The subcaption package*

Axel Sommerfeldt
https://gitlab.com/axelsommerfeldt/caption

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Abstract

This package supports typesetting of sub-captions (by using the the sub-caption feature of the caption package).

⚠ At the end of each section, text marked with the mountain symbol will contain background knowledge on how the particular command or environment is actually implemented. If you just want to use this package as it is, you don’t have to read or understand them.

⚠ This package demonstrates the usage of \DeclareCaptionSubType, \captionsetup{sub-type}, and the internal hook \caption@subtypehook (offered by the caption package).

⚠⚠ Please note: This package is incompatible with the subfigure and subfig packages.

*This package has version number v1.3.
1 Loading the package

Load this package using
\usepackage\{subcaption\} .

The options for the subcaption package are the same ones as for the caption package, but specify settings which are used for sub-captions additionally. In fact
\usepackage\{subcaption\}
is identical to
\usepackage\{subcaption\}
\captionsetup\{sub\}\{\options\} .

The default settings for subcaptions are:

\margin=0pt,\size=smaller,\labelformat=parens,\labelsep=space,\skip=6pt,\list=false,\hypcap=false

Options specified with \usepackage\{subcaption\} and \captionsetup\{sub\}\{\options\} will override the ones specified by \captionsetup\{\options\} and \captionsetup\{figure\}\{\options\}, but are again overwritten by \captionsetup\{subfigure\}\{\options\} (same for ‘table’). So finally we have the following order how settings for sub-captions are applied:

1. Global settings (\usepackage\{caption\} and \captionsetup\{\options\})
2. Environmental settings (\captionsetup\{figure\} or \captionsetup\{table\}\{\options\})
3. Local settings (\captionsetup\{\options\} inside figure or table environment)
4. Default ‘sub’ settings (\margin=0pt,\size=smaller,\ldots, see above)
5. Custom ‘sub’ settings (\usepackage\{subcaption\} and \captionsetup\{sub\}\{\options\})
6. Environmental ‘sub’ settings (\captionsetup\{subfigure\} or \captionsetup\{subtable\}\{\options\})
7. Local ‘sub’ settings (\captionsetup\{\options\} inside subfigure or subtable)

An example:
\usepackage\{labelsep=quad,indention=10pt\}\caption*\{\usepackage\{labelfont=bf,\list=true\}\caption*\{\usepackage\{subcaption\}
\captionsetup\{table\}\{\textfont=it,position=top\}
\captionsetup\{subtable\}\{\textfont=sf\}

causes the captions inside subtable environments to be typeset with the settings

indention=10pt,position=top,margin=0pt,font=small,\labelformat=parens,\labelsep=space,\skip=6pt,\hypcap=false,\labelfont=bf,\list=true,\textfont=sf .

\footnote{This means that sub-captions are not listed in the List of Figures or Tables by default, but you can enable that by specifying the option list=true.}
The easiest way to apply a sub-caption is by using the \subcaptionbox command, which automatically aligns the sub-figures resp. sub-tables by their very first caption line. Its syntax is:

\subcaptionbox{⟨list entry⟩}{⟨heading⟩}{⟨width⟩}{⟨inner-pos⟩}{⟨contents⟩}
\subcaptionbox*{⟨heading⟩}{⟨width⟩}{⟨inner-pos⟩}{⟨contents⟩}

The arguments ⟨list entry⟩ & ⟨heading⟩ will be used for typesetting the \caption. ⟨width⟩ is the width of the resulting \parbox; the default value is the width of the contents. ⟨inner-pos⟩ specifies how the contents will be justified inside the resulting \parbox; it can be either ‘c’ (for \centering), ‘l’ (for \raggedright), ‘r’ (for \raggedleft), or ‘s’ (for no special justification). The default is ‘c’. (But you can use any justification defined with \DeclareCaptionJustification as well, e.g. ‘centerlast’.)

Using \subcaptionbox, the baseline of the resulting box will be placed right between contents and heading, so usually you don’t have to care about the vertical alignment of the sub-figures for yourself. Also the hyperlink anchor is placed properly with respect to the \hypcap= setting.

