

The figureSeries package*

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July 14, 2015

Abstract

This package provides a first working version of a figure*-like construct, which can contain arbitrarily many sub-figures, (somewhat) float, and automatically break over multiple pages if necessary. The most current source code of this package can be found online at <http://github.com/thomasWeise/figureSeries>. Some discussions and additional information may be found at <http://www.it-weise.de>.

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*This document corresponds to figureSeries v0.9.4, dated 2015/07/13.

1 Introduction

1.1 Addressed Problem and Use Case

L^AT_EX documents can contain floating objects such as figures or tables. “floating” here means that you insert a figure somewhere in your text and L^AT_EX will find the best place where to put it for you, a place where it fits nicely into the overall layout of the document. Sometimes it is desirable that a figure contains several sub-figures. Let’s say you want to group several diagrams which show related information and which all have the same structure.

In L^AT_EX, a floating object (composed of its contents and potentially a caption) can occupy at most one full page, meaning that it cannot contain any page break. This, in turn, means that the number of (or better the space for) sub-figures that can be hosted inside a figure is limited as well. But what if we have too many sub-figures? What if the sub-figures do not fit on one page, into one floating object, into one `\begin{figure}... \end{figure}`? (Again: The required space includes the space for the sub-figures themselves, their captions, the vertical space between rows of sub-figures, and the caption of the hosting figure.)

We can somewhat solve this issue by splitting the hosting figure into several separate figures, each containing a feasible amount of sub-figures. This needs to be done by hand, because we need to compile the document and fix and compile and fix and so on, since we usually not know beforehand how many sub-figures fit into one figure. This is not nice.

Problems may occur when our L^AT_EX document is created automatically and has an *a priori* unknown number of sub-figures in a figure. There is no way to automatically determine how many sub-figures we can place into a figure. Even if we would know the sub-figure sizes, we cannot compute the space occupied by their captions beforehand (well, without replicating L^AT_EX, that is...). Trust me, I have tried this (in the software project *TSPSuite* [1]). Similar use cases have been reported in [2, 3].

Also, L^AT_EX is limited in terms of the number of floating objects it can handle, I believe the limit is 18 and can be increased using the package `morefloats` [4], but this is a true problem when creating many sub-figures automatically. You may have so many sub-figures that splitting them into multiple (hosting) figures leads to too many (hosting) figures. Or you just end up with too many floating objects which are all laid out at once at the end of a chapter or something or which otherwise make your text layout look odd and unbalanced.

1.2 Provided Functionality

This package provides

1. a facility to include an arbitrary number of (potentially differently-sized) sub-figures into a figure*-like construct,
2. the ability to make this figure*-like construct look as if it was a floating object, which

3. works well in both one-column and two-column documents.

2 Usage

2.1 Loading the Package

Load this package using

```
\RequirePackage{figureSeries}
```

This will automatically load the packages `caption` [5], `subcaption` [6], `afterpage` [7], and `cuted` [8].

2.2 Provided Macros

Here we discuss the macros that can directly be accessed by the user to make use of the package's functionality. The implementation of these macros is given in Section 3.2 and several examples can be found in Section 2.3.

\figureSeriesElement The macro `\figureSeriesElement{<caption>}{<contents>}` inserts an element of the figure series, i.e., one sub-figure. Its first argument is the caption of the element and may contain a `\label`. The second argument is the graphic to print. It could, e.g., be a call to `\includegraphic` from the `graphicx` package [9].

\figureSeriesRow `\figureSeriesElement{<contents>}` inserts a new row of elements (sub-figures) into the figure series. Its single argument should thus contain a sequence of `\figureSeriesElements`. As a consequence of this architecture, each sub-figure belongs to one row and no sub-figure can span multiple rows.

\figureSeriesHere The macro `\figureSeriesHere{<caption>}{<contents>}` tries to insert a (non-floating) figure series at the current position in the document. This means that it may begin wherever, well, it is used, e.g., in the middle of the page.

The macro has two mandatory parameters, the caption and the contents. The caption will be put at the beginning of the figure series, which is different from the normal behavior of captions in `\begin{figure*}...\end{figure*}` or `\begin{figure}...\end{figure}`. The reason is that a figure series may span over multiple pages and having the caption at the end may be awkward and confusing. The caption text may contain a `\label`.

The contents of a figure series should be a sequence of `\figureSeriesRow` calls.

Since figure series are page-wide elements, starting them in the middle of the page only works in one-column documents. In two-column documents, any figure series will behave as specified in macro `\figureSeriesFloat` below.

\figureSeriesFloat The macro `\figureSeriesFloat{<caption>}{<contents>}` macro takes the same parameters as `\figureSeriesHere`, but has a float-like behavior. By using the `\afterpage` command of `afterpage` package [7], we let it start at the following page. This is different from L^AT_EX' normal floating behavior, but as good as we can get with page-breaking objects, I think.

2.3 Examples

Here we provide a set of examples for the use of the package. Each example demonstrates another facet of the package and, at the same time, serves as test case. Instead of using `\includegraphic`, we simply stretch single letters via `\resizebox` and use them “sub-figures”. This is good enough to see how the layout works and allows us to generate arbitrarily-sized placeholders for figures.

In order to create some placeholder text in the examples, we use the `lipsum` command from package `lipsum` [10], which prints pseudo-Latin text known as “Lorem Ipsum” (see http://en.wikipedia.org/wiki/Lorem_ipsum).

2.3.1 Non-Floating Figure Series in Single-Column Document

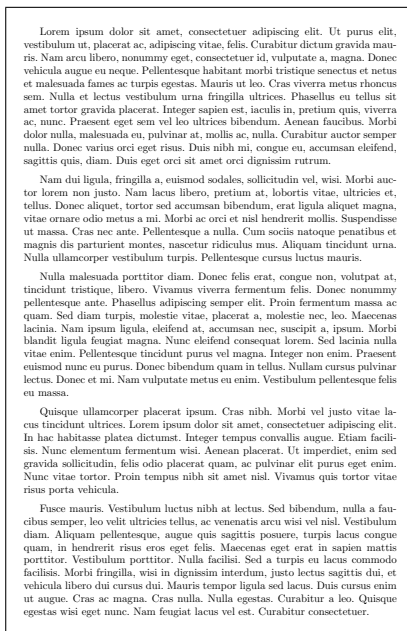
In Example 1 we place a non-floating figure series consisting of two rows of figures into a one-column document using Springer’s document class `llncs` [11]. The result can be seen in Figure 1 and compared with a floating version in Figure 7, which represents the floating version of this example (given in Example 7).

Example 1 An example using the one-column `llncs` class, rendered as Figure 1.

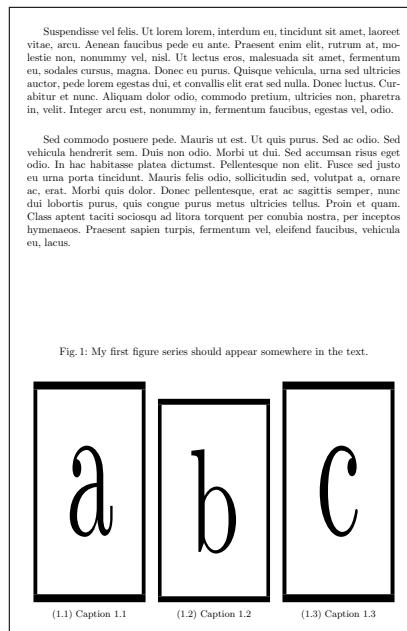
```
\documentclass{llncs}%
\RequirePackage{graphicx}%
\RequirePackage{lipsum}%
\RequirePackage{figureSeries}%
\begin{document}%
\lipsum%
\figureSeriesHere{%
My first figure series should appear somewhere in the text.%
}%
\figureSeriesRow{%
\figureSeriesElement{Caption 1.1}{\resizebox{0.3\linewidth}{5cm}{\fbox{a}}}%
\figureSeriesElement{Caption 1.2}{\resizebox{0.3\linewidth}{5cm}{\fbox{b}}}%
\figureSeriesElement{Caption 1.3}{\resizebox{0.3\linewidth}{5cm}{\fbox{c}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 1.4}{\resizebox{0.3\linewidth}{5cm}{\fbox{d}}}%
\figureSeriesElement{Caption 1.5}{\resizebox{0.3\linewidth}{5cm}{\fbox{e}}}%
\figureSeriesElement{Caption 1.6}{\resizebox{0.3\linewidth}{5cm}{\fbox{f}}}%
}%
\lipsum%
\end{document}%
```

2.3.2 Floating Figure Series in Two-Column Document

We now put a floating figure series into a two-column document using the `IEEEtran` [12] class in Example 2. This new figure series has five rows of sub-figures and should span over multiple pages. The two-column text continues directly after the figure series. The rendered results of this example are given in Figure 2.



