are not necessary. You can then test the `\pageref{LastPage}` directly.

<sup>5</sup>Actually there is another way but it requires two L<sup>A</sup>T<sub>E</sub>X passes: you can put `\label` commands before and after the text and compare the `\pagerefs`.

```

% extramarks.sty
\def\@leftmark#1#2#3#4{#1}
\def\@rightmark#1#2#3#4{#2}

\def\markboth#1#2{{\def\protect{\noexpand\protect\noexpand}
\let\label\relax \let\index\relax \let\glossary\relax
\expandafter\@markboth\@themark{#1}{#2}
\mark{\@themark}}\if@nbreak\ifvmode\nobreak\fi\fi}
\def\markright#1{{\def\protect{\noexpand\protect\noexpand}
\let\label\relax \let\index\relax \let\glossary\relax
\expandafter\@markright\@themark
{#1}\mark{\@themark}}\if@nbreak\ifvmode\nobreak\fi\fi}
\def\@markright#1#2#3#4#5{\gdef\@themark{#1}{#5}{#3}{#4}}
\def\@markboth#1#2#3#4#5#6{\gdef\@themark{#5}{#6}{#3}{#4}}
\def\leftmark{\expandafter\@leftmark\botmark{}}{}{}{}
\def\rightmark{\expandafter\@rightmark\firstmark{}}{}{}{}

\def\@themark{{}{}{}{}}

\def\extramarks#1#2{{\def\protect{\noexpand\protect\noexpand}
\let\label\relax \let\index\relax \let\glossary\relax
\expandafter\@markextra\@themark{#1}{#2}
\mark{\@themark}}\if@nbreak\ifvmode\nobreak\fi\fi}
\def\@markextra#1#2#3#4#5#6{\gdef\@themark{#1}{#2}{#5}{#6}}
\def\firstxmark{\expandafter\@firstxmark\firstmark{}}{}{}{}
\def\topxmark{\expandafter\@firstxmark\topmark{}}{}{}{}
\def\lastxmark{\expandafter\@lastxmark\botmark{}}{}{}{}
\def\@firstxmark#1#2#3#4{#3}
\def\@lastxmark#1#2#3#4{#4}

```

Figure 3: Package for extra marks in L<sup>A</sup>T<sub>E</sub>X

You may be tempted to think that the first `\lhead` and `\rfoot` will be in effect when T<sub>E</sub>X breaks the page in the middle of the text, and the last ones when the page breaks after the text. This is not true as the whole paragraph (including the last definitions) will be processed before T<sub>E</sub>X considers the page break, so at the time of the page break the last definitions are effective. Putting a paragraph boundary between the text and the last definitions will not work either, because you don't want the first definitions to be in effect when T<sub>E</sub>X decides to break the page exactly at this boundary. Actually the marks mechanism was invented to get rid of these kinds of problems.

In the above example the text 'Continued' appears in the page header. It may be nicer to put it in the top of the margin. This can be easily accomplished by positioning it at a fixed place relative to the page header. In plain T<sub>E</sub>X you would use a concoction of `\hbox` to 0pt, `\vbox` to 0pt, `\hskip`, `\vskip`, `\hss` and `\vss` but fortunately L<sup>A</sup>T<sub>E</sub>X's `picture` environment gives a much cleaner way to do this. In order not to disturb the normal header layout we put the text in a zero-sized `picture`. Actually this is the best way to position things on fixed places on the page. See also section 16 for another example of this technique. You can then also use the normal headings.

```

\setlength{\unitlength}{\baselineskip}
\lhead{\begin{picture}(0,0)
\put(-2,-3){\makebox(0,0)[r]{\firstxmark}}
\end{picture}\leftmark}

```

This solution can of course also be used for the footer. Be sure to put the `picture` first in left-hand side entries and last in right-hand side ones.

Finally you may want to put '(Continued. . .)' in the *text* rather than in the header or the margin. Then you have to use the `afterpage` package. We also decide to make a separate environment for it.

```

\newenvironment{continued}{\par
\extramarks{}{Continued on next page\ldots}
\afterpage{\noindent\firstxmark\vspace{1ex}}
}{\extramarks{(Continued\ldots)}{}}\par

```

It is a bit dangerous to use `\firstxmark` outside the page layout routine, but apparently with `\afterpage` this works. If you would need the information further on in the page you must remember the state of the marks in your own variable. You can do this in one of the fancy headings fields. For example if you want to add something *after* the broken piece of text you can use the following:

```

\newcommand{\mysaved}{}

\newenvironment{continued}{\par
\extramarks{}{Continued on next page\ldots}
}{\extramarks{(Continued\ldots)}{}}%
\par\vspace{1ex}\mysaved}

\lhead{\leftmark}
\chead{\ifthenelse{\equal{\lastxmark}{}}
{\gdef\mysaved{}}
{\gdef\mysaved{\noindent[Continued from
previous page]}}}

```

If you want to include one of the marks in the saved text, you must use `\xdef` rather than `\gdef`.