One example:

\begin{figure}
\centering
\subcaptionbox{A cat\label{cat}}{\includegraphics{cat}}
\subcaptionbox{An elephant\label{elephant}}{\includegraphics{elephant}}
\caption{Two animals}\label{animals}
\end{figure}

gives the result:

(a) A cat  (b) An elephant

Figure 1: Two animals  

2The pictures were taken with permission from the \LaTeX Companion[1] examples.
As you see the result is not satisfying; the caption below the cat looks ugly because of the small width of the graphic. This can be solved by using the optional arguments of \subcaptionbox, increasing the width of the resulting box:

```
\subcaptionbox{A cat\label{cat}}
[2.5cm]{\includegraphics{cat}}
```

(a) A cat  
(b) An elephant

Figure 2: Two animals

Furthermore the main caption, which is centered with respect to the \textwidth, looks mis-aligned with respect to the sub-captions. This can (again) be solved by using the optional arguments of \subcaptionbox, giving both boxes the same width, for example:

```
\subcaptionbox{A cat\label{cat}}
[.4\linewidth]{\includegraphics{cat}}
\subcaptionbox{An elephant\label{elephant}}
[.4\linewidth]{\includegraphics{elephant}}
```

(a) A cat  
(b) An elephant

Figure 3: Two animals

\begin{itemize}
\item The \subcaptionbox is a \parbox with \setcaptionsubtype as first contents line.
\end{itemize}
3 The subfigure & subtable environments

After loading the subcaption package the new environments subfigure and subtable are available, which have the same (optional & mandatory) arguments as the minipage environment:

\begin{subfigure}[⟨outer-pos⟩][⟨height⟩][⟨inner-pos⟩]{⟨width⟩}
...
\end{subfigure}

and

\begin{subtable}[⟨outer-pos⟩][⟨height⟩][⟨inner-pos⟩]{⟨width⟩}
...
\end{subtable}

Inside these environments you use the ordinary caption command for typesetting captions. So this example is the same as the last one, but uses the subfigure environment:

\begin{figure}
\begin{subfigure}[b]{.5\linewidth}
\centering
\large A
\caption{A subfigure}\label{fig:1a}
\end{subfigure}
\begin{subfigure}[b]{.5\linewidth}
\centering
\large B
\caption{Another subfigure}\label{fig:1b}
\end{subfigure}
\caption{A figure}\label{fig:1}
\end{figure}

Some additional notes:

• You can override the settings for a specific subcaption with a \captionsetup inside the subfigure or subtable environment, e.g.:

\begin{subfigure}[b]{.5\linewidth}
\centering
\large A
\captionsetup{skip=3pt}
\caption{A subfigure}\label{fig:1a}
\end{subfigure}

• Hyperlinks targeted to this subfigure will jump to the beginning of the subfigure, and not to the caption of the subfigure (if hypcap=true is set for sub-captions). (See section 6.5: Where do hyperlinks jump?)

Beside the ⟨outer-pos⟩ values of ‘c’, ‘t’, and ‘b’, the subcaption package also offers the values ‘T’ and ‘B’ additionally which align the subfigure at the very top resp. bottom. (In contrast ‘t’ and ‘b’ align the subfigure at the top resp. bottom baseline.)
The subfigure & subtable environments are just simple minipage environments with \setcaptionsubtype as first contents line. These environments are defined with the help of \caption@For{subtypelist}, which executes code for every sub-type declared with \DeclareCaptionSubType.

4 The \texttt{\subcaption} command

The most flexible way to apply a sub-caption is by using the \texttt{\subcaption} command. Its syntax is analogous to the one of the \texttt{\caption} command and shares its features:

\begin{verbatim}
\subcaption{⟨list entry⟩}{⟨heading⟩}
\subcaption*{⟨heading⟩}
\end{verbatim}

Please note that the \texttt{\subcaption} command must be applied inside its own box or environment.

