

# The pbalance (poor man’s balance) package\*

Nelson Lago  
lago@ime.usp.br

<https://gitlab.com/lago/pbalance>

July 28, 2022

## Abstract

This package tries to *safely* make the columns on the last page of a two-column document have approximately the same height. It should “just work” without user intervention, which is particularly useful for class authors, but also offers the user a command to adjust the height of the columns. There are, however, three caveats:

1. Results are adequate, but often not optimal;
2. In some very rare cases, the package may give up (the document is generated correctly but the last page is not balanced);
3. The package demands additional  $\LaTeX$  passes.

## 1 Introduction

First things first: this package is a **hack**. It is also **beta** quality. However, I believe it is *safe*, i.e., it should not generate incorrect output.

In a two-column document, it is desirable for the columns in the last page to have the same height (the columns should be “balanced”). Two packages (`balance` and `flushend`) try to provide this in  $\LaTeX$ , but both may generate defective output in some circumstances. This package tries to solve this problem.

Balancing is often not possible: imagine a document with an odd number of lines on the last page, or with ten lines of text together with an image that takes the height of fifteen lines of text, or a document where making columns the same height would leave a sectioning command at the bottom of the first column etc. Since such cases happen often, we consider it enough for the columns to be “not too unequal”, even when equal heights might be possible (the algorithm cannot deliver better results and, in fact, striving to make columns exactly the same height with it may sometimes yield poor results, so we do not even try).

---

\*This document corresponds to pbalance v1.4.0, dated 2022/07/28.

## 2 Usage

To use the package, add `\usepackage{pbalance}` to the preamble and things should “just work”. However, the document will take more  $\LaTeX$  passes to compile, and minute changes to it that would normally need one additional  $\LaTeX$  pass will likely demand three. If you load the package with the `draft` option (or pass the `draft` option to the document class), balancing is disabled, alleviating the need for extra passes during document preparation. You may also use `\shrinkLastPage{some-measurement}` to manually define how much shorter the first column of the last page should be instead of letting the package determine the amount and `\balancePageNum{page-number}` to force balancing a specific page (note that this is the *physical* page number). These options, however, will not eliminate the need for extra passes. Finally, you may disable processing by calling `\nopbalance` (useful if a class preloaded the package, for example).

## 3 Troubleshooting and fine tuning

`pbalance` should never generate defective output or cause an error; if it does, please try passing the `safe` option to the package and submit a bug report with a MWE. Other than that, three things may go wrong when using `pbalance`:

1. The final result may be “ugly”;
2. `pbalance` may give up and produce an unbalanced last page;
3. Some other package may prevent `pbalance` from working.

### 3.1 The final result is “ugly”

If you find the results unsatisfactory, there are two things you may try:

- Change the layout: apply `\looseness` to a paragraph, move where floats are defined<sup>1</sup> or change their sizes, etc.;
- Use `\shrinkLastPage` and `\balancePageNum` to manually define the size of the left column and the page to balance.

### 3.2 `pbalance` gave up

This should happen very rarely, but `pbalance` may sometimes generate the warning “Could not balance, doing nothing” (the document is still generated correctly in this case), which means the package algorithm failed to find a suitable solution to do

---

<sup>1</sup>Remember that, in two-column mode, `dblfloats` should be defined before the place you expect them to appear; see the docs for the `stfloats` package.

its thing<sup>2</sup>. This problem is amenable to the same mitigation strategies discussed in the previous section. However, if there are many floats near the end of the document, you should also consider making the L<sup>A</sup>T<sub>E</sub>X float placement parameters (`\topfraction`, `topnumber`, etc.) a little more liberal than the default, for example:

```
\setcounter{totalnumber}{5} % default 3
\setcounter{topnumber}{3} % default 2
\renewcommand{\topfraction}{.85} % default .7
\renewcommand{\textfraction}{.15} % default .2
\renewcommand{\floatpagefraction}{.75} % default .5, must be < \topfraction
```

### 3.3 Patching failed due to another package

If `pbalance` yields the warning “Patching failed, cannot balance; try loading `pbalance` earlier or later”, there is some incompatibility with another package. Since `pbalance` modifies the internal L<sup>A</sup>T<sub>E</sub>X macros `\@outputdblcol`, `\@addtocurcol`, `\@makecol`, and `\@addmarginpar`, there may be problems with other packages that do the same; thankfully, not many packages do. For some of them (such as `stfloats`), `pbalance` includes code to circumvent any problems; for others, your best bet is to change the order in which the packages are loaded (in general, `pbalance` prefers to go last).

### 3.4 Some details you normally do not need to consider

The package actually balances the last *text* page; if the last page is a float page, it is ignored. It also *should* work if you switch to single-column mode mid-document (with `\onecolumn`); it will then balance the last two-column text page. The same should happen in a document that is mainly typeset in one column and you switch to two-column layout (with `\twocolumn`), but *only* if the page to be balanced does *not* contain the `\twocolumn` command (i.e., there are at least two consecutive two-column text pages).