(1.1) Page 1 of the pdf compiled from Example 1.



(1.2) Page 2 of the pdf compiled from Example 1.



(1.3) Page 3 of the pdf compiled from Example 1.



(1.4) Page 4 of the pdf compiled from Example 1.

Figure 1: The rendered result of Example 1 (with trimmed page margins): A **figureSeries** starts at the bottom of a page and extends to the top of the next page.

Example 2 An example using the two-column IEEEtran class, rendered as Figure 2.

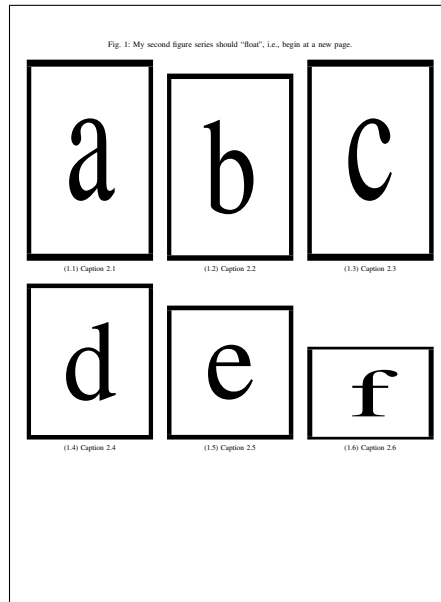
```

\documentclass{IEEEtran}%
\RequirePackage{graphicx}%
\RequirePackage{lipsum}%
\RequirePackage{figureSeries}%
\begin{document}%
\lipsum%
\figureSeriesFloat{%
My second figure series should ‘float’, i.e., begin at a new page.%
}%
\figureSeriesRow{%
\figureSeriesElement{Caption 2.1}{\resizebox{0.3\linewidth}{6cm}{\fbox{a}}}%
\figureSeriesElement{Caption 2.2}{\resizebox{0.3\linewidth}{6cm}{\fbox{b}}}%
\figureSeriesElement{Caption 2.3}{\resizebox{0.3\linewidth}{6cm}{\fbox{c}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 2.4}{\resizebox{0.3\linewidth}{5cm}{\fbox{d}}}%
\figureSeriesElement{Caption 2.5}{\resizebox{0.3\linewidth}{4cm}{\fbox{e}}}%
\figureSeriesElement{Caption 2.6}{\resizebox{0.3\linewidth}{3cm}{\fbox{f}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 2.7}{\resizebox{0.3\linewidth}{!}{\fbox{g}}}%
\figureSeriesElement{Caption 2.8}{\resizebox{0.3\linewidth}{!}{\fbox{h}}}%
\figureSeriesElement{Caption 2.9}{\resizebox{0.3\linewidth}{!}{\fbox{i}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 2.10}{\resizebox{0.3\linewidth}{3cm}{\fbox{j}}}%
\figureSeriesElement{Caption 2.11}{\resizebox{0.3\linewidth}{2cm}{\fbox{k}}}%
\figureSeriesElement{Caption 2.12}{\resizebox{0.3\linewidth}{2.5cm}{\fbox{l}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 2.13}{\resizebox{0.3\linewidth}{!}{\fbox{m}}}%
\figureSeriesElement{Caption 2.14}{\resizebox{0.3\linewidth}{6cm}{\fbox{n}}}%
\figureSeriesElement{Caption 2.15}{\resizebox{0.3\linewidth}{4cm}{\fbox{o}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 2.16}{\resizebox{0.3\linewidth}{3cm}{\fbox{p}}}%
\figureSeriesElement{Caption 2.17}{\resizebox{0.3\linewidth}{3cm}{\fbox{q}}}%
\figureSeriesElement{Caption 2.18}{\resizebox{0.3\linewidth}{3cm}{\fbox{r}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 2.19}{\resizebox{0.3\linewidth}{3cm}{\fbox{s}}}%
\figureSeriesElement{Caption 2.20}{\resizebox{0.3\linewidth}{3cm}{\fbox{t}}}%
\figureSeriesElement{Caption 2.21}{\resizebox{0.3\linewidth}{3cm}{\fbox{u}}}%
}%
\lipsum[1-20]%
\end{document}%

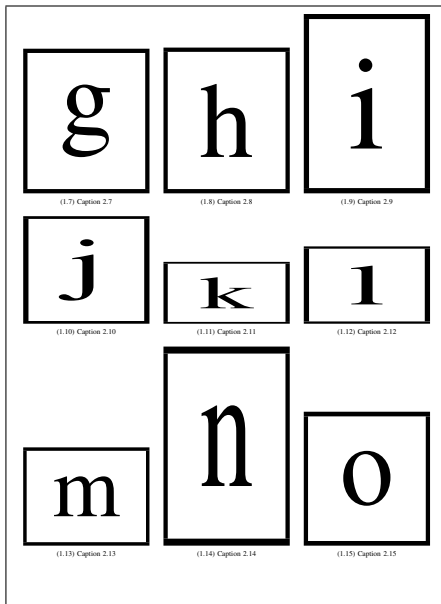
```



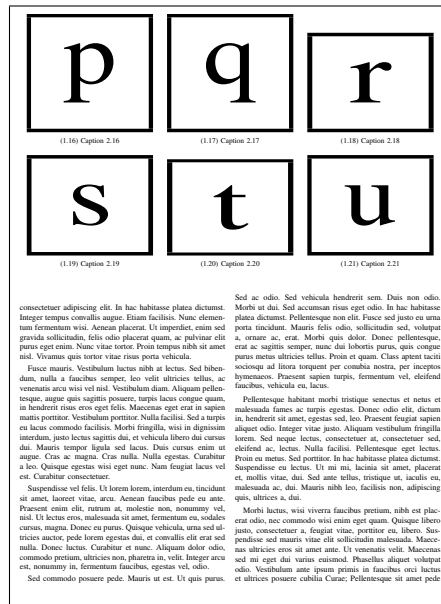
(2.1) Page 1 of the pdf compiled from Example 2.



(2.2) Page 2 of the pdf compiled from Example 2.



(2.3) Page 3 of the pdf compiled from Example 2.



(2.4) Page 4 of the pdf compiled from Example 2.

Figure 2: The rendered result of Example 2 (with trimmed page margins): A floating `figureSeries` in two-column mode.

2.3.3 Coalescing Figure Series in Two-Column Document

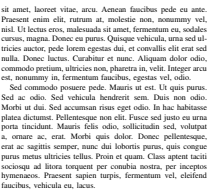
In Example 3, we put several floating figure series close to each other into a two-column document, again using the `IEEEtran` class [12]. The bodies of the figure series should coalesce without losing their captions, figure numbers, or identities. Since they coalesce, no empty pages are produced in between. The result is rendered as Figure 3.

Example 3 An example using the two-column `IEEEtran` class and two coalescing figure series, rendered as Figure 3.

