

# Fit graphics on a page<sup>\*†</sup>

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## Abstract

The *fitbox* package allows a box (usually an `\includegraphics` box) to fit on the page. It scales the box to the maximal allowed size within the user-set limits. If there there is not enough space on the page, the box is moved to the next one.

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# 1 Introduction

How often one puts a picture on a page only to see that L<sup>A</sup>T<sub>E</sub>X decides to move it to the next one because there is not enough space—while shaving a millimeter off the height would make the difference? This package is intended to alleviate this difference. It uses several strategies to fit a picture on the page, and only if they fail, the picture is moved to the next one.

## 2 User Guide

### 2.1 Installation

The installation of the class follows the usual practice [1] for L<sup>A</sup>T<sub>E</sub>X packages:

1. Run `latex` on `fitbox.ins`. This will produce the file `fitbox.sty`.
2. Put the file `fitbox.sty` to the place where L<sup>A</sup>T<sub>E</sub>X can find it (see [1] or the documentation for your T<sub>E</sub>X system).
3. Update the database of file names. Again, see [1] or the documentation for your T<sub>E</sub>X system for the system-specific details.
4. The file `fitbox.pdf` provides the documentation for the package

As an alternative to items 2 and 3 you can just put the files in the working directory where your `.tex` file is.

### 2.2 Usage

To use the package, add to the preamble of your document

```
\usepackage{fitbox}
```

`\fitbox` The main command of the package is `\fitbox[options]{stuff}`. The `{stuff}` will be typeset in a box according to the [*options*]. In most cases `{stuff}` is an `\includegraphics` command, but anything that fits into an LR-box can be typeset in this way.

The `{stuff}` is typeset in a box, and then the box is put on the page according to the following algorithm:

1. T<sub>E</sub>X starts a new paragraph.
2. The box is scaled up to the maximal dimensions specified by the user (while keeping the aspect ratio).
3. If there is not enough space on the page to fit the box, the latter is scaled down as necessary, but no smaller than the minimal dimensions specified by the user.

4. If there is still not enough space,  $\TeX$  tries to enlarge the page up to the specified limit.
5. If this also fails,  $\TeX$  starts a new page and fits the box there.

`\fitbox*` The starred version `\fitbox*` is intended to be used inside floats, where page length is not well defined. This command uses only the first two steps of the algorithm above, scaling the box up to the maximal dimensions provided by the user.

`\fitboxset` The options can be set individually for each `\fitbox` command, or globally using the command `\fitboxset`, for example,

```
\fitboxset{maxwidth=\textwidth, minwidth=\fitboxnatwidth}
```

`\fitboxnatwidth` `\fitboxnatheight` The options of the package use key-value interface. Often the values are dimensions; in these cases the special dimensions `\fitboxnatwidth` and `\fitboxnatheight` can be used; they are equal to natural dimensions of the box. Note that `height` and `\fitboxnatheight` are actually *total heights*, including both height and depth of the corresponding boxes. For example,

```
\fitboxset{minheight=0.5\fitboxnatheight}
```

means that the box cannot be scaled down more than 50%.

The following options are recognized by the `\fitbox` command:

**maxheight:** The maximal total height of the box. By default `\textheight`.

**maxwidth:** The maximal width of the box. By default the size of the current box to be constructed.

**minheight:** The minimal height of the box. By default `\fitboxnatheight`.

**minwidth:** The minimal width of the box. By default `\fitboxnatwidth`.

**belowboxspace:** The height of the space that must be left below the box (e.g. for a caption). By default zero.

**maxenlargepage:** The maximal amount to add to the current page. By default zero.

`\SetFitboxLayout` Since version 1.02 the package added the functionality of *FigSize* package [2]. The latter has a handy command `\SetFigLayout`, which can be used to scale all figures on a page. This package uses the command `\SetFitboxLayout` that somewhat mimics `\SetFigLayout`. The macro has the arguments `\SetFitboxLayout` [(keys)] {(rows)} {(column)} and helps to scale the boxes into a grid. However, unlike *FigSize* package, we do not redefine `\includegraphics` command: you should use `\fitbox` for your graphics. The command `\SetFitboxLayout` is just `\fitboxset` with special values of the parameters. These commands can be mixed, with the latest command overriding the previous ones.

