Fit graphics on a page*†

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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 LaTeX 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 LaTeX packages:

1. Run latex on `fitbox.ins`. This will produce the file `fitbox.sty`.
2. Put the file `fitbox.sty` to the place where LaTeX can find it (see [1] or the documentation for your TeX system).
3. Update the database of file names. Again, see [1] or the documentation for your TeX 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. TeX 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 neccessary, 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 alogithm 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

```
⟨*style⟩
```

3.1 Setting up parameters

`\fitboxnatheight` The total height of the box

```
\newdimen\fitboxnatheight
```

`\fitboxnatwidth` The total width of the box

```
\newdimen\fitboxnatwidth
```

We use `xkeyval` interface:

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

Setting some keys changes other keys

```
\define@key{FTBX}{colsepexpr}{%
  \setbox\@tempboxa=\hbox{#1}%
  \edef\cmdKV@FTBX@colsep{\wd\@tempboxa}}
\define@key{FTBX}{maincaplines}{%
  \@tempdima=\z@
  \advance\@tempdima by #1\baselineskip\relax
  \ifnum#1>0\relax
     \advance\@tempdima by \parskip
  \fi
  \advance\@tempdima by \abovecaptionskip
  \advance\@tempdima by \belowcaptionskip
  \edef\cmdKV@FTBX@maincapheight{\the\@tempdima}}
\define@key{FTBX}{subcaplines}{%
  \@tempdima=\z@
  \advance\@tempdima by #1\baselineskip\relax
  \ifnum#1>0\relax
     \advance\@tempdima by \parskip
  \fi
  \advance\@tempdima by \abovecaptionskip
  \advance\@tempdima by \belowcaptionskip
  \edef\cmdKV@FTBX@subcapheight{\the\@tempdima}}
```

`\fitboxset` Setting everything

```
\def\fitboxset#1{\setkeys{FTBX}{#1}}
```

The defaults

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

3.2 Main command

`\FTBX@box` The box which will held the stuff to be typeset

```
\newbox\FTBX@box
```

`\FTBX@desired@maxheight` The desired maximal height

```
\newdimen\FTBX@desired@maxheight
```

`\FTBX@desired@minheight` The desired minimal height

```
\newdimen\FTBX@desired@minheight
```

`\FTBX@available@height` The desired available height

```
\newdimen\FTBX@available@height
```

`\fitbox` The main command

```
\def\fitbox{\@ifstar\@@fitbox\@fitbox}
```

`\@fitbox` The main command—"normal" version

```
\newcommand\@fitbox[2][]{\noindent
  \fitboxset{#1}%
  \setbox\FTBX@box=\hbox{#2}%
  \fitboxnatwidth=\wd\FTBX@box\relax
  \fitboxnatheight=\ht\FTBX@box\relax
  \advance\fitboxnatheight by \dp\FTBX@box\relax
  % Checking the sizes
  \expandafter\ifdim\cmdKV@FTBX@minwidth>\columnwidth\relax
      \PackageWarning{fitbox}{Minimal width is too large.  Consider
        changing it to \the\hsize}%
  \fi
  \expandafter\ifdim\cmdKV@FTBX@maxwidth>\hsize\relax
      \PackageWarning{fitbox}{Desired width is too large.  Consider
        changing it to \the\hsize}%
  \fi
  \expandafter\ifdim\cmdKV@FTBX@minheight>\textheight\relax
      \PackageWarning{fitbox}{Minimal height is too large.
        Consider changing it to \the\textheight}%
  \fi
  \expandafter\ifdim\cmdKV@FTBX@maxheight>\textheight\relax
      \PackageWarning{fitbox}{Desired height is too large.
        Consider changing it to \the\textheight}%
  \fi
  % Calculating the minimal and maximal height
  \Gscale@div{\@FTBX@tempa}{\cmdKV@FTBX@maxwidth}{\fitboxnatwidth}%
  \FTBX@desired@maxheight=\@FTBX@tempa\fitboxnatheight\relax
  \expandafter\ifdim\cmdKV@FTBX@maxheight<\FTBX@desired@maxheight\relax
     \expandafter\FTBX@desired@maxheight=\cmdKV@FTBX@maxheight\relax
  \fi
  \Gscale@div{\@FTBX@tempa}{\cmdKV@FTBX@minwidth}{\fitboxnatwidth}%
  \FTBX@desired@minheight=\@FTBX@tempa\fitboxnatheight\relax
```

```
  \expandafter\ifdim\cmdKV@FTBX@minheight>\FTBX@desired@minheight\relax
     \expandafter\FTBX@desired@minheight=\cmdKV@FTBX@minheight\relax
  \fi
  \ifdim\FTBX@desired@minheight>\FTBX@desired@maxheight\relax
      \PackageWarning{fitbox}{Desired min scale exceeds desired max
        scale.}%
  \fi
  \FTBX@available@height=\pagegoal\relax
  \ifdim\FTBX@available@height>\vsize\relax
    \FTBX@available@height=\vsize
  \fi
  \advance\FTBX@available@height by -\pagetotal\relax
  \advance\FTBX@available@height by -\cmdKV@FTBX@belowboxspace\relax
  \advance\FTBX@available@height by -\baselineskip\relax
  \ifdim\FTBX@desired@maxheight>\FTBX@available@height\relax
     \ifdim\FTBX@available@height<\FTBX@desired@minheight\relax
        \@tempdima=\FTBX@desired@minheight\relax
        \advance\@tempdima by
        -\FTBX@available@height\relax
        \expandafter\ifdim\cmdKV@FTBX@maxenlargepage<\@tempdima\relax
          \newpage
          \resizebox*{!}{\FTBX@desired@maxheight}{\box\FTBX@box}%
        \else
          \enlargethispage{\@tempdima}%
          \resizebox*{!}{\FTBX@desired@minheight}{\box\FTBX@box}%
        \fi
      \else
       \resizebox*{!}{\FTBX@available@height}{\box\FTBX@box}%
      \fi
  \else
     \resizebox*{!}{\FTBX@desired@maxheight}{\box\FTBX@box}%
  \fi
}
```

