The subfigure package*

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Abstract

This article documents the LaTeX package 'subfigure', which provides support for the inclusion of small, 'sub', figures and tables. It simplifies the positioning, captioning and labeling of such objects within a single figure or table environment. In addition, this package allows such sub-captions to be written to a List-of-Figures or List-of-Tables if desired. The 'subfigure' package also cooperates with the 'caption' package by H.A. Sommerfeldt [1, 2], and the 'captcont' package [3] and should be compatible with all other packages that modify or extend the float environment or the `\caption` command.

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1 Introduction

This package provides support for the manipulation and reference of small or 'sub' figures and tables within a single figure or table environment.[1] It is convenient to use this package when your subfigures are to be separately captioned, referenced, or when such captions are to be included in the List-of-Figures.

Before using the `subfigure` package, consider the following to see if you really need it. If you simply want to center your figure, then use `\centerline` or the `center` environment to do so. If your figure has a short width or if you wrap your figure in a `\parbox` or a `minipage` of a short width, then you can place multiple figures or tables side-by-side. For example, the following will put two images side-by-side in a single figure as shown in Figure 1:

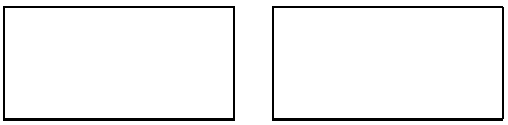


Figure 1: Here are two figures side-by-side.

```
\begin{figure}%
  \begin{center}%
    \parbox{1.2in}{...figure code...}%
    \hspace{0.2in}%
    \begin{minipage}{1.2in}%
      ...figure code...%
    \end{minipage}%
  \end{center}%
  \caption{Here are two figures side-by-side.}%
  \label{fig:1figs}%
\end{figure}
```

Further, if you place the caption inside the `\parbox` or `minipage`, then the width of the caption will be limited to the width of the parbox or minipage as shown in Figures 2 and 3:

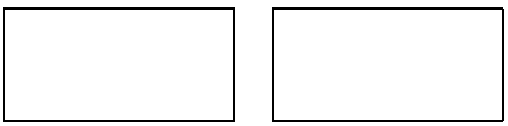


Figure 2: First.

Figure 3: Second.

```
\begin{figure}%
  \begin{center}%
```

[1] Section 4.6 describes how to add support for additional float environments.

```
    \parbox{1.2in}{%
      ...figure code...
      \caption{First.}%
      \label{fig:2figsA}}%
    \hspace{0.2in}%
    \begin{minipage}{1.2in}%
      ...figure code...
      \caption{Second.}%
      \label{fig:2figsB}%
    \end{minipage}%
  \end{center}}%
\end{figure}%
```

2 The user interface

To use this package place

`\usepackage[`⟨*options*⟩`]{subfigure}`

in the preamble of your document. The supported options are shown below. Within a `figure` or `table` environment, you can use the following commands to create a subfigure or subtable "box" with an optional CAPTION under a `figure`. By default, the `figure` is centered with `\subfigtopskip` of vertical space added above. If there is a CAPTION, then `\subfigcapskip` vertical space is added below the `figure` followed by the CAPTION. Finally, `\subfigbottomskip` of vertical space added at the bottom (see section 2.3 to swap the figure and caption).

`\subfigure[`⟨*list_entry*⟩`][`⟨*caption*⟩`]{`⟨*figure*⟩`}`
`\subtable[`⟨*list_entry*⟩`][`⟨*caption*⟩`]{`⟨*figure*⟩`}`

The resulting "box" is made such that its baseline is at the bottom of the `figure` portion (or at the top of the `figure` portion if swapped). Therefore, no matter how tall the figures and/or long the captions, adjacent subfigures are aligned at the bottom (top) of their respective figures.

If a CAPTION is given (including the null CAPTION '`[]`') then the subfigure is labeled with a counter formatted by the command '`\thesubfigure`' which returns, by default, '(a)', '(b)', etc. If desired, this command may be redefined. The counter used for labeling the subfigures is `subfigure` and is incremented for each subfigure regardless of whether a CAPTION was printed. The internals of the `\subtable` command are symmetric to those of the `\subfigure` command.

Option	Description
`normal`	Provides 'normal' subcaptions, this is the default.
`hang`, `isu`	Causes the label to be a hanging indentation to the subcaption paragraph. (`isu` is a synonym for `hang`.)
`center`	Causes each line of the paragraph to be separately centered.
`centerlast`, `anne`	Causes the last line only to be centered. (`anne` is a synonym for `centerlast`.)
`nooneline`	If a subcaption fits on one line it will, by default, be centered. This option left-justifies the one line subcaption.
`scriptsize`, ..., `Large`	Sets the font size of the subcaptions (both the label and the text).
`rm`, `sf`, `tt`, `md`, `bf`, `up`, `it`, `sl`, `sc`, `RM`, `SF`, `TT`, `MD`, `BF`, `UP`, `IT`, `SL`, `SC`	Sets the font attributes of the subcaption labels. The capitalized version sets the font attributes of the subcaption text as well as the caption labels.
`figbotcap`, `tabbotcap`, `FIGBOTCAP`, `TABBOTCAP`	Sets the figure or table numbering based on the assumption that the figure or table caption comes after the subfigures or subtables. The capitalized version also places the subcaption after the figure (This is the default setting).
`figtopcap`, `tabtopcap`, `FIGTOPCAP`, `TABTOPCAP`	Sets the figure or table numbering based on the assumption that the figure or table caption preceeds the subfigures or subtables. The capitalized version also places the subcaption before the figure (see section 2.3 for details).

Further, if the List-of-Figures (or List-of-Tables) is generated, then the LIST_ENTRY argument controls how the caption text is used there. The following cases show the possibilities:

Subfigure Command	LOF	Main Text
`\subfigure`{...fig...}		
`\subfigure`[]{...fig...}	(b)	(b)
`\subfigure`[Main Caption.]{...fig...}	(c) Main Caption. . . .	(c) Main Caption.
`\subfigure`[][Main Caption.]{...fig...}		(d) Main Caption.
`\subfigure`[][]{...fig...}		(e)
`\subfigure`[LOF Caption.][MainCaption.] {...fig...}	(f) LOF Caption. . . .	(f) Main Caption.
`\subfigure`[LOF Caption.][]{...fig...}	(g) LOF Caption. . . .	(g)

If you wish to reference a specific subfigure or subtable, you can include a `\label` inside the body of either the CAPTION or FIGURE argument to the command (but not the LIST_ENTRY argument). If supplied by itself, the CAPTION is a

"moving argument"[2] and, therefore, any "fragile" commands contained within it must be `\protect`'ed. If the LIST_ENTRY argument is supplied, then the CAPTION is not a "moving argument", but the LIST_ENTRY is.

One final note, the `\subfigure` and `\subtable` commands are actually identical and it is the environment that defines whether a subtable or subfigure will be generated and not which command is used. At the user level, the choice of names is purely cosmetic (and historical).

