

`ffcode`: L^AT_EX Package for Fixed-Font Code Blocks*

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1 Introduction

This package typesets source code within articles and ensures a tidy, consistent appearance. Following installation from CTAN, the typical usage proceeds as follows (note the `\ff` command and the `ffcode` environment):

<pre>The function <code>fibonacci()</code> is recursive: 1 int fibonacci(int n) { 2 if (n < 2) { 3 return n; 4 } 5 return fibonacci(n-1)+fibonacci(n-2); 6 } Line no. 3 returns <code>n</code> and terminates it.</pre>	<pre>1 \documentclass{article} 2 \usepackage{ffcode} 3 \pagestyle{empty} 4 \begin{document} 5 The function fibonacci() is recursive: 6 \begin{ffcode} 7 int fibonacci(int n) { 8 if (n < 2) { 9 return n; (*@ \label{ln:ret} @*) 10 } 11 return fibonacci(n-1)+fibonacci(n-2); 12 } 13 \end{ffcode} 14 Line no.~\ref{ln:ret} returns \code{n} 15 and terminates it. 16 \end{document}</pre>
--	--

`\ffinput` An `\ffinput` command is also provided, which reads content from a file and inserts it into the document, formatted in precisely the manner that would result from the `ffcode` environment. The `ffsave` environment may be employed beforehand; it behaves as the `ffcode` environment, save that the content is written to a file rather than printed, whence it may subsequently be retrieved by the `\ffinput` command.

2 Package Options

`samepage` The `samepage` package option prevents page breaks inside `ffcode` blocks.

*The sources are in GitHub at [yegor256/ffcode](https://github.com/yegor256/ffcode)

- `noframes` The `noframes` package option omits the light gray frames around `\ff` texts.
- `nobars` The `nobars` package option omits the vertical gray bar at the left side of each snippet.
- `nonumbers` The `nonumbers` package option omits the line numbers.
- `nocn` By default, line numbering is continuous: numbers commence at the first snippet and increment until the end of the document. The `nocn` package option (an abbreviation for “no continuous numbering”) causes the numbering to restart from one in each snippet.
- `tmpfile` Every `ffcode` block is captured verbatim to a scratch file before it is typeset (this is what makes `\ffcolumbreak` possible). The name of that file defaults to `\jobname.ffcode` and may be changed with the `tmpfile` package option, for instance `\usepackage[tmpfile=build/ffcode.tmp]{ffcode}`.
- `bold` The `\ff` fragments may be rendered in a heavier weight than the default, which proves convenient for certain document classes (note the use of the [lmodern](#) package: without it, boldface fails to operate, as explained [here](#)):

Sometimes it's necessary to make code pieces look bolder, like the <code>fibonacci</code> function in this text.	<pre> 4 \usepackage{lmodern} 5 \usepackage[bold,noframes]{ffcode} 6 \begin{document} 7 Sometimes it's necessary to make 8 code pieces look bolder, like 9 the fibonacci function in this text. 10 \end{document} </pre>
--	---

- `sf` The font family of `\ff` fragments may be altered to `\sffamily`:

Sometimes a less strictly fixed-width, more elegant look may be preferred, like the <code>fibonacci</code> here.	<pre> 4 \usepackage[sf,bold,noframes]{ffcode} 5 \begin{document} 6 Sometimes a less strictly fixed-width, 7 more elegant look may be preferred, 8 like the \emph{ fibonacci } here. 9 \end{document} </pre>
--	---

3 Typesetting

The package handles low-height text correctly, for instance a solitary dot: `.`

A pair of vertical bars decorates a TeX command within a snippet. A single vertical bar may be produced by means of “`|\char‘\vert|`”.