## 16 Thumb-indexes

Some railroad guides and expensive bibles have so called *thumb-indexes*, i.e. there are marks on the sides of the pages

that indicate where the chapters are. You can create these by printing black blobs in the margin of the pages. The vertical position should be determined by the chapter number or some other counter. As the position is independent of the contents of the page, we print these blobs as part of the header in a zero-sized picture as described in the previous section.

Of course we have to take care of two-sided printing, and we may want to have an index page with all the blobs in the correct position. The solution requires some hand-tuning to get the blobs nicely spaced out vertically. For the application that I had there were 12 sections, so I made the blobs 18 mm apart, i.e. 9 mm blob separated by 9 mm whitespace. In order to avoid calculations they are set in a picture environment with the `\unitlength` set to 18 mm. Page numbers are set in the headers at the outer sides, and the blobs are attached to these. In this example the section numbers are used to position the blobs, but you can replace this with any numeric value. See figure 4 for the code.

---

```

\setlength{\unitlength}{18mm}
\newcommand{\blob}{\rule[-.2\unitlength]{%
                2\unitlength}{.5\unitlength}}

\newcommand{\rblob}{\thepage
  \begin{picture}(0,0)
    \put(1,-\value{section}){\blob}
  \end{picture}}

\newcommand{\lblob}{%
  \begin{picture}(0,0)
    \put(-3,-\value{section}){\blob}
  \end{picture}%
  \thepage}

\pagestyle{fancy}
\cfoot{}

\newcounter{line}
\newcommand{\secname}[1]{\addtocounter{line}{1}%
  \put(1,-\value{line}){\blob}
  \put(-7.5,-\value{line}){\Large \arabic{line}}
  \put(-7,-\value{line}){\Large #1}}

\newcommand{\overview}{\thepage
  \begin{picture}(0,0)
    \secname{Introduction}
    \secname{The first year}
    \secname{Specialisation}
    ...etc...
  \end{picture}}

\begin{document}
\rhead{\overview}\mbox{} \newpage % This
% produces the overview page
\rhead{} % Front matter may follow here
\clearpage
\rhead[\rightmark]{\rblob}%
\lhead[\lblob]{\leftmark}
...

```

---

**Figure 4:** *Thumb-index code*

## 17 Final Remarks

The commands to specify the headers and footers are quite complicated when even- and odd-numbered pages have different layout and we want also to redefine the `plain` page style. Therefore for version 2 of `fancyheadings` I will create an easier user interface (the old commands will still work). To give you the opportunity to comment, here is a preview:

The `*head` and `*foot` commands will be replaced by commands `\fancyhead` and `\fancyfoot`. These will have an optional argument that selects which fields to change, e.g. L for the left field, E for even pages, etc. See figure 5. Selectors can be combined so `\fancyhead[LE,RO]{text}` will define the field for both the left header on even pages and the right header on odd pages.

E	Even page
O	Odd page
L	Left field
C	Center field
R	Right field
T	float at Top
B	float at Bottom
F	Float page

**Figure 5:** *Selectors*

There will also be a new command `\fancypagestyle` that allows you to (re)define page styles. One use for this is to redefine the page style `plain` so the `\fancyplain` stuff is no longer necessary. Another use is to allow special page styles to be used with `thispagestyle` or maybe for float pages.

The complicated example in section 6 will then become:

```

\fancyhead{} % clear all fields
\fancyhead[LE,RO]{\bfseries The performance of
                  new graduates}}

\fancyfoot[LO,CE]{From: K. Grant}
\fancyfoot[RE,CO]{To: Dean A. Smith}
\fancyfoot[RO,LE]{\bfseries \thepage}
\setlength{\headrulewidth}{0.4pt}
\setlength{\footrulewidth}{0.4pt}

\fancypagestyle{plain}{%
  \fancyhead{}
  \fancyfoot[C]{\bfseries \thepage}}

```

As you can see this is much less complicated.

If you want to comment please use e-mail or regular mail to:

Piet van Oostrum  
 Dept. of Computer Science  
 Utrecht University  
 P.O. Box 80.089  
 3508 TB Utrecht, The Netherlands  
 Telephone: +31 30 531806 Telefax: +31 30 513791  
 Internet: piet@cs.ruu.nl