2.1 Format Options

There are five options for formatting the layout of the caption label and text. The first is `normal`, which produces the style shown in figure 4. The other options may be used in various combinations to produce the layouts shown in Figures 5 thru 19. Note that some combinations, like `center` and `centerlast` don't make sense since `center` overrides `centerlast` (see Figures 10(b), 11(b), 18(b), and 19(b)). Also, note that `nooneline`, when combined with either `center` or `centerlast` has no effect, as in Figures 7(a), 9(a) and 11(a); or, produces ugly output when also combined with `hang`, as shown in figures 15(a), 17(a) and 19(a).

2.2 Font Size and Style Options

There are fourteen options for setting the font of the subcaption. The first six set the size of both the subcaption label and text. They are: `scriptsize`, `footnotesize` (default), `small`, `normalsize`, `large`, and `Large`. Their effect is shown in Figure 20.

The next nine, `rm`, `sf`, `tt`, `md`, `bf`, `up`, `it`, `sl`, and `sc` set the family, series or shape of the subcaption label, as shown in Figures 21(a)– 21(i). The last nine `RM`, `SF`, `TT`, `MD`, `BF`, `UP`, `IT`, `SL`, and `SC` do the same except for both the label and text of the subcaption, as shown in Figure 21(j)–21(r).

2.3 Caption Position Options

There are eight options that control the position of the subcaption and how the numbering is related to the "containing" figure or table's caption. The following shows only the subfigure-related options, but the subtable options are symmetric, where the former affect only the subfigure and the latter the subtable.

The first two options, `figbotcap` and `figtopcap`, tell the subfigure command where the "containing" figure's caption is located. This is needed to decide if the current figure counter shows the number for the last figure (`figbotcap`) or for the current one (`figtopcap`).

The third option, `FIGBOTCAP`, is similar to `figbotcap`, except that it also causes the subfigure's caption to be placed under the figure This is the default setting and is shown in figure 22.

[2] See [4] page 33 and sections 3.5.1 and 2.2.3 for a more detailed description of "moving arguments" and "fragile" commands

(a) Short.

(b) This is a long caption of giberish: Aafas d taed gaihgghn adf iriabdn sadfna aets etsd.

Figure 4: Format option [normal].

(a) Short.

(b) This is a long caption of giberish: Aafas d taed gaihgghn adf iriabdn sadfna aets etsd.

Figure 5: Format options [nooneline].

(a) Short.

(b) This is a long caption of giberish: Aafas d taed gaihgghn adf iriabdn sadfna aets etsd.

Figure 6: Format options [centerlast].

(a) Short.

(b) This is a long caption of giberish: Aafas d taed gaihgghn adf iriabdn sadfna aets etsd.

Figure 7: Format options [centerlast,nooneline].

(a) Short.

(b) This is a long caption of giberish: Aafas d taed gaihgghn adf iriabdn sadfna aets etsd.

Figure 8: Format option [center].

(a) Short.

(b) This is a long caption of giberish: Aafas d taed gaihgghn adf iriabdn sadfna aets etsd.

Figure 9: Format options [center,nooneline].

(a) Short.

(b) This is a long caption of giberish: Aafas d taed gaihgghn adf iriabdn sadfna aets etsd.

Figure 10: Format options [center,centerlast].

(a) Short.

(b) This is a long caption of giberish: Aafas d taed gaihgghn adf iriabdn sadfna aets etsd.

Figure 11: Format options [center,centerlast,nooneline].

(a) Short.

(b) This is a long caption of giberish: Aafas d taed gaihgghn adf iriabdn sadfna aets etsd.

Figure 12: Format option [hang].

(a) Short.

(b) This is a long caption of giberish: Aafas d taed gaihgghn adf iriabdn sadfna aets etsd.

Figure 13: Format options [hang,nooneline].

(a) Short.

(b) This is a long caption of giberish: Aafas d taed gaihgghn adf iriabdn sadfna aets etsd.

Figure 14: Format options [hang,centerlast].

(a) Short.

(b) This is a long caption of giberish: Aafas d taed gaihgghn adf iriabdn sadfna aets etsd.

Figure 15: Format options [hang,centerlast,nooneline].

(a) Short.

(b) This is a long caption of giberish: Aafas d taed gaihgghn adf iriabdn sadfna aets etsd.

Figure 16: Format options [hang,center].

(a) Short.

(b) This is a long caption of giberish: Aafas d taed gaihgghn adf iriabdn sadfna aets etsd.

Figure 17: Format options [hang,center,nooneline].

(a) Short.

(b) This is a long caption of giberish: Aafas d taed gaihgghn adf iriabdn sadfna aets etsd.

Figure 18: Format options [hang,center,centerlast].

(a) Short.

(b) This is a long caption of giberish: Aafas d taed gaihgghn adf iriabdn sadfna aets etsd.

Figure 19: Format options [hang,center,centerlast,nooneline].

(a) Font option [scriptsize].

(b) Font option [footnotesize].

(c) Font option [small].

(d) Font option [normalsize].

(e) Font option [large].

(f) Font option [Large].

Figure 20: Subfigure font size options.

(a) Font option [rm].

(b) Font option [sf].

(c) Font option [tt].

(d) Font option [md].

(e) Font option [bf].

(f) Font option [up].

(g) Font option [it].

(h) Font option [sl].

(i) Font option [sc].

(j) Font option [RM].

(k) Font option [SF].

(l) Font option [TT].

(m) Font option [MD].

(n) Font option [BF].

(o) Font option [UP].

(p) Font option [IT].

(q) Font option [SL].

(r) Font option [SC].

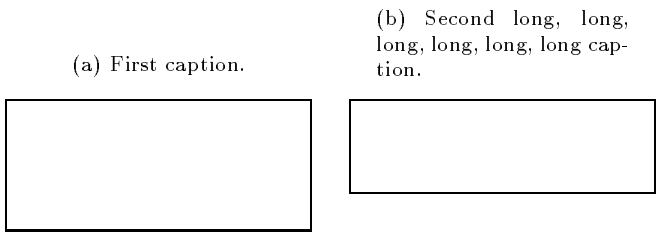
Figure 21: Subfigure font style options.

(a) First caption.

(b) Second long, long, long, long, long, long caption.

Figure 22: Caption position option: [FIGBOTCAP].

Figure 23: Caption position option: [FIGTOPCAP].



The fourth option, `FIGTOPCAP`, is similar to `figtopcap`, except that it causes the subfigure's caption to be placed above the figure box This is shown in figure 23, note that the baseline of the subfigure is along the top of the figure box. This option will probably work when you need the subcaption to be placed above a figure or table when the caption is only one line long (see section 4.5 for another way of positioning the caption when captions are placed above the figure or table).