The `\ff` command behaves differently in math mode—it adds no grey frames:

$x = \int_{\text{home}}^N f(x).$	<pre> 6 \begin{equation*} 7 x = \int_{\text{home}}^{\ff{N}} f(x). 8 \end{equation*} </pre>
----------------------------------	--

Lines within the `ffcode` environment may be highlighted, and any further configuration parameters from the `listings` package may likewise be supplied:

<pre> 1 while (true) { 2 print("Hi!") 3 print("Enter your 4 name:") 5 scan(x) 6 print("Your name " 7 + x) 8 } </pre>	<pre> 6 \begin{ffcode}[backgroundcolor=\color{gray!20}] 7 while (true) { 8 (*\textcolor{red}{print("Hi!")})@* 9 print("Enter your name:") 10 scan(x) 11 print("Your name " + x) 12 } 13 \end{ffcode} </pre>
--	---

`\ffcolumbreak` A snippet may be split into two or more side-by-side columns by placing `\ffcolumbreak` on a line of its own, wrapped in an escape so that `listings` does not print it. Line numbering runs continuously across the columns, which is handy for a listing too tall for the page. Each further `\ffcolumbreak` adds one more column. By default the columns share the line equally; a column whose longest line does not fit in its equal share is widened just enough to hold it, and the extra space is taken from the columns that have room to spare:

<pre> 1 int fibo(2 int n 3) { 4 if (n < 5 2) { 6 return n; 7 } 8 return fibo(n 9 -1)+fibo(n-2) 10 ; 11 } </pre>	<pre> 6 \begin{ffcode} 7 int fibo(int n) { 8 if (n < 2) { 9 (*\ffcolumbreak @*) 10 return n; 11 } 12 return fibo(n-1)+fibo(n-2); 13 } 14 \end{ffcode} </pre>
---	--

By means of the optional argument of `ffcode`, any other options from the `listings` package may be conveyed to the snippet.

The `\lstset` command of the `listings` package may also be employed to establish defaults for the `ffcode` environment. In contrast to the optional argument, which applies solely to a single snippet, `\lstset` acts globally: every subsequent code listing in the document inherits the new settings, including any further `ffcode` blocks thereafter. To confine the change to a single `ffcode` block, the call should be wrapped within a `\begingroup... \endgroup` pair:

<pre> 1 print("Hi!") </pre>	<pre> 6 \begingroup 7 \lstset{backgroundcolor=\color{yellow!30}} 8 \begin{ffcode} 9 print("Hi!") 10 \end{ffcode} 11 \endgroup 12 \end{document} </pre>
-----------------------------	--

A snippet may be rendered in “condensed” mode, with reduced spacing between letters, by supplying `columns=fixed` together with a narrower `basewidth` from the `listings` package:

<pre> 1 while (true) { 2 print("Enter your name:") 3 scan(x) 4 print("Hello, " + x) 5 } </pre>	<pre> 6 \begin{ffcode}[columns=fixed,basewidth=0.4em] 7 while (true) { 8 print("Enter your name:") 9 scan(x) 10 print("Hello, " + x) 11 } 12 \end{ffcode} </pre>
--	---

4 Implementation

First, we parse package options with the help of [pgfopts](#) package:

```

1 \RequirePackage{pgfopts}
2 \pgfkeys{
3   /ff/.cd,
4   bold/.store in=\ff@bold,
5   sf/.store in=\ff@sf,
6   samepage/.store in=\ff@samepage,
7   noframes/.store in=\ff@noframes,
8   nonumbers/.store in=\ff@nonumbers,
9   nobars/.store in=\ff@nobars,
10  novert/.store in=\ff@novert,
11  nocn/.store in=\ff@nocn,
12  tmpfile/.store in=\ff@file,
13  tmpfile/.default=\jobname.ffcode,
14  tmpfile,
15 }
16 \ProcessPgfPackageOptions{/ff}

```

Then, we include the [xcolor](#) package:

```
17 \RequirePackage{xcolor}
```

Then, we configure the [listings](#) package. The defaults are applied here, at package load, so that a user may override them globally with `\lstset` after `\usepackage{ffcode}`:

```

18 \RequirePackage{listings}
19 \makeatletter
20 % See \href{https://tex.stackexchange.com/questions/706858}{the explanation}:
21 \lst@AddToHook{Init}{\setlength{\lineskip}{0pt}}
22 % \texttt{acmart} warns about the \texttt{\char'\@vspace}
23 % that \texttt{listings} emits around displays;
24 % restore its saved originals during typesetting:
25 \ifdefined\@vspace@orig
26   \lst@AddToHook{DisplayStyle}{%
27     \let\@vspace\@vspace@orig
28     \ifdefined\@vspacer@orig\let\@vspacer\@vspacer@orig\fi}
29 \fi
30 \lstset{breaklines}
31 \lstset{escapeinside={(*@){@*}}
32 \lstset{basicstyle={\ttfamily}}
33 \lstset{columns=fullflexible}
34 \lstset{keepspace=true}
35 \ifdefined\ff@nonumbers\else