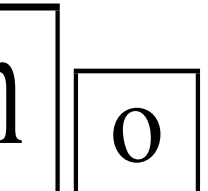
```

\documentclass{IEEEtran}%
\RequirePackage{graphicx}%
\RequirePackage{lipsum}%
\RequirePackage{figureSeries}%
\begin{document}%
\lipsum%
\figureSeriesFloat{%
My third figure series is small. It should float and merge with the following
series.\label{ser:3}%
}%
\figureSeriesRow{%
\figureSeriesElement{Caption 3.1}{\resizebox{0.3\linewidth}{3cm}{\fbox{a}}}%
\figureSeriesElement{Caption 3.2}{\resizebox{0.3\linewidth}{3cm}{\fbox{b}}}%
\figureSeriesElement{Caption 3.3}{\resizebox{0.3\linewidth}{3cm}{\fbox{c}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 3.4}{\resizebox{0.3\linewidth}{4.2cm}{\fbox{d}}}%
\figureSeriesElement{Caption 3.5}{\resizebox{0.3\linewidth}{4.2cm}{\fbox{e}}}%
\figureSeriesElement{Caption 3.6}{\resizebox{0.3\linewidth}{4.2cm}{\fbox{f}}}%
}%
This is a short text in between the two series~\ref{ser:3} and~\ref{ser:4},
which should not prevent them from merging.
\figureSeriesFloat{%
My fourth figure series is a bit longer. It should merge with the previous
series~\ref{ser:3}.\label{ser:4}%
}{
\figureSeriesRow{%
\figureSeriesElement{Caption 4.1}{\resizebox{0.3\linewidth}{!}{\fbox{g}}}%
\figureSeriesElement{Caption 4.2}{\resizebox{0.3\linewidth}{!}{\fbox{h}}}%
\figureSeriesElement{Caption 4.3}{\resizebox{0.3\linewidth}{!}{\fbox{i}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 4.4 is a very long caption. It will probably %
break into multiple lines. Does this matter? Let's find out.}%
\resizebox{0.3\linewidth}{3cm}{\fbox{j}}}%
\figureSeriesElement{Caption 4.5}{\resizebox{0.3\linewidth}{2cm}{\fbox{k}}}%
\figureSeriesElement{Caption 4.6}{\resizebox{0.3\linewidth}{2.5cm}{\fbox{l}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 4.7}{\resizebox{0.3\linewidth}{!}{\fbox{m}}}%
\figureSeriesElement{Caption 4.8}{\resizebox{0.3\linewidth}{6cm}{\fbox{n}}}%
\figureSeriesElement{Caption 4.9}{\resizebox{0.3\linewidth}{4cm}{\fbox{o}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 4.10}{\resizebox{0.3\linewidth}{3cm}{\fbox{p}}}%
\figureSeriesElement{Caption 4.11}{\resizebox{0.3\linewidth}{3cm}{\fbox{q}}}%
\figureSeriesElement{Caption 4.12}{\resizebox{0.3\linewidth}{3cm}{\fbox{r}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 4.13}{\resizebox{0.3\linewidth}{3cm}{\fbox{s}}}%
\figureSeriesElement{Caption 4.14}{\resizebox{0.3\linewidth}{3cm}{\fbox{t}}}%
\figureSeriesElement{Caption 4.15}{\resizebox{0.3\linewidth}{3cm}{\fbox{u}}}%
}%
\lipsum[1-20]%
\end{document}%

```



(3.2) Page 2 of the pdf compiled from Example 3.



(3.4) Page 4 of the pdf compiled from Example 3.

Figure 3: The rendered result of Example 3 (with trimmed page margins): Two floating `figureSeries` in two-column mode are coalesced, without using their caption and identities.

2.3.4 Two-Column Document with sig-alternate

In the following Example 4, we test the `figureSeries` together for documents using ACM's `sig-alternate` [13] document class.

2.3.5 Many Small Sub-Figures in Two-Column Document

In the following Example 5 (again based on ACM's `sig-alternate` [13] document class), we put many small sub-figures into a figure. Also, the last paragraph of the text in the example is a reference to one of the sub-figures. The results are rendered as Figure 5.

2.3.6 Two figureSeries Separated by Text in Two-Column Document

In the following Example 6 (again based on ACM's `sig-alternate` [13] document class), we put two `figureSeries` which are separated by text. The results are rendered as Figure 6.

2.3.7 One Floating figureSeries in a Single-Column Document

In the following Example 7 (based on Springer's `llncs` [11] document class), we let the figure series from Example 1 float. You can compare the rendered in Figure 7 with those in Figure 1.

2.3.8 Mixed figureSeries, figure, and figure*

In Example 8, we mix `figureSeries` with `figure` and `figure*` environments. Something like this would cause ! `LaTeX Error: Float(s) lost.` errors in version 0.9.2 of our package. Due to some modifications, this particular document now compiles, but the errors still appear in other documents.

We again use the `IEEEtran` class [12]. The result is rendered as Figure 8. As you can see, the ordering of the figures in the current version of our package (0.9.4) is far from perfect, but at least the document compiles. In a productive environment, you would have more text between your figures, so hopefully, such layout problems would not occur.

Example 4 An example featuring the two-column `sig-alternate` class. The results are rendered as Figure 4.

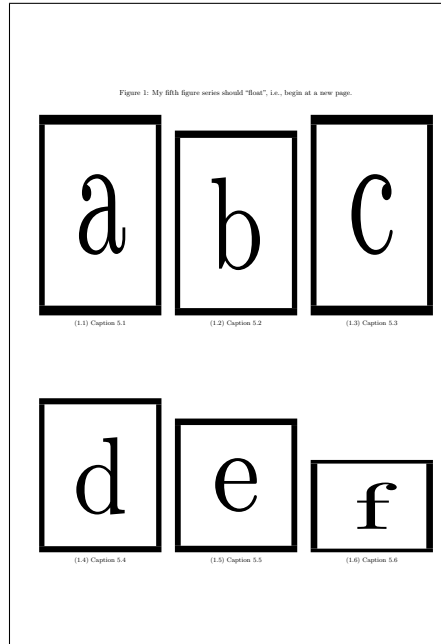
```

\documentclass{sig-alternate}
\RequirePackage{graphicx}%
\RequirePackage{lipsum}%
\RequirePackage{figureSeries}%
\begin{document}%
\lipsum[1]%
\figureSeriesFloat{%
My fifth figure series should ‘‘float’’, i.e., begin at a new page.%
}%
\figureSeriesRow{%
\figureSeriesElement{Caption 5.1}{\resizebox{0.3\linewidth}{6cm}{\fbox{a}}}%
\figureSeriesElement{Caption 5.2}{\resizebox{0.3\linewidth}{6cm}{\fbox{b}}}%
\figureSeriesElement{Caption 5.3}{\resizebox{0.3\linewidth}{6cm}{\fbox{c}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 5.4}{\resizebox{0.3\linewidth}{5cm}{\fbox{d}}}%
\figureSeriesElement{Caption 5.5}{\resizebox{0.3\linewidth}{4cm}{\fbox{e}}}%
\figureSeriesElement{Caption 5.6}{\resizebox{0.3\linewidth}{3cm}{\fbox{f}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 5.7}{\resizebox{0.3\linewidth}{!}{\fbox{g}}}%
\figureSeriesElement{Caption 5.8}{\resizebox{0.3\linewidth}{!}{\fbox{h}}}%
\figureSeriesElement{Caption 5.9}{\resizebox{0.3\linewidth}{!}{\fbox{i}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 5.10}{\resizebox{0.3\linewidth}{3cm}{\fbox{j}}}%
\figureSeriesElement{Caption 5.11}{\resizebox{0.3\linewidth}{2cm}{\fbox{k}}}%
\figureSeriesElement{Caption 5.12}{\resizebox{0.3\linewidth}{5.5cm}{\fbox{l}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 5.13}{\resizebox{0.3\linewidth}{!}{\fbox{m}}}%
\figureSeriesElement{Caption 5.14}{\resizebox{0.3\linewidth}{6cm}{\fbox{n}}}%
\figureSeriesElement{Caption 5.15}{\resizebox{0.3\linewidth}{4cm}{\fbox{o}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 5.16}{\resizebox{0.3\linewidth}{3cm}{\fbox{p}}}%
\figureSeriesElement{Caption 5.17}{\resizebox{0.3\linewidth}{3cm}{\fbox{q}}}%
\figureSeriesElement{Caption 5.18}{\resizebox{0.3\linewidth}{3cm}{\fbox{r}}}%
}%
\lipsum[1-20]%
\end{document}%

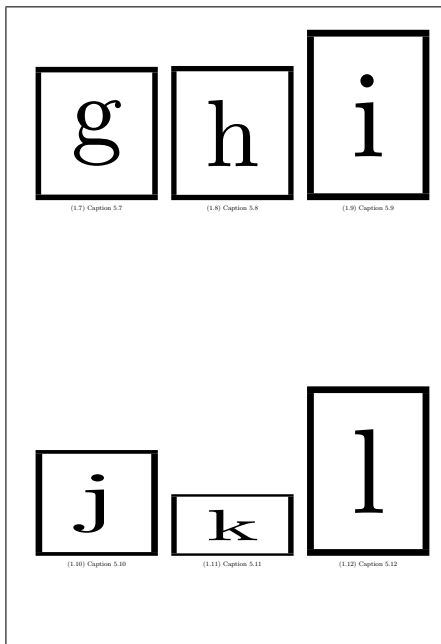
```