3 Examples

The easiest way to explain the use of this package is to give some examples. The first example, shown in Figure 24, specifies `\centering` and uses \\ to control the placement of the subfigures. Note that the alignment of the top two subfigures is along the bottom of the figure portion of each.

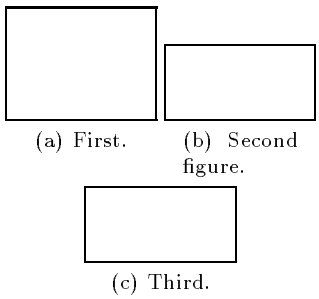


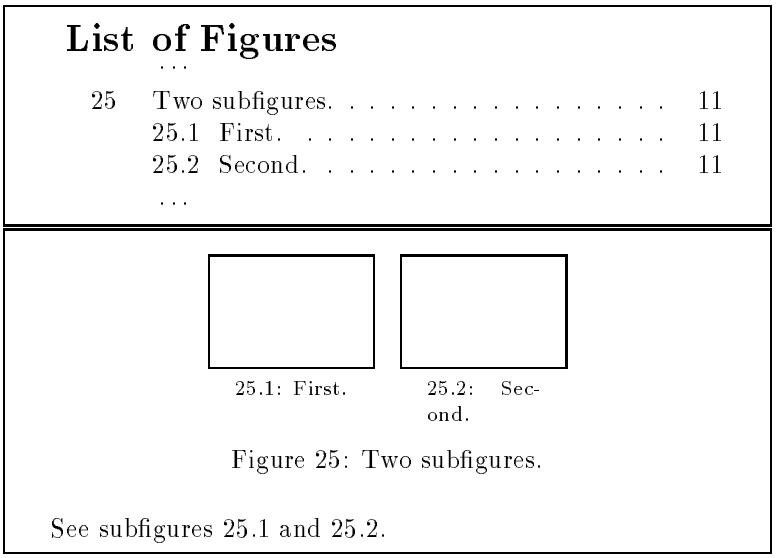
Figure 24: Three subfigures.

Figure 24 contains two top 'subfigures' and Figure 24(c).

```
\newcommand{\goodgap}{%
  \hspace{\subfigtopskip}%
  \hspace{\subfigbottomskip}}
...
\begin{figure}%
  \centering
```

```
  \subfigure[First.]{...}\goodgap
  \subfigure[Second figure.]{...}\\
  \subfigure[Third.]{\label{3figs-c}...}%
  \caption{Three subfigures.}
  \label{3figs}
\end{figure}
...
Figure~\ref{3figs} contains two top `subfigures' and
Figure~\ref{3figs-c}.
```

A second example, shown in Figure 25, is to change the way that the subfigures are labeled and to have the subfigure captions printed in the list-of-figures. Here the alignment of the figures is accomplished by surrounding them in a `center` environment.




```
\renewcommand{\thesubfigure}{\thefigure.\arabic{subfigure}}
\makeatletter
  \renewcommand{\@thesubfigure}{%
    {\subcapsize\subcaplabelfont\thesubfigure:}\space}
  \renewcommand{\p@subfigure}{}
\makeatother
...
\setcounter{lofdepth}{2}
\listoffigures
...
\begin{figure}%
  \begin{center}%
    \subfigure[First.]{%
```

```
      \label{fig:first}%
      ...}%
    \goodgap
    \subfigure[Second.]{%
      \label{fig:second}%
      ...}%
  \end{center}
  \caption{Two subfigures.}
\end{figure}
...
See subfigures~\ref{fig:first} and \ref{fig:second}.
```

4 Customization

The following sections describe the internal parameters used by the subfigure package to define the layout of the sub-figures or tables, as well as the labels and captions the accompany them. In addition, adjustments to the entries on a "list-of" page and the addition of new float environments is described.

4.1 Changing the layout

The layout of the `subfigure` or `subtable` is defined by several internal values which may be changed to customize appearance of the object. The following illustration shows the relationship of these values. Figure 26(a) shows the default layout with the caption following the figure, Figure 26(b) shows the case where the caption preceeds the figure (*i.e.*, `\subfiguretopcaptrue` or `\subtabletopcaptrue`). The last case, Figure 26(c) shows the case where there is no caption, however, the baseline will be aligned with either the bottom or top of the figure depending on whether TOPCAP or BOTCAP is specified.

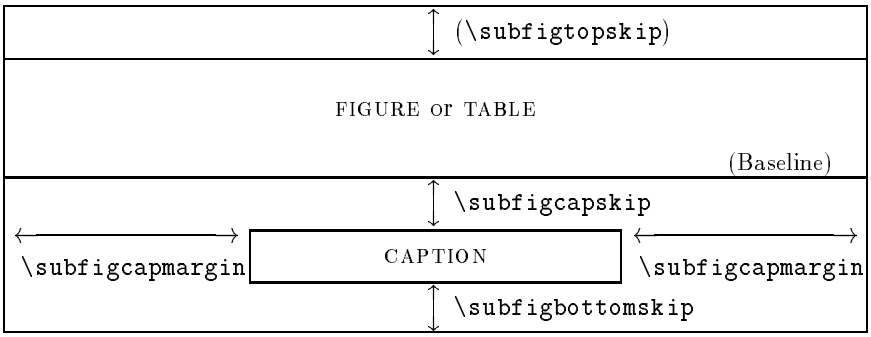
Note also, for all of these cases, that the `\subfigtopskip` may be removed for items that are the first box in a vertical list or other than the first box in a horizontal list. This allows tighter packing of the subfigures and the full use of the page.

4.2 Adjusting the label and caption

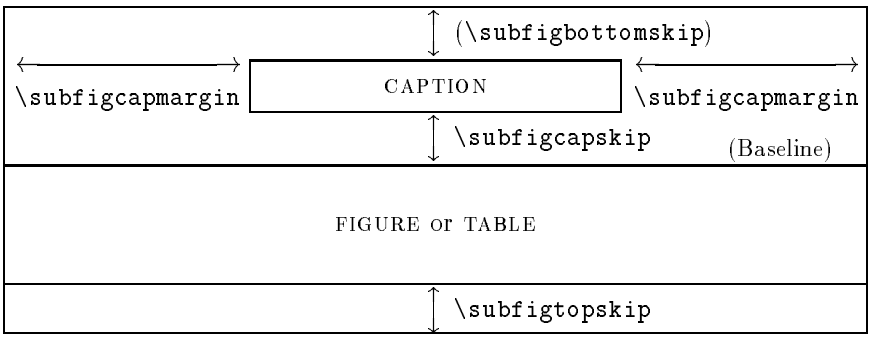
The subfigure label has two forms. The first is the one that appears in the text when you use the `\ref` command and the second is the one that appears under the subfigure as part of the caption.