An example:

\begin{verbatim}
\begin{figure}
\begin{minipage}[b]{.5\linewidth}
\centering\large A
\subcaption{A subfigure}\label{fig:1a}
\end{minipage}\
\begin{minipage}[b]{.5\linewidth}
\centering\large B
\subcaption{Another subfigure}\label{fig:1b}
\end{minipage}
\caption{A figure}\label{fig:1}
\end{figure}
\end{verbatim}

gives the result:

\begin{figure}
\centering
\begin{minipage}{.5\linewidth}
A
\subcaption{A subfigure}\label{fig:1a}
\end{minipage}\
\begin{minipage}{.5\linewidth}
B
\subcaption{Another subfigure}\label{fig:1b}
\end{minipage}
\caption{A figure}\label{fig:1}
\end{figure}

Figure 4: A figure

Prepared with \texttt{\DeclareCaptionSubType} (offered by the caption package), the caption package command \texttt{\setcaptionsubtype} becomes available. Analogous to the \texttt{\setcaptiontype} command of the caption package, the \texttt{\setcaptionsubtype} command sets the sub-type of the box or environment (so \texttt{\caption} will typeset a sub-caption instead of an ordinary one), places a proper hyperlink anchor (non-starred variant only), executes options associated with the sub-type etc.

The \texttt{\subcaption} command is just a simple combination of \texttt{\setcaptionsubtype*} and \texttt{\caption}. 

7
5 The `\DeclareCaptionSubType` command

For using the sub-caption feature of the `caption` package some commands and counters must be prepared. This is done with

\begin{verbatim}
\DeclareCaptionSubType{⟨numbering scheme⟩}{⟨type⟩}
\DeclareCaptionSubType*[⟨numbering scheme⟩]{⟨type⟩}
\end{verbatim}

For the environments `figure` & `table`, and all the ones defined with `\DeclareFloatingEnvironment` offered by the `newfloat` package, this will be done automatically, but for other environments (e.g. the ones defined with `\newfloat` offered by the `float` package or `\DeclareNewFloatType` offered by the `floatrow` package) this has to be done manually.

The starred variant provides the sub-caption numbering format ⟨type⟩.⟨subtype⟩ (e.g. ‘1.2’) while the non-starred variant simply uses ⟨subtype⟩ (e.g. ‘a’).

Own numbering formats can be created by redefining `\thesub⟨type⟩`, e.g.

\begin{verbatim}
\DeclareCaptionSubType*[⟨numbering scheme⟩]{⟨type⟩}
\renewcommand\thesub⟨type⟩{\the⟨numbering scheme⟩\alph{sub⟨numbering scheme⟩}}
\end{verbatim}

would give you sub-caption numbers like ‘1b’.

The default numbering scheme is `alph`, but you can use any \LaTeX (or self-defined) command name here which converts a counter to a text value, e.g. `arabic`, `roman`, `Roman`, `alph`, `Alph`, `fnsymbol`, ...

But `\DeclareCaptionSubType` is not only for defining new sub-caption types, you can use this command for re-definitions as well, e.g.

\begin{verbatim}
\DeclareCaptionSubType*[arabic]{table}
\captionsetup[subtable]{labelformat=simple,labelsep=colon}
\end{verbatim}

will give you sub-captions in tables like these ones:

\begin{table}
\centering
\begin{tabular}{|ll|ll|}
\hline
1.1: & Table one & 1.2: & Table two \\
\hline
A & B & E & F \\
C & D & G & H \\
\hline
\end{tabular}
\caption*{Table 1: Two tables}
\end{table}

`\DeclareCaptionSubType` is an integral part of the `caption` package kernel.
6 References

The macro \texttt{\textbackslash the(counter)} is not only responsible for the look of the \texttt{(counter)}, but for the look of the references typeset with \texttt{\textbackslash ref}, too. References will be prefixed by \LaTeX{} with the internal macro \texttt{\textbackslash p@\textbackslash (counter)}.