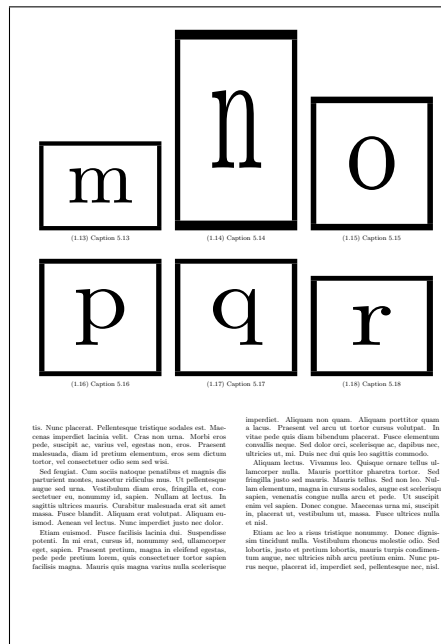
(4.1) Page 1 of the pdf compiled from Example 4.



(4.2) Page 2 of the pdf compiled from Example 4.



(4.3) Page 3 of the pdf compiled from Example 4.



(4.4) Page 4 of the pdf compiled from Example 4.

Figure 4: The rendered result of Example 4 (with trimmed page margins): It works for sig-alternate too.

Example 5 An example featuring the two-column `sig-alternate` class with a reference to sub-figure. The results are rendered as Figure 5.

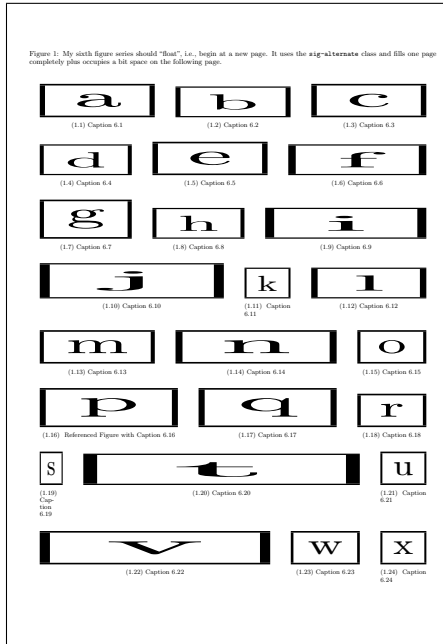
```

\documentclass{sig-alternate}
\RequirePackage{graphicx}%
\RequirePackage{lipsum}%
\RequirePackage{figureSeries}%
\begin{document}%
\lipsum[1]%
\figureSeriesFloat{%
My sixth figure series should ‘float’, i.e., begin at a new page.
It uses the \texttt{sig-alternate} class and fills one page completely
plus occupies a bit space on the following page.%
}%
\figureSeriesRow{%
\figureSeriesElement{Caption 6.1}{\resizebox{5cm}{1cm}{\fbox{a}}}%
\figureSeriesElement{Caption 6.2}{\resizebox{5cm}{1cm}{\fbox{b}}}%
\figureSeriesElement{Caption 6.3}{\resizebox{5cm}{1cm}{\fbox{c}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 6.4}{\resizebox{4cm}{1cm}{\fbox{d}}}%
\figureSeriesElement{Caption 6.5}{\resizebox{5cm}{1cm}{\fbox{e}}}%
\figureSeriesElement{Caption 6.6}{\resizebox{6cm}{1cm}{\fbox{f}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 6.7}{\resizebox{4cm}{1cm}{\fbox{g}}}%
\figureSeriesElement{Caption 6.8}{\resizebox{4cm}{1cm}{\fbox{h}}}%
\figureSeriesElement{Caption 6.9}{\resizebox{7cm}{1cm}{\fbox{i}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 6.10}{\resizebox{8cm}{1cm}{\fbox{j}}}%
\figureSeriesElement{Caption 6.11}{\resizebox{2cm}{1cm}{\fbox{k}}}%
\figureSeriesElement{Caption 6.12}{\resizebox{5cm}{1cm}{\fbox{l}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 6.13}{\resizebox{5cm}{1cm}{\fbox{m}}}%
\figureSeriesElement{Caption 6.14}{\resizebox{7cm}{1cm}{\fbox{n}}}%
\figureSeriesElement{Caption 6.15}{\resizebox{3cm}{1cm}{\fbox{o}}}%
}\figureSeriesRow{%
\figureSeriesElement{\label{checkThis}Referenced Figure with Caption 6.16}{%
\resizebox{6cm}{1cm}{\fbox{p}}}%
\figureSeriesElement{Caption 6.17}{\resizebox{6cm}{1cm}{\fbox{q}}}%
\figureSeriesElement{Caption 6.18}{\resizebox{3cm}{1cm}{\fbox{r}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 6.19}{\resizebox{1cm}{1cm}{\fbox{s}}}%
\figureSeriesElement{Caption 6.20}{\resizebox{12cm}{1cm}{\fbox{t}}}%
\figureSeriesElement{Caption 6.21}{\resizebox{2cm}{1cm}{\fbox{u}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 6.22}{\resizebox{10cm}{1cm}{\fbox{v}}}%
\figureSeriesElement{Caption 6.23}{\resizebox{3cm}{1cm}{\fbox{w}}}%
\figureSeriesElement{Caption 6.24}{\resizebox{2cm}{1cm}{\fbox{x}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 6.25}{\resizebox{7.5cm}{1cm}{\fbox{y}}}%
\figureSeriesElement{Caption 6.26}{\resizebox{7.5cm}{1cm}{\fbox{z}}}%
}%
\lipsum[1-20]\par%
\huge{Dude, check Figure~\ref{checkThis}.}%
\end{document}%

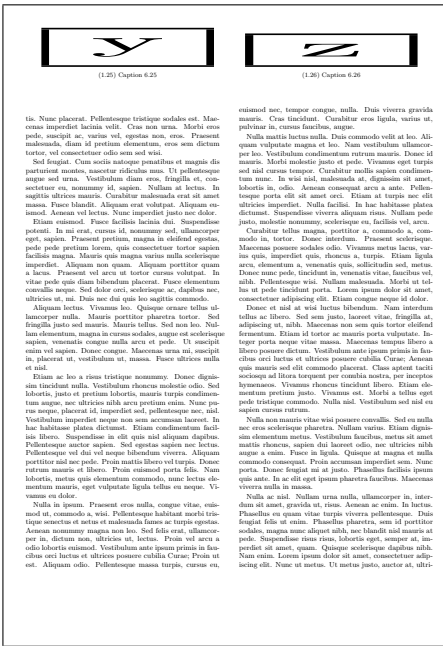
```



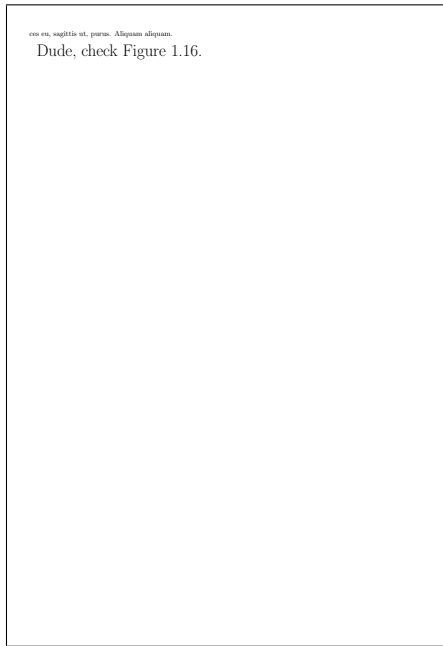
(5.1) Page 1 of the pdf compiled from Example 5.



(5.2) Page 2 of the pdf compiled from Example 5.



(5.3) Page 3 of the pdf compiled from Example 5.



(5.4) Page 4 of the pdf compiled from Example 5.