The `\ref` command yields a string composed by concatenating the value of `\p@subfigure` to `\thesubfigure`. By default these are defined by: "`\thefigure`" and "`(\alph{subfigure})`," respectively, which produces a reference of the figure number followed by the subfigure letter in parentheses. The label under the subfigure is generated by `\@thesubfigure`. By default this is

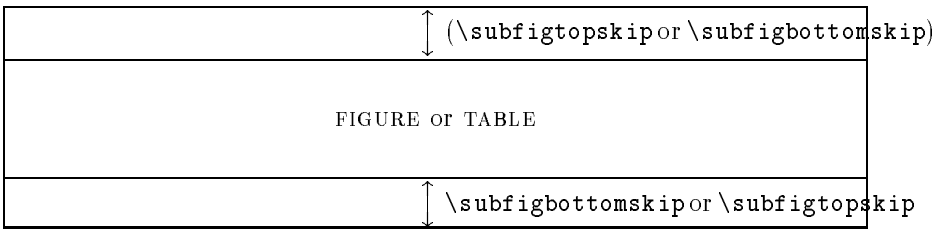
"`{\subcapsize\subcaplabelfont\thesubfigure}\space}`."



(a) Default (BOTCAP) layout.



(b) Reversed (TOPCAP) layout.



(c) Layout with no caption present.

Figure 26: Subfigure and subtable layout.

Note the \subcapsize and \subcaplabelfont values. This starts out as a null value or if one of the font attribute options are given it is set to that value. If you update the \@subfigure command, you should include the \subcapsize\subcaplabelfont and wrap the whole in curly brackets to restrict the scope of the font change.

Finally, the text of both the label and caption are prefixed by \subcapsize, which defaults to \footnotesize and may be changed using the six font size options. The caption is further modified by \subcapfont which starts as a null value, but may be set by one of the caption font style options or directly using \renewcommand.

One other way of changing the layout of the lapel and caption is by replacing the \@makesubfigurecaption command which both applies the font size option and the five caption shape options. Each subfloat type may be defined individually.

The subtable label and caption are symmetric to that of the subfigure defined above.

4.3 Adjusting the subfigure and subtable counters

To create some special effects, such as continuing the subfigure numbering across several pages as part of one long continued figure, you can backoff the number change from a caption with the command:

```
\addtocounter{figure}{-1}
```

within the figure environment. In addition, you can adjust for previous subfigures or subtables with one of the following (here we assume that two subfigures or subtables appeared in the previous pages:

```
\addtocounter{subfigure}{2}
```

or

```
\addtocounter{subtable}{2}
```

Two other things that may be necessary, if you switch between figures and tables in the same figure environment (by changing \@captype), is to add the command \listsubcaptions following the last subfigure when the subfigure is using teh TOPCAP or topcap option. This is necessary to flush the list of subcaptions before the next subfigure or subtable. This also may be necessary if you switch between \figuretopcaptrue and \figuretopcaptrue. The other thing is that in some cases it may be neceseary to reset the subfigure counter by entering:

```
\setcounter{subfigure}{0}
```

This should only be necessary if you are switching between different states within the document.

4.4 Modifying the "List-Of" page information

To generate a "list-of" page for a float environment, you need to add a `\listoffigures` or `\listoftables` command where you want the list to appear. This command also causes the appropriate captions and subcaptions to be written to a file with the extensions `lof` or `lot` respectively. If you want the sub-caption text to appear in the "list-of" page, you need to change the value of the counters `lofdepth` or `lotdepth` counters from their default of '1'. For example, to have the `subfigure` sub-captions to appear on the "list-of-figures," add the following to the preamble of your paper:

`\setcounter{`⟨*subfigure*⟩`}{2}`

If you want to change how the sub-caption appears on the "list-of" pages you can change its format by redefining the `\l@subfigure` or `\l@subtable` command. Usually you will want to use the `\@dottedxxxline` command (section 5.7, page 29) to help with the formatting. For instance the default value of `\l@subfigure` is:

```
\newcommand{\l@subfigure}{%
  \@dottedxxxline{\ext@subfigure}{2}{3.8em}{2.5em}}
```

To change the amount of space reserved for the label (if, for instance, you have a lot of figures) you could widen the 2.5em space for the label to 4.0em:

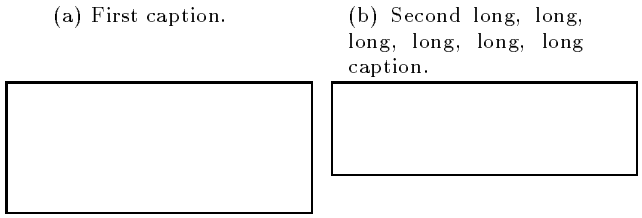
```
\makeatletter
  \renewcommand{\l@subfigure}{%
    \@dottedxxxline{\ext@subfigure}{2}{3.8em}{4.0em}}
\makeatother
```

The arguments of the `\@dottedxxxline` command are:

1. Type. The usual values are : `lof` or `lot`. The internal values `\ext@subfigure` and `\ext@subtable` stand for these extensions.
2. Level. By default this is '2' for the `subfigure` and `subtable`. If the level is greater than `\c@`<type>`depth` (where <type> is the first argument value), then no line is produced.
3. Indent. Total indentation from the left margin.
4. Numwidth. Width of box for the label number if the title has a `\numberline` command. This is also the amount of extra indentation added to second and later lines of a multiple line entry.
5. Title. Contents of entry.
6. Page. Page number.

The final two arguments, title and page, are automatically appended to the value of `\l@subfigure` (and symmetrically for `\l@subtable`).

Figure 27: Caption position option: [figtopcap] with changing settings of `\subfiguretopcap`.



4.5 Aligning Captions Above the Figure

For large captions, the caption portion looks unbalanced (see Figure 23). To get a more pleasing layout, as shown in Figure 27, you can use the `figtopcap` option as in Figure 23, but use two "empty" subfigures to position the captions followed by two more containing the figures, but without captions. The code to produce this example is:

```
\begin{figure}%
  \caption{Caption position option: [figtopcap] with changing
           settings of \subfiguretopcap.}%
  \label{fig:position3}%
  \begin{center}%
    \subfiguretopcapfalse
    \subfigure[First caption.]{\hbox to 1.5in{\hss}}%
    \hspace{0.1in}%
    \subfigure[Second long, long, long, long, long, long caption.]{%
      \hbox to 1.5in{\hss}}\\
    \subfiguretopcaptrue
    \hspace{0.1in}%
    \subfigure{\fbox{\hbox to 1.5in{\vbox to 15mm{\vfil\null}\hfil}}}%
    \hspace{0.1in}%
    \subfigure{\fbox{\hbox to 1.5in{\vbox to 10mm{\vfil\null}\hfil}}}%
  \end{center}%
\end{figure}
```

There are two problems with this approach, first, you need to change the setting of `\subfiguretopcap`, and second, if you have more than one row of subfigures or subtables, then you will need to fiddle with the counter (see section 4.3 to keep the numbers straight. The reason that this format is not supported by the subfigure package is that you need information about all of the subfigure or subtables on a row to box the figures correctly and this information is not available locally.