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

```
\newcommand\@@fitbox[2][]{\noindent
  \fitboxset{#1}%
  \setbox\FTBX@box=\hbox{#2}%
  \fitboxnatwidth=\wd\FTBX@box\relax
  \fitboxnatheight=\ht\FTBX@box\relax
  \advance\fitboxnatheight by \dp\FTBX@box\relax
  % Checking the sizes
  \expandafter\ifdim\cmdKV@FTBX@minwidth>\columnwidth\relax
      \PackageWarning{fitbox}{Minimal width is too large.  Consider
        changing it to \the\hsize}%
  \fi
  \expandafter\ifdim\cmdKV@FTBX@maxwidth>\hsize\relax
      \PackageWarning{fitbox}{Desired width is too large.  Consider
        changing it to \the\hsize}%
  \fi
```

```
  \expandafter\ifdim\cmdKV@FTBX@minheight>\textheight\relax
      \PackageWarning{fitbox}{Minimal height is too large.
        Consider changing it to \the\textheight}%
  \fi
  \expandafter\ifdim\cmdKV@FTBX@maxheight>\textheight\relax
      \PackageWarning{fitbox}{Desired height is too large.
        Consider changing it to \the\textheight}%
  \fi
  % Calculating the minimal and maximal height
  \Gscale@div{\@FTBX@tempa}{\cmdKV@FTBX@maxwidth}{\fitboxnatwidth}%
  \FTBX@desired@maxheight=\@FTBX@tempa\fitboxnatheight\relax
  \expandafter\ifdim\cmdKV@FTBX@maxheight<\FTBX@desired@maxheight\relax
     \expandafter\FTBX@desired@maxheight=\cmdKV@FTBX@maxheight\relax
  \fi
  \Gscale@div{\@FTBX@tempa}{\cmdKV@FTBX@minwidth}{\fitboxnatwidth}%
  \FTBX@desired@minheight=\@FTBX@tempa\fitboxnatheight\relax
  \expandafter\ifdim\cmdKV@FTBX@minheight>\FTBX@desired@minheight\relax
     \expandafter\FTBX@desired@minheight=\cmdKV@FTBX@minheight\relax
  \fi
  \ifdim\FTBX@desired@minheight>\FTBX@desired@maxheight\relax
      \PackageWarning{fitbox}{Desired min scale exceeds desired max
        scale.}%
  \fi
  \resizebox*{!}{\FTBX@desired@maxheight}{\box\FTBX@box}%
}
```

3.3 Multi-figure layout

\SetFitboxLayout A macro styles after \SetFigsizeLayout of *FigSize* package.

```
\newcommand\SetFitboxLayout[3][]{%
  \fitboxset{#1}%
  \@tempdima=\textheight
  \advance\@tempdima by -\cmdKV@FTBX@maincapheight\relax
  \divide\@tempdima by #2\relax
  \advance\@tempdima by -\cmdKV@FTBX@subcapheight\relax
  \edef\cmdKV@FTBX@maxheight{\the\@tempdima}%
  \@tempdima=\columnwidth
  \@tempdimb=\cmdKV@FTBX@colsep\relax
  \advance\@tempdima by -#3\@tempdimb\relax
  \advance\@tempdima by \@tempdimb\relax
  \divide\@tempdima by #3\relax
  \edef\cmdKV@FTBX@maxwidth{\the\@tempdima}%
}
```

⟨/style⟩

References

[1] UK TEX Users Group. UK list of TEX 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

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Numbers written in italic refer to the page where the corresponding entry is described; numbers underlined refer to the code line of the definition; numbers in roman refer to the code lines where the entry is used.