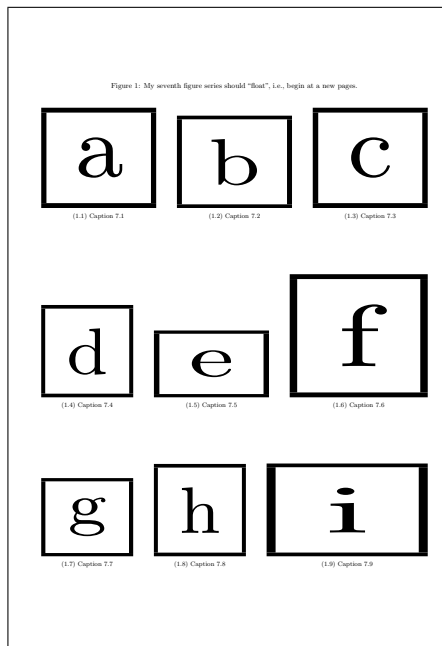
Figure 5: The rendered result of Example 5 (with trimmed page margins): Many small sub-figures nicely fill a page.

Example 6 An example featuring two figure series separated by text. The results are rendered as Figure 6.

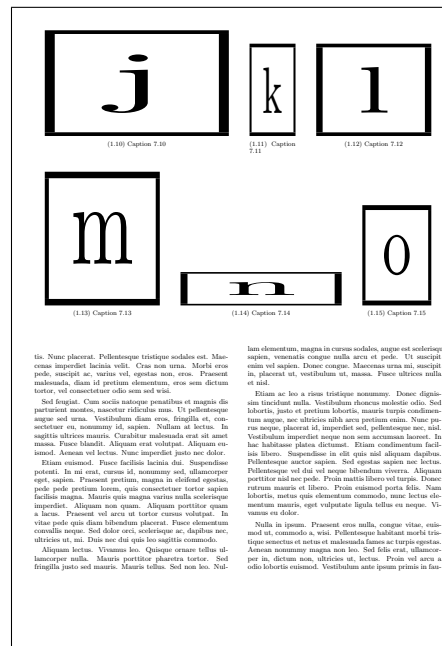
```

\documentclass{sig-alternate}
\RequirePackage{graphicx}%
\RequirePackage{lipsum}%
\RequirePackage{figureSeries}%
\begin{document}%
\lipsum[1]%
\figureSeriesFloat{%
My seventh figure series should ‘‘float’’, i.e., begin at a new pages.%
}%
\figureSeriesRow{%
\figureSeriesElement{Caption 7.1}{\resizebox{5cm}{3cm}{\fbox{a}}}%
\figureSeriesElement{Caption 7.2}{\resizebox{5cm}{3cm}{\fbox{b}}}%
\figureSeriesElement{Caption 7.3}{\resizebox{5cm}{3cm}{\fbox{c}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 7.4}{\resizebox{4cm}{3cm}{\fbox{d}}}%
\figureSeriesElement{Caption 7.5}{\resizebox{5cm}{2cm}{\fbox{e}}}%
\figureSeriesElement{Caption 7.6}{\resizebox{6cm}{4cm}{\fbox{f}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 7.7}{\resizebox{4cm}{2cm}{\fbox{g}}}%
\figureSeriesElement{Caption 7.8}{\resizebox{4cm}{3cm}{\fbox{h}}}%
\figureSeriesElement{Caption 7.9}{\resizebox{7cm}{3cm}{\fbox{i}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 7.10}{\resizebox{8cm}{3cm}{\fbox{j}}}%
\figureSeriesElement{Caption 7.11}{\resizebox{2cm}{3cm}{\fbox{k}}}%
\figureSeriesElement{Caption 7.12}{\resizebox{5cm}{3cm}{\fbox{l}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 7.13}{\resizebox{5cm}{4cm}{\fbox{m}}}%
\figureSeriesElement{Caption 7.14}{\resizebox{7cm}{1cm}{\fbox{n}}}%
\figureSeriesElement{Caption 7.15}{\resizebox{3cm}{3cm}{\fbox{o}}}%
}%
\lipsum[1-30]%
\figureSeriesFloat{%
My eighth figure series also ‘‘floats’’. It comes after the seventh.%
}%
\figureSeriesRow{%
\figureSeriesElement{Caption 8.1}{\resizebox{0.3\linewidth}{6cm}{\fbox{a}}}%
\figureSeriesElement{Caption 8.2}{\resizebox{0.3\linewidth}{6cm}{\fbox{b}}}%
\figureSeriesElement{Caption 8.3}{\resizebox{0.3\linewidth}{6cm}{\fbox{c}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 8.4}{\resizebox{0.3\linewidth}{5cm}{\fbox{d}}}%
\figureSeriesElement{Caption 8.5}{\resizebox{0.3\linewidth}{4cm}{\fbox{e}}}%
\figureSeriesElement{Caption 8.6}{\resizebox{0.3\linewidth}{3cm}{\fbox{f}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 8.7}{\resizebox{0.3\linewidth}{!}{\fbox{g}}}%
\figureSeriesElement{Caption 8.8}{\resizebox{0.3\linewidth}{!}{\fbox{h}}}%
\figureSeriesElement{Caption 8.9}{\resizebox{0.3\linewidth}{!}{\fbox{i}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 8.10}{\resizebox{0.3\linewidth}{3cm}{\fbox{j}}}%
\figureSeriesElement{Caption 8.11}{\resizebox{0.3\linewidth}{2cm}{\fbox{k}}}%
\figureSeriesElement{Caption 8.12}{\resizebox{0.3\linewidth}{8.5cm}{\fbox{l}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 8.13}{\resizebox{0.3\linewidth}{!}{\fbox{m}}}%
\figureSeriesElement{Caption 8.14}{\resizebox{0.3\linewidth}{6cm}{\fbox{n}}}%
\figureSeriesElement{Caption 8.15}{\resizebox{0.3\linewidth}{4cm}{\fbox{o}}}%
}%
\lipsum[1-30]%
\end{document}%

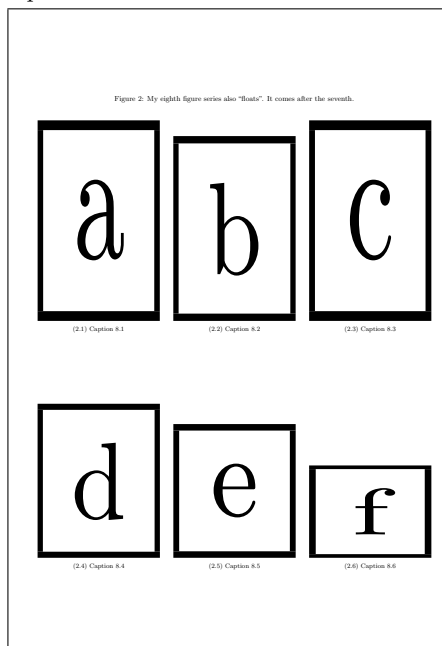
```



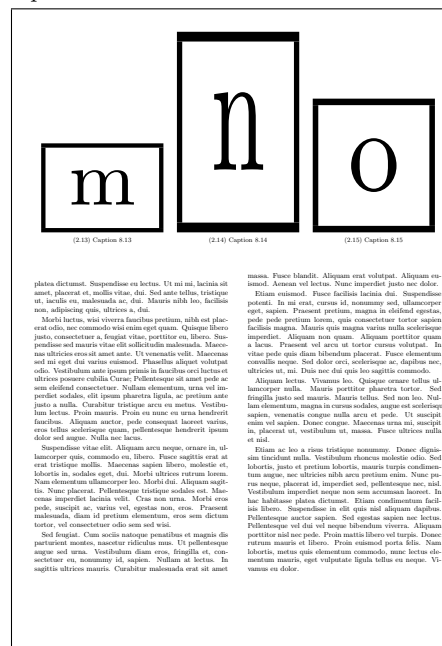
(6.1) Page 2 of the pdf compiled from Example 6.



(6.2) Page 3 of the pdf compiled from Example 6.



(6.3) Page 6 of the pdf compiled from Example 6.



(6.4) Page 8 of the pdf compiled from Example 6.

Figure 6: The rendered result of Example 6 (with trimmed page margins): Two figureSeries are separated by text.