\texttt{\textbackslash DeclareCaptionSubType} will define both of them for sub-captions (e.g. sub-figure and subtable), and as you have seen in the last section \texttt{\textbackslash DeclareCaptionSubType} will give you some options to control the internal (re-)definition of \texttt{\textbackslash the(counter)} and \texttt{\textbackslash p@\textbackslash (counter)}.

\texttt{\thesubfigure} and \texttt{\p@subfigure} are (as default) internally defined as

\begin{verbatim}
\newcommand\thesubfigure{\alph{subfigure}}
\newcommand\p@subfigure{\thefigure}
\end{verbatim}

so the label of sub-captions will look like ‘a’ (decorated by the selected label format), while references will look like ‘1a’ since they are prefixed by \texttt{\p@subfigure = \textbackslash thefigure}.

After \texttt{\textbackslash DeclareCaptionSubType\*\{arabic\}\{figure\}}, \texttt{\thesubfigure} and \texttt{\p@subfigure} will look like

\begin{verbatim}
\renewcommand\thesubfigure{\thefigure.\arabic{subfigure}}
\renewcommand\p@subfigure{}
\end{verbatim}

But if you want detailed control on how the references will look like, the options of \texttt{\textbackslash DeclareCaptionSubType} are potentially not sufficient. In this case one need to redefine these two macros on his/her own. Some examples:

If you want parentheses around the sub-figure part of the reference, so they will look like ‘1(a)’, you may get them this way:

\begin{verbatim}
\usepackage[labelformat=simple]{subcaption}
\renewcommand\thesubfigure{\langle\textbackslash alph\{subfigure}\rangle}
\end{verbatim}

(Note: Since \texttt{parens} is the default label format you will get double parentheses in sub-captions when not specifying a different label format, e.g. simple.)

But if you want only a closing parenthesis, so references will look like ‘1a)’, but the sub-captions itself should still look like ‘(a)’, this would be a possible solution:

\begin{verbatim}
\usepackage{subcaption}
\renewcommand\thesubfigure{\langle\textbackslash alph\{subfigure\}\rangle}
\DeclareCaptionLabelFormat{opening}{(#2}
\captionsetup[subfigure]{labelformat=opening}
\end{verbatim}

(Please note that you need to surround redefinitions of \texttt{\textbackslash p@\textbackslash (counter)} with \texttt{\textbackslash makeatletter} and \texttt{\textbackslash makeatother}. See \url{http://tex.stackexchange.com/questions/8351/} for details.)
6.1 The \texttt{\subref} command

While \texttt{\ref{⟨key⟩}} (and \texttt{\ref*{⟨key⟩}}, if the \texttt{hyperref} package is used) usually gives a combined result representing the main caption counter and the sub-caption one, it is sometimes useful to have a reference to the sub-caption only. For this purpose you can use

\texttt{\subref{⟨key⟩}} \texttt{\subref*{⟨key⟩}}

3. So for example \texttt{\ref{cat}} gives the result ‘1a’ but \texttt{\subref{cat}} gives ‘a’.

\textit{Note:} If the sub-caption was (re-)defined with the starred variant \texttt{\DeclareCaptionSubType*}, both \texttt{\ref} and \texttt{\subref} usually gives the same result.

\textbf{The \texttt{\subref} command demonstrates the usage of \texttt{\caption@subtypehook} which will be called during \texttt{\captionsetup{subtype}}.}

6.2 The \texttt{subrefformat=} option

By applying \texttt{\DeclareCaptionSubType}, or by redefining \texttt{\the⟨counter⟩} and \texttt{\p@⟨counter⟩}, you will change the look of references typeset with \texttt{\ref} and \texttt{\subref}. But maybe you only want to change the output of \texttt{\subref} without affecting the references typeset with \texttt{\ref}? This is possible, too, by using the option \texttt{subrefformat}:

\texttt{\captionsetup{subrefformat={⟨label format⟩}}}

This one will choose a label format (either a pre-defined one, or a one defined with \texttt{\DeclareCaptionLabelFormat}) as decorative element to sub-references. The default one is \texttt{simple} which has no decorative elements but simply typeset the reference as it is.