If the last page does not have floats, footnotes, or `marginpars`, the package simply uses `\balance`, from the `balance` package, otherwise it uses its own algorithm. If that fails for some reason, you may add the `safe` option to the package, which makes the code never use (or even load) the `balance` package.

## 4 Other options

There are other approaches to balancing that may be better suited to your needs. Beyond the already mentioned `balance` and `flushend` packages, I am aware of:

---

<sup>2</sup>For example, imagine a document in which page 5 is a float page that happens to be the last one. We will balance page 4, which is the last text page. Balancing page 4 may move a float from the left to the right column, but this may in turn exceed the maximum number of floats in the right column. As a result, one or more floats may be deferred to page 5. At the same time, a float of a different kind from page 5 may be pulled back to the extra space that just opened up in page 4. Depending on the size of this float, the text may no longer fit in page 4, making some text spill onto page 5. This means page 5 is now the last text page and should then be balanced instead of page 4. Oops!

- The `multicol` package, which allows the user to freely switch between one- and multi-column layouts. The only drawback of the package is that it cannot handle ordinary floats, only `dblfloats` (`\begin{figure*}`, `\begin{table*}`);
- The `ltxgrid` package, which allows the user to freely switch between one- and two-column layouts but, differently from `multicol`, works even in the presence of floats. With it, switching from two columns to one balances the previous output (its main disadvantage is that it may have compatibility problems with other packages);
- The `revtex` class, for which `ltxgrid` was developed;
- The `\IEEEtriggeratref{}` macro from the `IEEEtran` class, which allows you to attach arbitrary code (such as `\newpage`) to a specific entry in a bibliography listing;
- The code suggested at <https://tex.stackexchange.com/a/583228/>, similar to the `IEEEtran` approach.

## 5 How does it work

This package works on two fronts:

1. It uses a  $\LaTeX$  pass to gather information: which is the last two-column text page? Does it have floats? Footnotes? How much free space in each column?
2. It uses this information in a subsequent pass to balance that page. If there are no floats or footnotes, it uses the `balance` package, otherwise it uses the measurements collected to shrink the first column (using `\enlargethispage`) by a “reasonable” amount.

If measurements change between passes, either the document was edited or  $\LaTeX$  is still adding crossrefs, citations, etc. In both cases, the previously gathered data is bogus, so we start over. However, the package cannot detect changes that happen between the “collect data” pass and the “balance for the first time” pass: it has to assume that any change at this point is caused by the fact that we started balancing (it can, however, detect whether the last text page changed; if this happens, we give up balancing). If a small change (such as an updated crossref adding or removing a line somewhere) slips through, that is acceptable: we are not aiming at balancing perfectly anyway. However, if the change is big (for example, the addition of the bibliography block after running `bibtex/biber`), results will suffer.

To prevent this, it would be ideal to only start the process after all passes needed to stabilize the document have run. In practice, however, this would be too hard to detect (and demand even more passes). What we do instead is simply wait for two consecutive passes to result in columns of the same size in the last two-column page. When this happens, we proceed to balance in the next pass and assume (quite reasonably) that, as long as the document is not modified, the effect of concurrent changes during that pass in the last page is small, so ignoring it disturbs the balancing only slightly<sup>3</sup>.

---

<sup>3</sup>Like I said on the introduction: this package is a hack.

## 6 TODO / wish list

Some useful stuff we should consider implementing:

- make the mechanism able to work with any page, not just the last, and with more than one page at once. This is useful for the last page of each chapter of a two-column book, for example;
- on top of that:
  1. create command to manually indicate the page numbers to balance
  2. create command similar to `\balance` from the `balance` package
  3. allow user to set manual balancing for each page independently

## Change History

v1.0	General: Initial version . . . . . 1	v1.2.1	General: Better error handling . . . . . 1
v1.0.1	General: Improvements to documentation . . . . . 1	v1.3.0	General: Compatibility with <code>stfloats</code> pkg . . . . . 1
v1.1.0	General: Do not crash in one-column mode . . . . . 1	v1.4.0	General: Add alternatives and troubleshooting sections to the docs . . . . . 1
v1.1.1	General: Do not use <code>balance</code> package if there are <code>dbltop</code> floats . . . . . 1		Compatibility with <code>memoir</code> , <code>footmisc</code> , <code>ftnright</code> , <code>flafter</code> , <code>fnpos</code> , <code>midfloat</code> , and <code>cuted</code> . . . . . 1
v1.2.0	General: Add “safe” option . . . . . 1		Create <code>\balancePageNum</code> and <code>\nopbalance</code> commands . . . . . 1
	Compatibility with <code>lineno</code> pkg . . . 1		Fix bug when switching single/double cols . . . . . 1
	Do not use <code>balance</code> pkg with <code>lineno</code> . . . . . 1		Fix bug: detect float pages correctly . . . 1
	Improvements to <code>latexmk</code> file . . . . 1		
	More logging and sanity checks . . . 1		