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Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non justo. Nam lacus libero, pretium at, lobortis vitae, ultricies et, tellus. Donec aliquet, tortor sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi. Morbi ac orci et nisl hendrerit mollis. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Aliquam tincidunt urna. Nulla ullamcorper vestibulum turpis. Pellentesque cursus luctus mauris.

Nulla malesuada porttitor diam. Donec felis erat, congue non, volutpat at, tincidunt tristique, libero. Vivamus viverra fermentum felis. Donec nonummy pellentesque ante. Phasellus adipiscing semper elit. Proin fermentum massa ac quam. Sed diam turpis, molestie vitae, placerat a, molestie nec, leo. Maecenas lacinia. Nam ipsum ligula, eleifend at, accumsan nec, suscipit a, ipsum. Morbi blandit ligula feugiat magna. Nunc eleifend consequat lorem. Sed lacinia nulla vitae enim. Pellentesque tincidunt purus vel magna. Integer non enim. Praesent euismod nunc eu purus. Donec bibendum quam in tellus. Nullam cursus pulvinar lectus. Donec et mi. Nam vulputate metus eu enim. Vestibulum pellentesque felis eu massa.

Quisque ullamcorper placerat ipsum. Cras nibh. Morbi vel justo vitae lacus tincidunt ultrices. Lorem ipsum dolor sit amet, consectetur adipiscing elit. In hac habitasse platea dictumst. Integer tempus convallis augue. Etiam facilisis. Nunc elementum fermentum wisi. Aenean placerat. Ut imperdiet, enim sed gravida sollicitudin, felis odio placerat quam, ac pulvinar elit purus eget enim. Nunc vitae tortor. Proin tempus nibh sit amet nisl. Vivamus quis tortor vitae risus porta vehicula.

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(7.1) Page 1 of the pdf compiled from Example 7.

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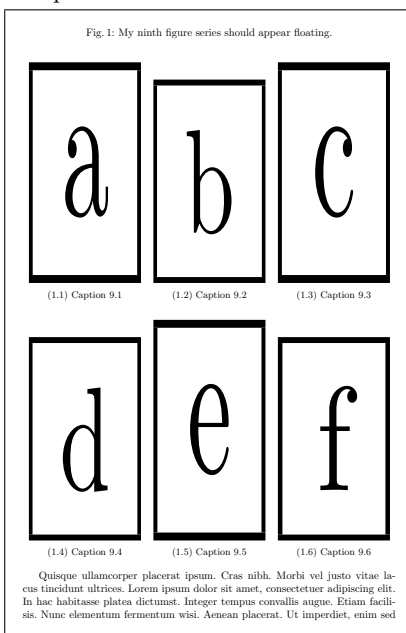
Sed commodo posuere pede. Mauris ut est. Ut quis purus. Sed ac odio. Sed vehicula hendrerit sem. Duis non odio. Morbi ut dui. Sed accumsan risus eget odio. In hac habitasse platea dictumst. Pellentesque non elit. Fusce sed justo eu urna porta tincidunt. Mauris felis odio, sollicitudin sed, volutpat a, ornare ac, erat. Morbi quis dolor. Donec pellentesque, erat ac sagittis semper, nunc dui lobortis purus, quis congue purus metus ultricies tellus. Proin et quam. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos hymenaeos. Praesent sapien turpis, fermentum vel, eleifend faucibus, vehicula eu, lacus.

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Nulla malesuada porttitor diam. Donec felis erat, congue non, volutpat at, tincidunt tristique, libero. Vivamus viverra fermentum felis. Donec nonummy pellentesque ante. Phasellus adipiscing semper elit. Proin fermentum massa ac quam. Sed diam turpis, molestie vitae, placerat a, molestie nec, leo. Maecenas lacinia. Nam ipsum ligula, eleifend at, accumsan nec, suscipit a, ipsum. Morbi blandit ligula feugiat magna. Nunc eleifend consequat lorem. Sed lacinia nulla vitae enim. Pellentesque tincidunt purus vel magna. Integer non enim. Praesent euismod nunc eu purus. Donec bibendum quam in tellus. Nullam cursus pulvinar lectus. Donec et mi. Nam vulputate metus eu enim. Vestibulum pellentesque felis eu massa.

(7.2) Page 2 of the pdf compiled from Example 7.



(7.3) Page 3 of the pdf compiled from Example 7.

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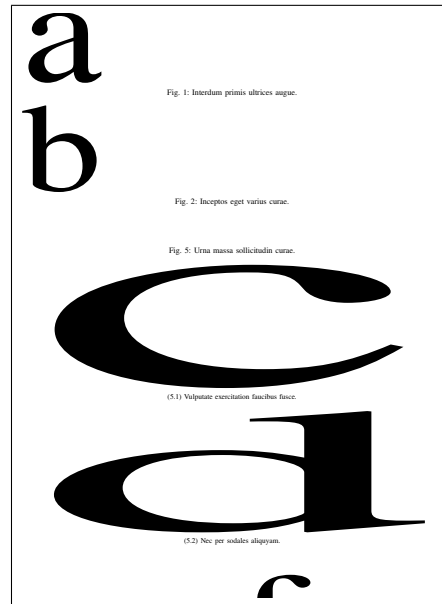
Fusce mauris. Vestibulum luctus nibh at lectus. Sed bibendum, nulla a faucibus semper, leo velit ultrices tellus, ac venenatis arcu wisi vel nisl. Vestibulum diam. Aliquam pellentesque, augue quis sagittis posuere, turpis lacus congue quam, in hendrerit risus eros eget felis. Maecenas eget erat in sapien mattis porttitor. Vestibulum porttitor. Nulla facilisi. Sed a turpis eu lacus commodo facilisis. Morbi fringilla, wisi in dignissim interdum, justo lectus sagittis dui, et vehicula libero dui cursus dui. Mauris tempor ligula sed lacus. Duis cursus enim ut augue. Cras ac magna. Cras nulla. Nulla egestas. Curabitur a leo. Quisque egestas wisi eget nunc. Nam feugiat lacus vel est. Curabitur consectetuer.

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Sed commodo posuere pede. Mauris ut est. Ut quis purus. Sed ac odio. Sed vehicula hendrerit sem. Duis non odio. Morbi ut dui. Sed accumsan risus eget odio. In hac habitasse platea dictumst. Pellentesque non elit. Fusce sed justo eu urna porta tincidunt. Mauris felis odio, sollicitudin sed, volutpat a, ornare ac, erat. Morbi quis dolor. Donec pellentesque, erat ac sagittis semper, nunc dui lobortis purus, quis congue purus metus ultricies tellus. Proin et quam. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos hymenaeos. Praesent sapien turpis, fermentum vel, eleifend faucibus, vehicula eu, lacus.

(7.4) Page 4 of the pdf compiled from Example 7.

Figure 7: The rendered result of Example 7 (with trimmed page margins): A `figureSeries` floating in one-column mode (see Example 1 for the non-floating version).



(8.1) Page 1 of the pdf compiled from Ex- (8.2) Page 2 of the pdf compiled from Ex-
ample 8. ample 8.



(8.3) Page 3 of the pdf compiled from Ex-
ample 8.

Figure 8: The rendered result of Example 8 (with trimmed page margins): a mixture of figureSeries, figure, and figure*.