The following keys are recognized by the `\SetFitboxLayout` command:

**colsep:** the distance between the columns; by default the size of `\quad`.

**colsepexpr:** if set, the width of the expression becomes `colsep`. For example, `colsepexpr=\quad` makes separation between the columns the size of `\quad`.

**maincapheight:** The height of the main caption. By default, `\abovecaptionskip + \belowcaptionskip + n\baselineskip` where  $n$  is the expected number of lines in the main caption (by default 1).

**maincaplines:** The number of lines in the main caption. By default 1.

**subcapheight:** The height of the subcaption. By default, `\abovecaptionskip + \belowcaptionskip + m\baselineskip` where  $m$  is the expected number of lines in the subcaptions (by default 0).

**subcaplines:** The number of lines in the subcaptions. By default 0.

### 3 Implementation

1 *(\*style)*

#### 3.1 Setting up parameters

`\fitboxnatheight` The total height of the box  
2 `\newdimen\fitboxnatheight`

`\fitboxnatwidth` The total width of the box  
3 `\newdimen\fitboxnatwidth`

We use `xkeyval` interface:

```
4 \RequirePackage{xkeyval}
5 \define@cmdkeys{FTBX}{maxheight, minheight, maxwidth, minwidth,
6 belowboxspace, maxenlargepage, colsep, maincapheight,
7 subcapheight}
```

Setting some keys changes other keys

```
8 \define@key{FTBX}{colsepexpr}{%
9 \setbox\@tempboxa=\hbox{#1}%
10 \edef\cmdKV@FTBX@colsep{\wd\@tempboxa}}
11 \define@key{FTBX}{maincaplines}{%
12 \@tempdima=\z@
13 \advance\@tempdima by #1\baselineskip\relax
14 \ifnum#1>0\relax
15 \advance\@tempdima by \parskip
16 \fi
17 \advance\@tempdima by \abovecaptionskip
18 \advance\@tempdima by \belowcaptionskip
19 \edef\cmdKV@FTBX@maincapheight{\the\@tempdima}}
20 \define@key{FTBX}{subcaplines}{%
21 \@tempdima=\z@
22 \advance\@tempdima by #1\baselineskip\relax
23 \ifnum#1>0\relax
24 \advance\@tempdima by \parskip
25 \fi
26 \advance\@tempdima by \abovecaptionskip
27 \advance\@tempdima by \belowcaptionskip
28 \edef\cmdKV@FTBX@subcapheight{\the\@tempdima}}
```

`\fitboxset` Setting everything  
29 `\def\fitboxset#1{\setkeys{FTBX}{#1}}`

The defaults

```
30 \fitboxset{maxheight=\textheight, minheight=\fitboxnatheight,
31 maxwidth=\hsize, minwidth=\fitboxnatwidth,
32 belowboxspace=0pt, maxenlargepage=0pt, colsepexpr={aaa},
33 maincaplines=1, subcaplines=0}
```