```

```

36 \lstset{numbers=left,numbersep=.8em,
37   numberstyle={\tiny\sffamily\color{gray}},
38   xleftmargin=2.5em}
39 \fi
40 \ifdefined\ff@nobars\else
41   \lstset{frame=leftline,framerule=.05em,rulecolor={\color{gray}}}
42 \fi
43 \ifdefined\ff@nocn\else
44   \lstset{firstnumber=last}
45 \fi
46 \makeatother

```

`\ffcolumnbreak` Then, we define the `\ffcolumnbreak` marker and the machinery that splits an `ffcode` block into side-by-side columns. Because `listings` typesets a single line-by-line stream, a block is first captured verbatim to a temporary file; that file is then scanned for `\ffcolumnbreak` markers, which cut it into segments. Each segment is measured before it is printed: it is typeset once into a discarded box, so that `listings` records the width of its longest line in `\lst@maxwidth`, and that width (plus the gutter reserved for line numbers) becomes the natural width of the column. The available width is then shared by a water-filling pass in `\ff@computelevel`: it seeks the common level such that every column narrower than the level takes the level, while a column wider than the level keeps its natural width, and the two together fill `\linewidth`. Thus equal-sized columns split the line evenly, and only a column too wide for its share claims more, at the expense of the columns that have room to spare. When even the natural widths overflow `\linewidth`, the widths are scaled down in proportion to fit. A block without any marker is rendered as one listing, exactly as before:

```

47 \RequirePackage{fancyvrb}
48 \makeatletter
49 \newcommand\ffcolumnbreak{}
50 \edef\ff@cbmarker{\string\ffcolumnbreak}
51 \newread\ff@read
52 \newcount\ff@nlines
53 \newcount\ff@nbreaks
54 \newcount\ff@ncols
55 \newcount\ff@prev
56 \newdimen\ff@colwd
57 \newdimen\ff@sepwd
58 \newdimen\ff@total
59 \newdimen\ff@avail
60 \newdimen\ff@natwd
61 \newdimen\ff@gutter
62 \newdimen\ff@level
63 \newdimen\ff@fixedsum
64 \newcount\ff@fixedcnt
65 \newcount\ff@denom
66 \newcount\ff@prevcnt
67 \newsavebox\ff@mbox
68 \let\ff@grab\relax
69 \lst@AddToHook{Init}{\ff@grab}
70 \def\ff@colsep{\hspace{0.4em}{\color{gray}\vrule width 0.3pt}%
71   \hspace{0.4em}}
72 \def\ff@allother{%