For the full picture, there are four flags defined to control how the caption labels are numbered and where the caption appears, two for the `\subfigure`

and two for the \subtable. The first tells the \subfigure or \subtable command that the related caption appears before or after the set of subfloats. \figuretopcaptrue and \tabletopcaptrue indicate that the caption appears before and \figureotopcapfalse and \tabletopcapfalse indicate that the it appears after. The other flags force the caption to be placed before (\subfiguretopcaptrue and \subtabletopcaptrue) or after the actual subfigure or subtable (\subfiguretopcapfalse and \subtabletopcapfalse).

4.6 Adding additional float environments

It is easy to add a new float environment. For instance, let us assume we have a new float environment called "map" in which various maps are displayed and for which a list-of-maps is to be generated in the contents section. If we wanted to have sub-maps, then we could define the following:

```
\makeatletter
  \newcounter{submap}[map]
  \newif\ifmaptopcap
  \newif\ifsubmaptopcap
  \newcommand{\thesubmap}{(\alph{submap})}
  \newcommand{\@thesubmap}{%
    {\subcapsize\subcaplabelfont\thesubmap}\space}
  \newcommand{\p@submap}{\themap}
  \newcommand{\ext@submap}{\ext@map}
  \newcommand{\l@submap}{\@dottedxxxline{\ext@submap}{2}{3.8em}{2.5em}}
  \newcounter{lomdepth}
  \setcounter{lomdepth}{1}
  \newcommand{\submap}{\subfigure}
  \newcommand{\@makesubmapcaption}{\@makesubfigurecaption}
\makeatother
```

4.7 Interaction with other parts of LaTeX

In the following sections, the interaction of the subfigure package with other parts of LaTeXis documented. These "other parts" may be either part of the the LaTeX base or contributed packages or classes.

4.7.1 TeX's "mouth"

The most important thing to remember when laying out your figures within a float environment is that spaces take room. If you have an extra space between two figures, then they will be separated by a little bit.

TeX's state varies as it reads a line of text from a file. It ignores some spaces and carrage-returns and converts others to \space's or \par's. You can use a '%' to insure that you only have real spaces where you want them. To understand which spaces are significant, you should read chapter 8 of the TeXbook [5]. However, the main source of unexpected extra spacing is carrage-returns which are turned in to

\space's. Take a look at the examples in section 3 for an example. As a general rule: if in doubt, then add a '%' immediately after the last significant character of the line.

4.7.2 The float environments

Although the subfigure package was designed to work within a float environment (e.g. `figure`), it can be used outside with the following two caveats:

1. You need to define `\@captype`. This is usually either "`figure`" or "`table`." For example add the following to the preamble of your document:

   ```
   \makeatletter
     \newcommand{\change_cap_type}[1]{%
       \renewcommand{\@captype}{#1}}
   \makeatother
   ```

   Then use the new command to switch in the middle of a given float environment, say from "figure" to "table" with the cammand `\change_cap_type{table}`.

2. If you want to define references using `\label`, then you need to redefine the LaTeX internal `\@currentlabel`. For example:

   ```
   \makeatletter
     \edef\@currentlabel{\p@subfigure\thesubfigure}
   \makeatother
   ```

4.7.3 The caption and captcont packages

The only packages that directly interact with the subfigure package are the caption/caption2 packages by H.A. Sommerfeldt [1, 2] and the captcont package by S.D. Cochran [3]. If you load the subfigure package **before** the caption package, then the caption will detect that fact and will change the `\subcapsize` when the options `scriptsize`, ..., `Large` are specified (overriding such options used when loading the subfigure package). In addition, it redefines `\@thesubfigure` and `\@thesubtable` to use `\captionlabelfont` rather than `\subcaplabelfont`.

If you **don't** want this behavior, then you must load the subfigure package **after** the caption package. However, the newer caption2 package doesn't interact in this way and the subfigure package may be loaded before or after (with the author's recommendation that it be loaded before).

The other package, captcont, may be used with or without the subfigure package to extend the figure or table numbering across multiple pages. This package knows about how the subfigure package interacts with the List-Of mechanism and does the right thing when used with subfigures.

4.7.4 Creating a subfigure environment

Some people have wanted to use the `verbatim` environnment within the `\subfigure` command and run into the restriction that the verbatim environment cannot be nested. To include verbatim text in a subfigure, you can define a new environment, in which verbatim text may be enclosed, and which calls the `\subfigure` command.

```
\newbox\subfigbox
\makeatletter
  \newenvironment{subfloat}%
    {\def\caption##1{\gdef\subcapsave{\relax##1}}%
     \let\subcapsave\@empty
     \setbox\subfigbox\hbox
       \bgroup}%
      {\egroup
     \subfigure[\subcapsave]{\box\subfigbox}}%
\makeatother
```

This environment may be used something like the following to produce Figure 28 (but note that you will need to supply the width of the `verbatim` section using a `minipage`).

```
\begin{figure}
  \begin{center}%
    \begin{subfloat}%
      \begin{minipage}{2.1in}
        \begin{verbatim}
   This text  should be
verbatim.     And   not
 messed with in any way  !
        \end{verbatim}
      \end{minipage}%
      \caption{First subcaption.}%
    \end{subfloat}%
    \goodgap
    \begin{subfloat}%
      \begin{minipage}{2.1in}
        \begin{verbatim}
  This text (also)should be
verbatim.     And   not
 messed with in any way  !
        \end{verbatim}
      \end{minipage}%
      \caption{Second subcaption.}%
    \end{subfloat}
  \end{center}
  \caption{This is an example of verbatim text in a subfigure.}
```

```
   This text  should be
 verbatim.     And   not
  messed with in any way  !
```

(a) First subcaption.

```
   This text (also)should be
 verbatim.     And   not
  messed with in any way  !
```

(b) Second subcaption.

Figure 28: This is an example of verbatim text in a subfigure.

```
  \label{fig:verbatim}
\end{figure}
```

5 The code

5.1 Identification

```
%%
%%  Identification
%%
\NeedsTeXFormat{LaTeX2e}[1994/12/01]
\ProvidesPackage{subfigure}[1998/01/27 v2.1 subfigure package]
\typeout{Package: subfigure 1998/01/27 v2.1F (beta)}

```

5.2 Initialization and Shared constants

\if@subcaphang
\if@subcapcenter
\if@subcapcenterlast
\if@subcapnooneline

These four flags control how the style in which the subfloat label and caption are printed.

```
%%
%%  Initial Code
%%
\newif\ifsubcaphang
\newif\ifsubcapcenter
\newif\ifsubcapcenterlast
\newif\ifsubcapnooneline

```

The following table gives the initial (default) values of the internals that are used to control the placement and printing of the subfloats.[3]

[3] The \subcapsize value is initialized in section 5.5.1 along with the caption flags.