Example 7 An example using the one-column `llncs` class, rendered as Figure 7.

```

\documentclass{llncs}%
\RequirePackage{graphicx}%
\RequirePackage{lipsum}%
\RequirePackage{figureSeries}%
\begin{document}%
\lipsum%
\figureSeriesFloat{%
My ninth figure series should appear floating.%
}%
\figureSeriesRow{%
\figureSeriesElement{Caption 9.1}{\resizebox{0.3\linewidth}{5cm}{\fbox{a}}}%
\figureSeriesElement{Caption 9.2}{\resizebox{0.3\linewidth}{5cm}{\fbox{b}}}%
\figureSeriesElement{Caption 9.3}{\resizebox{0.3\linewidth}{5cm}{\fbox{c}}}%
}\figureSeriesRow{%
\figureSeriesElement{Caption 9.4}{\resizebox{0.3\linewidth}{5cm}{\fbox{d}}}%
\figureSeriesElement{Caption 9.5}{\resizebox{0.3\linewidth}{5cm}{\fbox{e}}}%
\figureSeriesElement{Caption 9.6}{\resizebox{0.3\linewidth}{5cm}{\fbox{f}}}%
}%
\lipsum%
\end{document}%

```

Example 8 An example for a mixture of `figureSeries`, `figure`, and `figure*`, Figure 8.

```

\documentclass{IEEEtran}%
\RequirePackage{lipsum}%
\RequirePackage{graphicx}%
\RequirePackage{figureSeries}%
%
\begin{document}%
%
\title{Test Example: Mixed figure, figure*, and figureSeries}%
\author{Thomas Weise}%
\maketitle%
%
\begin{figure*}%
\resizebox{0.19\linewidth}{0.12\textheight}{a}%
\caption{Interdum primis ultrices augue.}%
\end{figure*}
%
\lipsum[1-7]%
%
\begin{figure*}%
\resizebox{0.19\linewidth}{0.15\textheight}{b}%
\caption{Inceptos eget varius curae.}%
\end{figure*}%
%
\figureSeriesFloat{Urna massa sollicitudin curae.}{%
\figureSeriesRow{%
\figureSeriesElement{Vulputate exercitation faucibus fusce.}{%
\resizebox{0.95\linewidth}{0.21\textheight}{c}}}%
}%
\figureSeriesRow{%
\figureSeriesElement{Nec per sodales aliquyam.}{%
\resizebox{0.95\linewidth}{0.21\textheight}{d}}}%
}%
%
\begin{figure}%
\resizebox{0.31\columnwidth}{0.13\textheight}{e}%
\caption{Sodales condimentum nascetur tempus?}%
\end{figure}%
%
\begin{figure}%
\resizebox{0.31\columnwidth}{0.15\textheight}{f}%
\caption{Soluta autem nascetur litora.}%
\end{figure}%
%
\lipsum[14]%
%
\end{document}%

```

3 Implementation

The names of all macros for public use are prefixed with `figureSeries`. The names of all internal elements of the package are prefixed with `@figSer@`. This naming convention should prevent any name clashes with other packages.

3.1 Loading of Required Packages

Our `figureSeries` package requires three other packages:

1. The package `caption` [5] for the caption of the `figureSeries`.
2. The package `subcaption` [6] for sub-figure layout and captions.
3. The package `afterpage` [7] for creating the impression that our `figureSeries` can float.
4. The package `cuted` [8] for laying out the figure series in two-column mode.

```

1 %%
2 %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% Preamble %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
3 %

```

3.1.1 Loading caption and subcaption

We rely on the packages `caption` and `subcaption` to render the `figureSeries`' and sub-figure's captions. However, Springer's `llncs.cls` [11] seems to be incompatible with the `subcaption` package [6]¹. Yet, we need that package for giving nice captions to the sub-figures. Therefore, we load the `caption` package [5] with option `compatibility=false` (which can solve this issue) if necessary. This is behavior governed by the Boolean flag `@figSer@captionCompatibilityFalse`, initialized to `false`.

```

4 \newif\if@figSer@captionCompatibilityFalse%
5 \@figSer@captionCompatibilityFalsefalse%
6 %

```

After the flag has been allocated and set to `false`, we check for Springer's `llncs.cls` (in a crude way). In case of `llncs.cls`, if we do not set the option `compatibility` of the `caption` package to `false`, we will get the error *! Package caption Error: The 'subcaption' package does not work correctly in compatibility mode*.

```

7 \ifx\spnewtheorem\@undefined%
8 \else%
9 \@figSer@captionCompatibilityFalsetrue%
10 \fi%
11 %

```

¹According to <http://www.michaelshell.org/tex/ieeetran/>, IEEE's `IEEEtran.cls` [12] may also be incompatible, but it seems to work here.

Now we can load the `caption` [5] package with the right “compatibility” setting.

```
12 \if@figSer@captionCompatibilityFalse%
13 \RequirePackage[compatibility=false]{caption}%
14 \else%
15 \RequirePackage{caption}%
16 \fi%
```

We now load the `subcaption` package [6] and set the caption style for sub-figures to arabic. The reason is that we may have many sub-figures, too many for indexes ranging only from *a*) to *z*). By using arabic numbers, we are on the safe side.

```
17 \RequirePackage{subcaption}%
18 \DeclareCaptionSubType*[arabic]{figure}%
```

3.1.2 Loading the afterpage Package

Floating objects cannot break across pages, so we cannot really make our figure series float. However, by using the `afterpage` [7] package, we can make it look as if it was floating by rendering it on the next page.

```
19 \RequirePackage{afterpage}%
```

3.1.3 Loading the cuted Package

In two-column mode, we need to temporarily switch to one-column mode to lay out the figure series. Therefore, we use the `strip` environment from package `cuted` [8].

```
20 \RequirePackage{cuted}%
```

3.2 User Interface Macros

This section contains the macros which the package user can/should access, i.e., those macros which have been shortly discussed in Section 2.2.

```
21 %%
22 %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% User Interface %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
23 %%
```

\figureSeriesElement The macro `\figureSeriesElement{<caption>}{<contents>}` inserts an element of the figure series, i.e., one sub-figure. Its first argument is the caption of the element. This argument also may contain a `\label`. The second argument is the graphic to print. It could, e.g., be a call to `\includegraphic` from the `graphicx` package [9].

Spacing between sub-figures is handled dynamically via `\hfill`. We make sure to tell the `subcaption` that the sub-figures are sub-figures by setting `@caption` appropriately.

```
24 %%
```

```

25 %% Insert an element of the figure series, i.e., a sub-figure.
26 %% #1 the caption of the sub-figure, potentially including a |\label|
27 %% #2 the contents of the sub-figure, likely a call to |\includegraphics|
28 \long\gdef\figureSeriesElement#1#2{%
29 \strut\hfill\strut%
30 \edef\@capttype{figure}%
31 \subcaptionbox{#1}{#2}%
32 \strut\hfill\strut%
33 }%

```

`\figureSeriesRow` `\figureSeriesRow{<contents>}` inserts a new row of elements (sub-figures) into the figure series. Its single argument should thus contain a sequence of `\figureSeriesElements`. Since sub-figures are placed row-by-row, no sub-figure can span multiple rows.

If the overall caption of the figure series has not yet been printed, it would be stored in `\@figSer@delayedCaption`. Thus, if `\@figSer@delayedCaption` is not empty, this macro first prints the delayed caption and then the contents of the row together in a `\parbox` command which is wrapped into a `center` environment.

Again, the reason why we need to delay caption printing is that L^AT_EX's page breaking algorithm may separate the caption from the first figure row if the figure series starts close to the bottom of the page. Thus, we pack the delayed caption together with the first row of figures into a `\parbox` command. `\parboxes` are (hopefully) not affected by page breaking and (hopefully) always remain as solid objects. If the caption has already been printed, i.e., `\@figSer@delayedCaption` is empty, we do not need the awkward `\parbox`.

Plain `\parboxes`, however, seem to not work we with the breaking of the `figureSeries` into multiple pieces to facilitate page breaking later on. Thus, we (need to?) wrap everything into a `center` environment.

```

34 %%
35 %% Insert a row of sub-figures into the figure series.
36 %% #1 the contents of the rows: arbitrarily many calls to |\figureSeriesElement|
37 \long\gdef\figureSeriesRow#1{%
38 \begin{center}%
39 \ifx\@figSer@delayedCaption\@empty%
40 \vspace\abovecaptionskip%
41 \strut#1\strut%
42 \else%
43 \parbox[b]{\textwidth}{%
44 \@figSer@delayedCaption%
45 \global\let\@figSer@delayedCaption\@empty%
46 \vspace\abovecaptionskip%
47 \strut#1\strut%
48 }%
49 \fi%
50 \end{center}%
51 }%

```


The following two macros, `\figureSeriesHere` and `\figureSeriesFloat` act as switches that decide which special situation applies, as different things have to be done for

1. the non-floating (“Here”) or floating (“Float”) case, as well as for
2. one-column or two-column documents.

`\figureSeriesHere` The macro `\figureSeriesHere{<caption>}{<contents>}` tries to insert a non-floating figure series at the current position in the document. This means that it may begin wherever, well, it is defined, e.g., in the middle of the page.

The macro has two mandatory parameters, the caption and the contents. The caption will (different from usual `figures`) be put at the beginning of the figure series. The reason is that a figure series may span over multiple pages and having the caption at the end may be awkward. The caption text may contain a `\label`.