```

```

73 \count@=\z@
74 \loop\catcode\count@=12 \ifnum\count@<255 \advance\count@\@ne\repeat
75 \catcode'\ =10 \endlinechar=-1 }
76 \def\ff@readloop{%
77 \read\ff@read to\ff@line
78 \ifeof\ff@read
79 \let\ff@next\relax
80 \else
81 \global\advance\ff@nlines\@ne
82 \edef\ff@call{\noexpand\in@{\ff@cbmarker}{\ff@line}}\ff@call
83 \ifin@
84 \global\advance\ff@nbreaks\@ne
85 \xdef\ff@segs{\unexpanded\expandafter{\ff@segs}\noexpand\ff@seg
86 {\the\numexpr\ff@prev+\@ne\relax}{\the\numexpr\ff@nlines-\@ne\relax}}%
87 \global\ff@prev=\ff@nlines
88 \fi
89 \let\ff@next\ff@readloop
90 \fi
91 \ff@next}
92 \def\ff@scan{%
93 \global\ff@nlines=\z@ \global\ff@nbreaks=\z@
94 \global\ff@prev=\z@ \gdef\ff@segs{}%
95 \openin\ff@read=\ff@file\relax
96 \begingroup\ff@allother\ff@readloop\endgroup
97 \closein\ff@read
98 \ifnum\ff@nbreaks>\z@
99 \xdef\ff@segs{\unexpanded\expandafter{\ff@segs}\noexpand\ff@seg
100 {\the\numexpr\ff@prev+\@ne\relax}{\the\ff@nlines}}%
101 \fi}
102 \def\ff@measure#1#2{%
103 \setbox\ff@mbox=\vbox{\hfuzz\maxdimen
104 \lstinputlisting[numbers=none,breaklines=false,%
105 firstline=#1,lastline=#2]{\ff@file}}%
106 \ff@natwd=\dimexpr\lst@maxwidth+\ff@gutter\relax
107 \global\advance\ff@total\ff@natwd
108 \xdef\ff@cols{\unexpanded\expandafter{\ff@cols}%
109 \noexpand\ff@col{#1}{#2}{\the\ff@natwd}}
110 \def\ff@onepass{%
111 \global\ff@fixedsum=\z@ \global\ff@fixedcnt=\z@
112 \begingroup
113 \def\ff@col##1##2##3{%
114 \ifdim##3>\ff@level
115 \global\advance\ff@fixedsum##3\relax
116 \global\advance\ff@fixedcnt\@ne
117 \fi}%
118 \ff@cols
119 \endgroup
120 \ifnum\ff@fixedcnt<\ff@ncols
121 \ff@denom=\numexpr\ff@ncols-\ff@fixedcnt\relax
122 \ff@level=\dimexpr(\ff@avail-\ff@fixedsum)/\ff@denom\relax
123 \fi}
124 \def\ff@computelevel{%
125 \ff@level=\dimexpr\ff@avail/\ff@ncols\relax
126 \ff@prevcnt=\z@

```

```

127 \loop
128   \ff@onepass
129 \ifnum\ff@fixedcnt>\ff@prevcnt
130   \ff@prevcnt=\ff@fixedcnt
131 \repeat}
132 \def\ff@col#1#2#3{%
133 \ifnum\ff@prev=\z@\else\ff@colsep\fi
134 \ifdim\ff@total>\ff@avail
135   \ff@colwd=\dimexpr#3*\number\ff@avail/\number\ff@total\relax
136 \else
137   \ifdim#3>\ff@level\ff@colwd=#3\relax\else\ff@colwd=\ff@level\fi
138 \fi
139 \parbox[t]{\ff@colwd}{%
140   \ifdefined\@vspace@orig
141     \let\@vspace\@vspace@orig
142     \ifdefined\@vspacer@orig\let\@vspacer\@vspacer@orig\fi
143   \fi
144   \vspace{0pt}%
145   \lstinputlisting[firstline=#1,lastline=#2]{\ff@file}}%
146 \ff@prev=\@ne}
147 \def\ff@render{%
148 \ff@scan
149 \begingroup
150 \expandafter\lstset\expandafter{\ff@opts}%
151 \ifnum\ff@nbreaks=\z@
152   \lstinputlisting{\ff@file}%
153 \else
154   \ff@ncols=\ff@nbreaks \advance\ff@ncols\@ne
155   \ff@sepwd=0.8em \advance\ff@sepwd0.3pt
156   \ff@avail=\dimexpr\linewidth-\ff@sepwd*\ff@ncols+\ff@sepwd\relax
157   \global\ff@total=\z@ \gdef\ff@cols{%
158     \edef\ff@savendnum{\the\c@lstnumber}%
159     \def\ff@grab{\global\ff@gutter\@totalleftmargin}%
160     \let\ff@seg\ff@measure \ff@segs
161     \let\ff@grab\relax
162     \global\c@lstnumber=\ff@savendnum\relax
163     \ff@computelevel
164     \par\addvspace\topsep
165     \noindent\hbox{\ff@prev=\z@ \ff@cols}%
166     \par\addvspace\topsep
167   \fi
168 \endgroup}
169 \makeatother