### 3.2 Main command

<code>\FTBX@box</code>	The box which will held the stuff to be typeset 34 <code>\newbox\FTBX@box</code>
<code>\FTBX@desired@maxheight</code>	The desired maximal height 35 <code>\newdimen\FTBX@desired@maxheight</code>
<code>\FTBX@desired@minheight</code>	The desired minimal height 36 <code>\newdimen\FTBX@desired@minheight</code>
<code>\FTBX@available@height</code>	The desired available height 37 <code>\newdimen\FTBX@available@height</code>
<code>\fitbox</code>	The main command 38 <code>\def\fitbox{\@ifstar\@fitbox\@fitbox}</code>
<code>\@fitbox</code>	The main command—“normal” version 39 <code>\newcommand\@fitbox[2][\noindent</code> 40 <code>\fitboxset{#1}%</code> 41 <code>\setbox\FTBX@box=\hbox{#2}%</code> 42 <code>\fitboxnatwidth=\wd\FTBX@box\relax</code> 43 <code>\fitboxnatheight=\ht\FTBX@box\relax</code> 44 <code>\advance\fitboxnatheight by \dp\FTBX@box\relax</code> 45 <code>% Checking the sizes</code> 46 <code>\expandafter\ifdim\cmdKV@FTBX@minwidth&gt;\columnwidth\relax</code> 47 <code>\PackageWarning{fitbox}{Minimal width is too large. Consider</code> 48 <code>changing it to \the\hsize}%</code> 49 <code>\fi</code> 50 <code>\expandafter\ifdim\cmdKV@FTBX@maxwidth&gt;\hsize\relax</code> 51 <code>\PackageWarning{fitbox}{Desired width is too large. Consider</code> 52 <code>changing it to \the\hsize}%</code> 53 <code>\fi</code> 54 <code>\expandafter\ifdim\cmdKV@FTBX@minheight&gt;\textheight\relax</code> 55 <code>\PackageWarning{fitbox}{Minimal height is too large.</code> 56 <code>Consider changing it to \the\textheight}%</code> 57 <code>\fi</code> 58 <code>\expandafter\ifdim\cmdKV@FTBX@maxheight&gt;\textheight\relax</code> 59 <code>\PackageWarning{fitbox}{Desired height is too large.</code> 60 <code>Consider changing it to \the\textheight}%</code> 61 <code>\fi</code> 62 <code>% Calculating the minimal and maximal height</code> 63 <code>\Gscale@div{\@FTBX@tempa}{\cmdKV@FTBX@maxwidth}{\fitboxnatwidth}%</code> 64 <code>\FTBX@desired@maxheight=\@FTBX@tempa\fitboxnatheight\relax</code> 65 <code>\expandafter\ifdim\cmdKV@FTBX@maxheight&lt;\FTBX@desired@maxheight\relax</code> 66 <code>\expandafter\FTBX@desired@maxheight=\cmdKV@FTBX@maxheight\relax</code> 67 <code>\fi</code> 68 <code>\Gscale@div{\@FTBX@tempa}{\cmdKV@FTBX@minwidth}{\fitboxnatwidth}%</code> 69 <code>\FTBX@desired@minheight=\@FTBX@tempa\fitboxnatheight\relax</code>

```

70 \expandafter\ifdim\cmdKV@FTBX@minheight>\FTBX@desired@minheight\relax
71   \expandafter\FTBX@desired@minheight=\cmdKV@FTBX@minheight\relax
72 \fi
73 \ifdim\FTBX@desired@minheight>\FTBX@desired@maxheight\relax
74   \PackageWarning{fitbox}{Desired min scale exceeds desired max
75     scale.}%
76 \fi
77 \FTBX@available@height=\pagegoal\relax
78 \ifdim\FTBX@available@height>\vsize\relax
79   \FTBX@available@height=\vsize
80 \fi
81 \advance\FTBX@available@height by -\pagetotal\relax
82 \advance\FTBX@available@height by -\cmdKV@FTBX@belowboxspace\relax
83 \advance\FTBX@available@height by -\baselineskip\relax
84 \ifdim\FTBX@desired@maxheight>\FTBX@available@height\relax
85   \ifdim\FTBX@available@height<\FTBX@desired@minheight\relax
86     \tempdima=\FTBX@desired@minheight\relax
87     \advance\tempdima by
88     -\FTBX@available@height\relax
89     \expandafter\ifdim\cmdKV@FTBX@maxenlargepage<\tempdima\relax
90       \newpage
91       \resizebox*{!}{\FTBX@desired@maxheight}{\box\FTBX@box}%
92     \else
93       \enlargethispage{\tempdima}%
94       \resizebox*{!}{\FTBX@desired@minheight}{\box\FTBX@box}%
95     \fi
96   \else
97     \resizebox*{!}{\FTBX@available@height}{\box\FTBX@box}%
98   \fi
99 \else
100   \resizebox*{!}{\FTBX@desired@maxheight}{\box\FTBX@box}%
101 \fi
102 }