The contents of a figure series should be a sequence of `\figureSeriesRow` calls.

Since figure series are page-wide elements, starting them in the middle of the page only works in one-column documents. In two-column documents, any figure series will behave as specified in macro `\figureSeriesFloat` below.

Furthermore, if a floating figure series is already pending for insertion, we will not print the current figure series here but attach it to the floating one. This will ensure that the order in which figure series’ are printed is always the same as the order in which they are declared.

```

52 %%
53 %% Insert a figure series right here, i.e., at the location at which this
54 %% function is called.
55 %% Exceptions: This function will behave like \figureSeriesFloat if 1. a
56 %% floating figure series already pending and 2. in two-column documents.
57 %% #1 the caption of the figure series, potentially including a |\label|
58 %% #2 the contents of the figure series: arbitrarily many calls to
59 %%   |\figureSeriesRow|
60 \long\def\figureSeriesHere#1#2{%
61 \ifx\@figSer@floatingBody\@empty%
62 \if@twocolumn%
63 \@figSer@store{#1}{#2}%
64 \afterpage{\@figSer@deferred}%
65 \else%
66 \@figSer@print{#1}{#2}%
67 \fi%
68 \else%
69 \@figSer@store{#1}{#2}%
70 \fi%
71 }%
```

`\figureSeriesFloat` The macro `\figureSeriesFloat{<caption>}{<contents>}` takes the same parameters as `\figureSeriesHere`, but has a float-like behavior. By using the `\afterpage` command from the `afterpage` package [7], we let it start at the following page. This is different from L^AT_EX’ normal floating behavior, but as good as we can get with page-breaking objects, I think.

```

72 %%
73 %% Insert a floating figure series right here, i.e., one which will be
74 %% laid out on top of the following page.
75 %% #1 the caption of the figure series, potentially including a |\label|
76 %% #2 the contents of the figure series: arbitrarily many calls to
77 %%     |\figureSeriesRow|
78 \long\gdef\figureSeriesFloat#1#2{%
79 \ifx\@figSer@floatingBody\@empty%
80 \@figSer@store{#1}{#2}%
81 \afterpage{\@figSer@deferred}%
82 \else%
83 \@figSer@store{#1}{#2}%
84 \fi%
85 }%

```

3.3 Internal Utility Definitions and Macros

Here we discuss the internal utility definitions and macros used by our figure series.

```

86 %%
87 %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% Internal Macros %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
88 %%

```

3.3.1 Container Macros

We use the command `\@figSer@floatingBody` to temporarily store any floating figure series. If this command is `\@empty`, no floating figure series is pending.

```

89 \global\let\@figSer@floatingBody\@empty%

```

We want to avoid having a figure series broken right below the caption, i.e., having a caption alone at the bottom of a page and the first row of sub-figures coming on the next page. Therefore, we temporarily store the overall caption of the figure series in `\@figSer@delayedCaption` and print it together with the first figure row.

```

90 \global\let\@figSer@delayedCaption\@empty%

```

Our figure series are basically nothing else than simple arrays of rows. Each `\figureSeriesRow` is wrapped into a `center` environment and the `\figureSeriesElements` are horizontally distributed inside using `\struts` and `\hfills`.

Here we define the macro for printing our figure series. The rest of the package will deal with the logic where and how to invoke it.

`\@figSer@print` The macro `\@figSer@print{<caption>}{<contents>}` does the work of printing the figure series.

```

91 \long\def\@figSer@print#1#2{%
92 \def\@figSer@delayedCaption{%
93 \noindent\parbox{\textwidth}{%
94 \captionof{figure}{#1}%
95 \global\advance\c@figure by 0%

```

```

96 }%
97 \par}%
98 \begin{center}%
99 #2%
100 \end{center}%
101 \medskip%
102 }%

```

\@figSer@store If we want to make a figure series float, we need to temporarily store it. If another figure series is already stored, we attach the new one at its end. We store a figure series in `\@figSer@floatingBody` for later layout with the macro `\@figSer@store{<caption>}{<contents>}`.

```

103 \long\def\@figSer@store#1#2{%
104 \g@addto@macro{\@figSer@floatingBody}{\@figSer@print{#1}{#2}}%
105 }%

```

\@figSer@deferred This macro is used to lay out the figure series in a “deferred” way, i.e., when we emulate floating behavior via `\afterpage`. It behaves differently in one- and two-column mode.

In one-column mode, there is nothing much to do: The figure series is stored in `\@figSer@floatingBody` and we just need to print it.

In two column mode, we should only print it if we are in the first column. Otherwise, there may be errors. Thus, if we are not in the first column, we simply defer again, via `\afterpage`. For actually printing the figure series, we then use the `strip` environment from package `cuted` [8].

```

106 \def\@figSer@deferred{%
107 \if@twocolumn%
108 \if@firstcolumn%
109 \begin{strip}\@figSer@floatingBody\end{strip}\null\par%
110 \global\let\@figSer@floatingBody\@empty%
111 \else%
112 \afterpage{\@figSer@deferred}%
113 \fi%
114 \else%
115 \@figSer@floatingBody%
116 \global\let\@figSer@floatingBody\@empty%
117 \fi%
118 }%

```

3.4 Errors, Tests, and Incompatibilities

We may sometimes get `! Dimension too large.` errors. These may be caused by too-long `figureSeries` or too-big sub-figures.

`figureSeries` loads the packages `caption` [5], `subcaption` [6], `afterpage` [7], and `cuted` [8]. Therefore it inherits all incompatibilities of these packages. The `subcaption` package, for instance, is not compatible with the packages `subfigure` and `subfig`.

3.5 Related Work

The `longfigure` package [14] provides a similar functionality, i.e., a figure environment that can wrap over multiple pages. This environment can be made to float by using `\afterpage`, but does not work in two-column documents.

Tomáš Hejda’s method [15] was originally used in our package (up to version 0.9.3) to lay out figure series. However, with my implementation of that method, I often got `! LaTeX Error: Float(s) lost.` errors in conjunction with `\afterpage`. With the ‘strip’ environment from package `cuted` [8], I do not get those errors anymore.

The following web resources are related to this package:

1. Primary GitHub Repository: <https://github.com/thomasWeise/figureSeries>
2. <http://tex.stackexchange.com/questions/185534>
3. <http://stackoverflow.com/questions/1078370>
4. <http://tex.stackexchange.com/questions/11059>
5. <http://blog.it-weise.de/p/318>
6. <http://tex.stackexchange.com/questions/252487>
7. <http://tex.stackexchange.com/questions/255091>

The reason why I developed this package is my `optimizationBenchmarking` framework, which can automatically generate reports from benchmark data obtained from optimization algorithms. It therefore needs a facility to deal with arbitrarily many automatically generated sub-figures of a figure. You can find this project at <https://github.com/optimizationBenchmarking/optimizationBenchmarking>.

3.6 License

The copyright (c) of this work is with Thomas Weise (<http://www.it-weise.de>).

This document, the package, and its documentation are under the LaTeX Project Public License, version 1.3, which may be found online at <http://www.latex-project.org/lppl.txt>.

The distribution of this package may also contain the L^AT_EX document classes `llncs.cls` [11], `IEEEtran.cls` [12], and `sig-alternate.cls` [13]. The copyrights of these files are with their respective owners and these owners alone can determine the license terms for these files. The files are just included here to make the examples stand-alone. They may not be up-to-date, so please download their latest versions from their respective locations.

If you feel that this document, its presentation, or any parts I provide for download violate your (copy)right, please contact me (<http://www.it-weise.de>, tweise@ustc.edu.cn, tweise@gmx.de) and I will immediately resolve the issues.

3.7 Thanks

I want to thank Prof. Sigitas Tolušis for his quick answer to my question regarding disappearing `figureSeries` in empty documents.

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Change History

v0.9.0	well. 1
General: Initial Draft Version 1	v0.9.3
v0.9.1	General: Failed attempt to fix “LaTeX Error: Float(s) lost.” errors. 1
General: Better examples showing the shortcomings of the package (in particular in two-column mode). 1	v0.9.4
v0.9.2	General: Hopefully a working fix for “LaTeX Error: Float(s) lost.” errors by using the package “cuted.” 1
General: Shortcomings in two-column mode fixed: vertical column starts are now aligned	

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