```

`ffcode` Then, we (re)define the `ffcode` environment. Its body is written verbatim to the temporary file and handed to `\ff@render`. The optional `[...]` argument is parsed the same way `fancyvrb` does it, by turning the end-of-line active before looking ahead, so that the newline after `\begin{ffcode}` is not swallowed when no options are supplied:

```

170 \makeatletter
171 \newenvironment{ffcode}
172   {\catcode'\^^M=\active
173   \@ifnextchar[\ff@begin{\ff@begin[]}}
174   {\end{VerbatimOut}}%

```

```

175 \ff@render
176 \ifdefined\ff@samepage\endminipage\fi}
177 \def\ff@begin[#1]{%
178 \catcode'\^M=5\relax
179 \def\ff@opts[#1]{%
180 \ifdefined\ff@samepage\noindent\minipage{\linewidth}\fi%
181 \VerbatimEnvironment\begin{VerbatimOut}{\ff@file}}
182 \makeatother

```

`\ffinput` Then, we define the `\ffinput` command:

```

183 \makeatletter
184 \newcommand\ffinput[2][ ]{%
185 \ifdefined\ff@samepage\noindent\minipage{\linewidth}\fi%
186 \lstinputlisting[#1]{#2}%
187 \ifdefined\ff@samepage\endminipage\fi%
188 }
189 \makeatother

```

`\ffsave` Then, we define the `\ffsave` environment. Before opening the output stream, its missing parent directory is created, so that `\begin{\ffsave}[foo/bar.txt]` works even when `foo/` is absent (this needs shell escape enabled):

```

190 \RequirePackage{fancyvrb}
191 \RequirePackage{shellesc}
192 \makeatletter
193 \ExplSyntaxOn
194 \cs_new_protected:cpn { ff@mkdir } #1
195 {
196 \str_set:Nn \l_tmpa_str {#1}
197 \sys_if_platform_windows:TF
198 {
199 \str_replace_all:Nnn \l_tmpa_str { / } { \c_backslash_str }
200 \ShellEscape { if-not-exist~"\l_tmpa_str"~mkdir~"\l_tmpa_str" }
201 }
202 { \ShellEscape { mkdir~-p~"\l_tmpa_str" } }
203 }
204 \ExplSyntaxOff
205 \newenvironment{\ffsave}[1][\ffsave.txt]
206 {\filename@parse{#1}%
207 \ifx\filename@area@empty\else
208 \expandafter\ff@mkdir\expandafter{\filename@area}%
209 \fi
210 \VerbatimEnvironment\begin{VerbatimOut}{#1}}
211 {\end{VerbatimOut}}
212 \makeatother

```

`\ff@print` Then, we define a supplementary macro `\ff@print`:

```

213 \makeatletter
214 \newcommand\ff@print[1]{%
215 \textnormal{%
216 \ifdefined\ff@sf\sffamily\else\ttfamily\fi%
217 \ifdefined\ff@bold\fontseries{b}\selectfont\fi%
218 #1%
219 }%
220 }

```

```
221 \makeatother
```

`\ff@rule` Then, we define a supplementary command `\ff@rule`:

```
222 \makeatletter\newcommand\ff@rule
223   {\vrule height 0.6em depth 0.1em width 0em}
224 \makeatother
```

`\ff@box` Then, we use `tcolorbox` to define the `\ff@box` command for a gray box around a verbatim text block:

```
225 \makeatletter
226 \ifdefined\ff@noframes\else
227   \RequirePackage{tcolorbox}
228   \newtcbbox\ff@box{nobeforeafter,colframe=gray!80!white,
229     colback=gray!5!white,boxrule=0.01em,arc=0.1em,
230     boxsep=0.12em,left=0.05em,right=0.05em,top=0.02em,bottom=0.02em,
231     tcbbox raise base}
232 \fi
233 \makeatother
```

`\ff@x` Then, we define the internal `\ff@x` command for printing a piece of fixed-width-font text:

```
234 \makeatletter
235 \NewDocumentCommand\ff@x{v}{\ff{#1}}
236 \makeatother
```