Macro	Default	Description
`\subfigtopskip`	5pt	Length from the top of the sub-float box to the begining of the `figure`.
`\subfigcapskip`	8pt	Length from the bottom of the `figure` to the begining of the `caption`.
`\subfigbottomskip`	5pt	Length from the bottom of the `caption` to the bottom of the subfloat.
`\subfigcapmargin`	8pt	Indentation of the caption from the sides of the subfloat box (This should always be positive).
`\subcapsize`	`\footnotesize`	Size for the text portion `caption` font.
`\subcaplabelfont`		Font for the label portion of the `caption`.
`\subcapfont`		Font for the text portion of the `caption`.

```
\newcommand{\subfigtopskip}{5pt}
\newcommand{\subfigcapskip}{8pt}
\newcommand{\subfigbottomskip}{5pt}
\newcommand{\subfigcapmargin}{10pt}
\newcommand{\subcapsize}{} % Set to default value by \ExecuteOptions.
\newcommand{\subcaplabelfont}{}
\newcommand{\subcapfont}{}

```

5.3 Subfigure constants

`\c@subfigure` Subfigure counter.

```
\newcounter{subfigure}[figure]
```

`\iffiguretopcap` `\figuretopcaptrue` `\figuretopcapfalse` `\ifsubfiguretopcap` `\subfiguretopcaptrue` `\subfiguretopcapfalse` These define the form that the sub-caption prefix is generated. The boolean `\ifsubfiguretopcap` works with the numbering of the label and uses the current `figure` counter value if true and the next value if false.

```
\newif\iffiguretopcap
\newif\ifsubfiguretopcap

```

`\thesubfigure` `\@thesubfigure` `\p@subfigure` The `\thesubfigure` macro defines the basic label for text references (prefixed by `\p@subfigure`), while the `\@thesubfigure` macro defines what appears under the subfigure. In the case of a conflict between this package and a prior one over the definition of `\thesubfigure`, this package will win.

```
\def\thesubfigure{(\alph{subfigure})}
\newcommand{\@thesubfigure}{{\subcapsize\subcaplabelfont\thesubfigure}\space}
\let\p@subfigure\thefigure

```

\ext@subfigure
\l@subfigure
\c@lofdepth

These define how and if the subfigure caption will appear in a list-of-figures file. `\ext@subfigure` defines the default subfigure file extension (which is the same as `\ext@figure` — the list-of-figures file). `\l@subfigure` shows how to print an `lof` subfigure line and defines that line at level two. `\c@lofdepth` is an extension of the table-of-contents depth value and controls the depth to which captions in the file are printed to the actual page. By default, the sub-captions are not printed.

```
\let\ext@subfigure\ext@figure
\newcommand{\l@subfigure}{%
  \@dottedxxxline{\ext@subfigure}{2}{3.8em}{2.5em}}
\newcounter{lofdepth}
\setcounter{lofdepth}{1}

```

5.4 Subtable constants

\c@subtable

Subtable counter.

```
\newcounter{subtable}[table]

```

\iftabletopcap
\tabletopcaptrue
\tabletopcapfalse
\ifsubtabletopcap
\subtabletopcaptrue
\subtabletopcapfalse

These define the form that the sub-caption prefix is generated. The boolean `\ifsubtabletopcap` works with the numbering of the label and uses the current `table` counter value if true and the next value if false.

```
\newif\iftabletopcap
\newif\ifsubtabletopcap

```

\thesubtable
\@thesubtable
\p@subtable

The `\thesubtable` macro defines the basic label for text references (prefixed by `\p@subtable`), while the `\@thesubtable` macro defines what appears under the subtable. In the case of a conflict between this package and a prior one over the definition of `\thesubtable`, this package will win.

```
\def\thesubtable{(\alph{subtable})}
\newcommand{\@thesubtable}{{\subcapsize\subcaplabelfont\thesubtable}\space}
\let\p@subtable\thetable

```

\ext@subtable
\l@subtable
\c@lotdepth

These define how and if the subtable caption will appear in a list-of-tables file. `\ext@subtable` defines the default subtable file extension (which is the same as `\ext@table` — the list-of-tables file). `\l@subtable` shows how to print an `lot` subtable line and defines that line at level two. `\c@lotdepth` is an extension of the table-of-contents depth value and controls the depth to which captions in the file are printed to the actual page. By default, the sub-captions are not printed.

```
\let\ext@subtable\ext@table
```

```
\newcommand{\l@subtable}{%
  \@dottedxxxline{\ext@subtable}{2}{3.8em}{2.5em}}
\newcounter{lotdepth}
\setcounter{lotdepth}{1}

```

5.5 Declaration of options

The following options allow general compatibility with the caption package by H.A. Sommerfeldt [1]. There are five different sub-caption options supported: `normal`, `hang` (or `isu`), `center`, `centerlast` (or `anne`) and `nooneline`. The `hang` sub-caption may be combined with the `center` or `centerlast` options. The `nooneline` may be combined with any of the other options (but it's effect is negated or looks bad with either of `center` or `centerlast` unless the `hang` option is also used).

```
%%
%% Declaration of Options
%%
\DeclareOption{normal}{%
  \subcaphangfalse
  \subcapcenterfalse
  \subcapcenterlastfalse
  \subcapnoonelinefalse}
\DeclareOption{hang}{\subcaphangtrue}
\DeclareOption{center}{\subcapcentertrue}
\DeclareOption{centerlast}{\subcapcenterlasttrue}
\DeclareOption{nooneline}{\subcapnoonelinetrue}

\DeclareOption{isu}{\ExecuteOption{hang}}
\DeclareOption{anne}{\ExecuteOption{centerlast}}
```

There are options for six different font sizes available.

```
\DeclareOption{scriptsize}{\renewcommand{\subcapsize}{\scriptsize}}
\DeclareOption{footnotesize}{\renewcommand{\subcapsize}{\footnotesize}}
\DeclareOption{small}{\renewcommand{\subcapsize}{\small}}
\DeclareOption{normalsize}{\renewcommand{\subcapsize}{\normalsize}}
\DeclareOption{large}{\renewcommand{\subcapsize}{\large}}
\DeclareOption{Large}{\renewcommand{\subcapsize}{\Large}}