```

`\@@fitbox` The main command—“starred” version. Simplified computations.

```

103 \newcommand\@@fitbox[2] []{\noindent
104   \fitboxset{#1}%
105   \setbox\FTBX@box=\hbox{#2}%
106   \fitboxnatwidth=\wd\FTBX@box\relax
107   \fitboxnatheight=\ht\FTBX@box\relax
108   \advance\fitboxnatheight by \dp\FTBX@box\relax
109   % Checking the sizes
110   \expandafter\ifdim\cmdKV@FTBX@minwidth>\columnwidth\relax
111     \PackageWarning{fitbox}{Minimal width is too large. Consider
112       changing it to \the\hsize}%
113   \fi
114   \expandafter\ifdim\cmdKV@FTBX@maxwidth>\hsize\relax
115     \PackageWarning{fitbox}{Desired width is too large. Consider
116       changing it to \the\hsize}%
117   \fi

```

```

118 \expandafter\ifdim\cmdKV@FTBX@minheight>\textheight\relax
119   \PackageWarning{fitbox}{Minimal height is too large.
120     Consider changing it to \the\textheight}%
121 \fi
122 \expandafter\ifdim\cmdKV@FTBX@maxheight>\textheight\relax
123   \PackageWarning{fitbox}{Desired height is too large.
124     Consider changing it to \the\textheight}%
125 \fi
126 % Calculating the minimal and maximal height
127 \Gscale@div{\@FTBX@tempa}{\cmdKV@FTBX@maxwidth}{\fitboxnatwidth}%
128 \FTBX@desired@maxheight=\@FTBX@tempa\fitboxnatheight\relax
129 \expandafter\ifdim\cmdKV@FTBX@maxheight<\FTBX@desired@maxheight\relax
130   \expandafter\FTBX@desired@maxheight=\cmdKV@FTBX@maxheight\relax
131 \fi
132 \Gscale@div{\@FTBX@tempa}{\cmdKV@FTBX@minwidth}{\fitboxnatwidth}%
133 \FTBX@desired@minheight=\@FTBX@tempa\fitboxnatheight\relax
134 \expandafter\ifdim\cmdKV@FTBX@minheight>\FTBX@desired@minheight\relax
135   \expandafter\FTBX@desired@minheight=\cmdKV@FTBX@minheight\relax
136 \fi
137 \ifdim\FTBX@desired@minheight>\FTBX@desired@maxheight\relax
138   \PackageWarning{fitbox}{Desired min scale exceeds desired max
139     scale.}%
140 \fi
141 \resizebox*{!}{\FTBX@desired@maxheight}{\box\FTBX@box}%
142 }

```

### 3.3 Multi-figure layout

`\SetFitboxLayout` A macro styles after `\SetFigsizesLayout` of *FigSize* package.

```

143 \newcommand\SetFitboxLayout [3] [] {%
144   \fitboxset{#1}%
145   \@tempdima=\textheight
146   \advance\@tempdima by -\cmdKV@FTBX@maincapheight\relax
147   \divide\@tempdima by #2\relax
148   \advance\@tempdima by -\cmdKV@FTBX@subcapheight\relax
149   \edef\cmdKV@FTBX@maxheight{\the\@tempdima}%
150   \@tempdima=\columnwidth
151   \@tempdimb=\cmdKV@FTBX@colsep\relax
152   \advance\@tempdima by -#3\@tempdimb\relax
153   \advance\@tempdima by \@tempdimb\relax
154   \divide\@tempdima by #3\relax
155   \edef\cmdKV@FTBX@maxwidth{\the\@tempdima}%
156 }
157 </style>

```



## References

- [1] UK T<sub>E</sub>X Users Group. UK list of T<sub>E</sub>X frequently asked questions. <http://www.tex.ac.uk/cgi-bin/texfaq2html>, 2015.
- [2] Anthony A. Tanbakuchi. *The FigSize Package*, March 2002. <https://ctan.org/pkg/figsize>.

## Change History

v1.01		Split into normal and starred version . . . . .	7
	<code>\@@fitbox: Do not force width adjustment . . . . .</code>		7
	<code>\@fitbox: Do not force width adjustment . . . . .</code>		6
	General: Changed maximal width .		5
	New keys for <code>\SetFitboxLayout</code>		5
v1.02		<code>\@fitbox: \noindent</code> instead of <code>\leavevmode</code> (suggested by Frank Mittelbach) . . . . .	7
		<code>\@fitbox: \noindent</code> instead of <code>\leavevmode</code> (suggested by Frank Mittelbach) . . . . .	6
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