`\ff` Then, we define `\ff` macro:

```
237 \makeatletter
238 \newcommand\ff[1]{%
239   \ifdefined\ff@noframes%
240     \ff@rule\ff@print{#1}%
241   \else%
242     \relax\ifmmode%
243       \ff@rule\ff@print{#1}%
244     \else%
245       \ff@box{\ff@rule\ff@print{#1}}%
246     \fi%
247   \fi%
248 }
249 \makeatother
```

`novert` Finally, we let vertical bars work similarly to `\ff`, as suggested [here](#) and [here](#) (unless the `novert` package option is used):

```
250 \makeatletter\ifdefined\ff@novert\else
251   \catcode'\|active
252   \AtBeginDocument{\catcode'\|active\protected\def|\ff@x|}
253   \catcode'\|12%
254   \fi\makeatother
```

```
255 \endinput
```

Change History

v0.1.0		<code>\ffcolumbreak</code> : Columns split by
General: Initial version	4	<code>\ffcolumbreak</code> are now sized
v0.10.0		by the longest line in each,
General: Package option <code>samepage</code>		instead of splitting <code>\linewidth</code>
added, to prevent each <code>ffcode</code>		evenly.
block from breaking across		Restore the original <code>\@vspace</code>
pages.	4	inside every <code>\ffcolumbreak</code>
<code>ffinput</code> : The <code>\ffinput</code> command		column, so <code>acmart</code> no longer
added.	8	warns about the top-alignment
v0.10.2		strut in each column box.
General: We started to use		The <code>\ffcolumbreak</code> marker
<code>keepspace</code> s in order to		added, to split an <code>ffcode</code> block
guarantee correct visual		into two or more side-by-side
rendering of multi-spaced		columns.
content.	4	v0.15.0
v0.11.0		<code>\ffcolumbreak</code> : Columns split by
<code>ffsave</code> : The <code>ffsave</code> environment		<code>\ffcolumbreak</code> now share the
added.	8	line equally by default,
v0.11.1		widening only a column that
General: Reserve <code>xleftmargin</code> for		does not fit its equal share.
line numbers so they sit inside		v0.2.0
the column instead of		General: Package options
protruding into the page		<code>nonumbers</code> and <code>noframes</code>
margin.	4	added.
v0.12.0	
General: Static <code>\lstset</code> defaults		v0.3.0
moved from the		General: Package option <code>nocn</code>
per-environment hook to the		added.
preamble, so that user-supplied	
<code>\lstset</code> calls are no longer		v0.4.0
overwritten on every <code>ffcode</code>		General: Package option <code>nobars</code>
usage.	4	added.
<code>ffinput</code> : Stopped <code>\ffinput</code>	
options from leaking into later		v0.5.1
listings.	8	<code>\ff@print</code> : Now, the command <code>ff</code>
v0.12.1		ignores italic and bold and
<code>ffsave</code> : The <code>ffsave</code> environment		always prints <code>\texttt</code> as it
now creates the missing parent		should be.
directory of its target file.	8	v0.6.0
v0.12.2		General: Package option <code>novert</code>
General: Restore the original		added, to disable the
<code>\@vspace</code> inside listings, so		redefinition of the vertical bar.
<code>acmart</code> no longer warns about		We use <code>pgfopts</code> instead of
the vertical spacing that		<code>xkeyval</code>
<code>listings</code> emits around every		v0.7.0
block.	4	General: Package option <code>bold</code>
v0.13.0		added, to make all <code>\ff</code> pieces
General: Package option <code>tmpfile</code>		look bolder than usual.
added, to configure the scratch		Package option <code>sf</code> added, to
file used to capture <code>ffcode</code>		print all <code>\ff</code> pieces with
bodies.	4	<code>\sffamily</code>
		v0.8.0
		<code>\ff</code> : The <code>\ff</code> command is now a
		normal command, not

verbatim.	9	package.	4
v0.9.0		v0.9.2	
General: The <code>minted</code> package is replaced by the <code>listings</code>		General: All lengths and sizes are in "em" instead of "pt".	4

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