```

There are eighteen options available to set the font attributes of the sub-caption labels. The first nine affect only the caption label. The other nine affect the entire caption.

```
\DeclareOption{rm}{\renewcommand{\subcaplabelfont}{\rmfamily}}
\DeclareOption{sf}{\renewcommand{\subcaplabelfont}{\sffamily}}
\DeclareOption{tt}{\renewcommand{\subcaplabelfont}{\ttfamily}}
\DeclareOption{md}{\renewcommand{\subcaplabelfont}{\mdseries}}
\DeclareOption{bf}{\renewcommand{\subcaplabelfont}{\bfseries}}
\DeclareOption{up}{\renewcommand{\subcaplabelfont}{\upshape}}
\DeclareOption{it}{\renewcommand{\subcaplabelfont}{\itshape}}
```

```
\DeclareOption{sl}{\renewcommand{\subcaplabelfont}{\slshape}}
\DeclareOption{sc}{\renewcommand{\subcaplabelfont}{\scshape}}

\DeclareOption{RM}{\ExecuteOptions{rm}\renewcommand{\subcapfont}{\rmfamily}}
\DeclareOption{SF}{\ExecuteOptions{sf}\renewcommand{\subcapfont}{\sffamily}}
\DeclareOption{TT}{\ExecuteOptions{tt}\renewcommand{\subcapfont}{\ttfamily}}
\DeclareOption{MD}{\ExecuteOptions{md}\renewcommand{\subcapfont}{\mdseries}}
\DeclareOption{BF}{\ExecuteOptions{bf}\renewcommand{\subcapfont}{\bfseries}}
\DeclareOption{UP}{\ExecuteOptions{up}\renewcommand{\subcapfont}{\upshape}}
\DeclareOption{IT}{\ExecuteOptions{it}\renewcommand{\subcapfont}{\itshape}}
\DeclareOption{SL}{\ExecuteOptions{sl}\renewcommand{\subcapfont}{\slshape}}
\DeclareOption{SC}{\ExecuteOptions{sc}\renewcommand{\subcapfont}{\scshape}}

```

There are eight options available to control the caption placement and the proper numbering in association with the figure or table caption placement. The first four affect only the caption numbering by informing the internals that the associated figure or table caption appears before or after the subfloat. The second four do this and, in addition, shift the subfloat caption to the bottom or top of the subfloat. The `\subfigure` and `\subtable` commands each have a set of flags since it is often the case that a document style requires that figure captions follow the figure and table captions preceed the table.

```
\DeclareOption{figbotcap}{\figuretopcapfalse}
\DeclareOption{figtopcap}{\figuretopcaptrue}
\DeclareOption{tabbotcap}{\tabletopcapfalse}
\DeclareOption{tabtopcap}{\tabletopcaptrue}

\DeclareOption{FIGBOTCAP}{\ExecuteOptions{figbotcap}\subfiguretopcapfalse}
\DeclareOption{FIGTOPCAP}{\ExecuteOptions{figtopcap}\subfiguretopcaptrue}
\DeclareOption{TABBOTCAP}{\ExecuteOptions{tabbotcap}\subtabletopcapfalse}
\DeclareOption{TABTOPCAP}{\ExecuteOptions{tabtopcap}\subtabletopcaptrue}

```

5.5.1 Execution of options

The `normal` type of sub-caption is preselected and the standard sub-caption size is set to `\footnotesize`. Also, the subcaptions for the subfigure and subtable are placed after the figure box and it is assumed that the figure or table caption follows all of the associated subfloats.

```
%%
%% Execution of Options
%%
\ExecuteOptions{normal,footnotesize,FIGBOTCAP,TABBOTCAP}
\InputIfFileExists{subfigure.cfg}{}{}
\ProcessOptions

```

5.6 The subfigure/subtable body

\subfigure
\subtable
\@subfigure

These macros act as cover functions for the \@subfloat macro. They insure that the proper counter is used and has the correct value. Since the caption is usually generated later, we must locally anticipate the future value of its counter by adding one to it within a local group. Upon leaving the \subfigure or \subtable macro, the old value is restored.

```
%%
%% Main Code
%%
\newcommand{\subfigure}{%
  \bgroup
    \csname if\@captype topcap\endcsname\else
      % If the regular caption is usually generated later, we
      % must locally anticipate the future value of its counter.
      \advance\csname c@\@captype\endcsname\@ne
    \fi
    \refstepcounter{sub\@captype}%
    \@ifnextchar [%
      {\@subfigure}%
      {\@subfigure[\@empty]}}

\let\subtable\subfigure

\def\@subfigure[#1]{%
  \@ifnextchar [%
    {\@subfloat{sub\@captype}[#1]}%
    {\@subfloat{sub\@captype}[\@empty#1][#1]}}

```

\@subfloat

This is the common code for setting up the subfloat box and drawing the sub-caption under it. It first determines width of the figure or table by placing it in a box. This box is combined with the top margin (\subfigtopskip) and placed as the height portion of the output "vbox." The depth of this box is determined by the existence of a sub-caption. If one exists, then the depth is made up of the sub-caption spacing (\subfigcapskip), the height+depth of the sub-caption and the bottom margin (\subfigbottomskip). If no sub-caption exists, then the depth of the output "vbox" is just the bottom margin (see the illustration in section 4.1).

The first argument is the type of object being generated: that is, a subfigure or a subtable. The second and third are the caption and figure arguments from the calling \subfigure or \subtable command.

```
\def\@subfloat#1[#2][#3]#4{%
    % Check the environment to see what to do about the topskip.
    \if@minipage
      \@tempcnta=\z@
    \else\ifdim\lastskip=\z@
      \@tempcnta=1
    \else
      \@tempcnta=2
```

```
\fi\fi
\leavevmode
% Swap the top and bottom skips if TOPCAP.
\csname if#1topcap\endcsname
  \def\subfig@top{\subfigbottomskip}%
  \def\subfig@bottom{\subfigtopskip}%
\else
  \def\subfig@top{\subfigtopskip}%
  \def\subfig@bottom{\subfigbottomskip}%
\fi
% Build the actual subfigure here and save until needed.
\setbox\@tempboxa \hbox{#4}%
\@tempdima=\wd\@tempboxa
% Begin building the subfigure box.
\vtop\bgroup
  \vbox\bgroup
    \ifcase\@tempcnta
      % If at the top of a float or minipage, don't add space.
    \or
      % If inside a box or the first box of the non-first line
      % of a float or minipage, add the full topskip.
      \vskip\subfig@top
    \or
      % Add the topskip only if is larger than the lastskip, else,
      % if the lastskip was negative and the topskip is positive,
      % then remove the lastskip and add the topskip.
      \@tempskipb\subfig@top\@xaddvskip
    \fi
    % Decide if the caption is before or after the figure and
    % place both in the vtop.  The bottom of whichever is first
    % becomes the baseline for the vbox.
    \csname if#1topcap\endcsname
      %% Next add the caption paragraph (if any) to the top box.
      %%   (unless #3 == \@empty)
      \ifx \@empty#3\relax \else
        \@subcaption{#1}{#2}{#3}%
        \vskip\subfigcapskip
      \fi\egroup
      %% Then put the figure in the bottom box.
      \box\@tempboxa
    \else
      %% Put the figure in the top box.
      \box\@tempboxa\egroup
      %% Now add the caption paragraph (if any).
      %%   (unless #3 == \@empty)
      \ifx \@empty#3\relax \else
        \vskip\subfigcapskip
        \@subcaption{#1}{#2}{#3}%
      \fi
    \fi
```

```
      %% Finally add the bottom spacing.
      \vskip\subfig@bottom
    \egroup
  \egroup}
```

\@subfigcaptionlist
\@subcaption
\listsubcaptions
\@listsubcaptions

The following series of macros control exactly how the sub-caption is typeset. The `\@subcaption` macro adds the sub-caption to the current list of sub-captions to be added to the "list-of" page as soon as the major caption is declared (see `\@caption` below). (NOTE: Only one list is kept because that seems right; if there is a mix of tables and figures, they will be grouped under the next `\caption`.

Next `\@subcaption` calls the appropriate float-type specific macro to decide how to size and shape the sub-caption text.

```
\newcommand{\@subfigcaptionlist}{}

\newcommand{\@subcaption}[3]{%
  \ifx \relax#2\relax \else
    \bgroup
      \let\label\@gobble
      \let\protect\string
      \def\@subcaplabel{\csname the#1\endcsname}%
      \xdef\@subfigcaptionlist{%
        \@subfigcaptionlist,%
        {\protect\numberline{\@subcaplabel}\noexpand{\ignorespaces #2}}}%
    \egroup
  \fi
  \@nameuse{@make#1caption}{\@nameuse{@the#1}}{#3}}

\def\listsubcaptions{%
  \@ifstar
    {\gdef\@subfigcaptionlist{}}%
    {\@listsubcaptions{\@captype}}}

\def\@listsubcaptions#1{%
  \@for \@tempa:=\@subfigcaptionlist \do {%
    \ifx\@empty\@tempa\relax \else
      \addcontentsline
        {\@nameuse{ext@sub#1}}%
        {sub#1}%
        {\@tempa}%
    \fi}%
  \gdef\@subfigcaptionlist{}}
```

\@makesubfigurecaption
\@makesubtablecaption

By default, the `\@subfigurecaption` and `\@subtablecaption` macros are identical. Unlike the standard `\@makecaption` macro, we assume that the first argument (the label number produced by the `\@thesubfigure` or the `\@thesubtable`) contains any trailing separator characters or spacing (which makes it easier to customize).

The `\@makesubfigurecaption` macro first checks the size of the caption typeset as a single line. If it will fit under the subfigure with the given `\subfigcapmargin`, then we are done. Otherwise, the sub-caption is set with multiple lines either with or without the label hanging.

```
\newcommand{\@makesubfigurecaption}[2]{%
  \setbox\@tempboxa\hbox{%
    #1%
    {\subcapsize\subcapfont
\ignorespaces #2}}%
  \@tempdimb=-\subfigcapmargin
  \multiply\@tempdimb\tw@
  \advance\@tempdimb\@tempdima
    \hbox to\@tempdima{%
      \hfil
      \ifdim \wd\@tempboxa >\@tempdimb
        \subfig@caption{#1}{#2}%
      \else\ifsubcapnooneline
        \subfig@caption{#1}{#2}%
      \else
        \box\@tempboxa
      \fi\fi
      \hfil}}

\let\@makesubtablecaption\@makesubfigurecaption

```

`\subfig@caption` `\subfig@captionpar`

These macros are called to typeset a multiple-line sub-caption (or a single line when `subcapnooneline` is true). Depending on the `subcapcenter` and `subcapcenterlast` flags, the text will be justified (both false), centered (`subcapcenter` true), or justified with the last line centered (only the flag `subcapcenterlast` set true).

```
\newcommand{\subfig@caption}[2]{%
  \ifsubcaphang
    \sbox{\@tempboxa}{#1}%
    \addtolength{\@tempdimb}{-\wd\@tempboxa}%
    \usebox{\@tempboxa}%
    \subfig@captionpar{\@tempdimb}{#2}%
  \else
    \subfig@captionpar{\@tempdimb}{#1#2}%
  \fi}

\newcommand{\subfig@captionpar}[2]{%
  \parbox[t]{#1}{%
    \subcapsize\subcapfont
    \strut
    \ifsubcapcenter
      \setlength{\leftskip}{\@flushglue}%
      \setlength{\rightskip}{\@flushglue}%
      \setlength{\parfillskip}{\z@skip}%
```

```
    \else\ifsubcapcenterlast
      \addtolength{\leftskip}{0pt plus 1fil}%
      \addtolength{\rightskip}{0pt plus -1fil}%
      \setlength{\parfillskip}{0pt plus 2fil}%
    \fi\fi
    \ignorespaces #2}}
```

5.7 Patches to the standard environment

The following adjust the standard environment for the `\subfigure` and `\subtable` macros. They are designed as wrappers to the current definition of the standard commands to minimize any chance of conflict with other packages.

`\@dottedxxxline` This is a generalized wrapper for the `\@dottedtocline` macro. It checks for the level based on the output file (first argument) and not using only `\@tocdepth`. (See section 4.4 for a description of the arguments.)

```
\newcommand{\@dottedxxxline}[6]{%
  \ifnum #2>\@nameuse{c@#1depth}\else
    \@dottedtocline{0}{#3}{#4}{#5}{#6}
  \fi}
```

`\subfig@end@float` `\subfig@end@dblfloat` `\end@float` `\end@dblfloat` These commands patch the end of the float environemnt so that it will dump out the subcaptions if any remain at this point. This can occur when using the TOPCAP options.

```
\let\subfig@end@float\end@float

\renewcommand{\end@float}{%
  \@listsubcaptions{\@captype}%
  \subfig@end@float}

\let\subfig@end@dblfloat\end@dblfloat

\renewcommand{\end@dblfloat}{%
  \@listsubcaptions{\@captype}%
  \subfig@end@dblfloat}
```

`\subfig@oldcaption` `\@caption` Next, we redefine the current `\@caption` macro to dump any sub-captions saved. First the 'old' caption macro is called to add the line to the list-of file and then the list of sub-captions, `\@subfigcaptionlist` is written to the same file. Lastly, the `\@subfigcaptionlist` is reinitialized.

```
\let\subfig@oldcaption\@caption

\long\def\@caption#1[#2]#3{%
  \csname if#1topcap\endcsname
    \@listsubcaptions{#1}%
    \subfig@oldcaption{#1}[{#2}]{#3}%
  \else
```

```
    \subfig@oldcaption{#1}[{#2}]{#3}%
    \@listsubcaptions{#1}%
  \fi}
```

References

[1] Harald Axel Sommerfeldt, *The* caption *package*, 1995/04/05.

[2] Harald Axel Sommerfeldt, *The* caption *package*, 1995/10/09.

[3] Steven Douglas Cochran, *The* captcont *package*, 1997/01/22.

[4] Leslie Lamport, *LaTeX User's Guide and Reference Manual*, 2nd edition, Addison-Wesley, Reading, Massachusetts, 1994.

[5] Donald Ervin Knuth, *The TEXbook*, Addison-Wesley, Reading, Massachusetts, 1986.