For example

\texttt{\captionsetup{subrefformat=pars}}

will result in references (typeset with \texttt{\ref}) like ‘1a’ but sub-references (typeset with \texttt{\subref}) like ‘(a)’.

6.3 Referencing sub-figures without sub-captions

If you don’t want to give a sub-figure a caption, because the picture itself already contains the caption, or for some other reason, you can use the command

\texttt{\phantomsubcaption}

instead of \texttt{\subcaption}, or – when inside a subfigure or subtable environment – \texttt{\phantomcaption} instead of \texttt{\caption}. \texttt{\phantomsubcaption} and \texttt{\phantomcaption} do not have any arguments, and they do not generate any output, but give you an anchor for a \texttt{\label} command which can be placed afterwards. Furthermore it increases the sub-figure resp. sub-table counter.

Please note that – just like \texttt{\subcaption} – the \texttt{\phantomsubcaption} command \textit{must} be applied inside its own group, box, or environment.

\textit{3Like \texttt{\ref*}, \texttt{\subref*} is only available if the \texttt{hyperref} package is used.}
An example:

\begin{figure}
  \centering
  \includegraphics{cat_with_a}
  \phantomsubcaption\label{cat}
  \includegraphics{elephant_with_b}
  \phantomsubcaption\label{elephant}
  \caption{Two animals: \subref{cat} a huge cat, and \subref{elephant} an elephant}
\end{figure}

Figure 5: Two animals: (a) a huge cat, and (b) an elephant

6.4 Where to place the \texttt{label} command?

When using \texttt{\subcaption} or \texttt{\phantomsubcaption}, or \texttt{\caption} or \texttt{\phantomcaption} inside a \texttt{subfigure} or \texttt{subtable} environment, the \texttt{label} can be either placed inside the caption text or right after the \texttt{\subcaption} or \texttt{\caption} command, e.g:

\begin{verbatim}
\subcaption{Some text here}\label{label1}
...
\subcaption{Some other text}\label{label2}
...
\subcaption{Something different}
\label{label3}
\end{verbatim}

When using the \texttt{\subcaptionbox} command, the \texttt{label} should be placed inside the caption text, e.g.:  

\begin{verbatim}
\subcaptionbox{A description here}\label{label4}
{Some content here}
...
\subcaptionbox[List-of-Figures entry]{A description here}\label{label5}
{Some content here}
\end{verbatim}
6.5 Where do hyperlinks jump?

For the subfigure & subtable environments and \subcaptionbox boxes (and own constructs which use \setcaptionsubtype) the hyperlink anchors will be placed in respect to the hypcap= setting. While usage of this option is straight-forward for ordinary captions, the usage for sub-captions depends on the setting regarding the main captions. This table gives you an overview where the hyperlinks will jump:

<table>
<thead>
<tr>
<th>hypcap=false</th>
<th>hypcap=true</th>
</tr>
</thead>
<tbody>
<tr>
<td>sub-caption</td>
<td>figure or table (default setting)</td>
</tr>
<tr>
<td>sub-figure or sub-table</td>
<td>sub-figure or sub-table</td>
</tr>
</tbody>
</table>

But if \subcaption is used and hypcap=true is set for sub-captions, the subcaption package does not know where the sub-figure or sub-table actually begins, so it will jump to the sub-caption instead.

\textit{Remember:} If you use the hypcap package[4], it controls the placement of the hyperlink anchors, making the rules above invalid.

(See also the documentation of the caption package, sections about hyperref & hypcap.)

7 The \subfloat command

\texttt{\subfloat} \texttt{[\textbf{list_entry}][\textbf{caption}]\{\textbf{body}\}}

8 Beyond this package

For a more advanced usage of the sub-caption feature of the caption package, please take a look at the floatrow package[2] which provides the powerful \subfloatrow environment for typesetting sub-figures.

9 Thanks

I would like to thank Stephen Dalton who helped to make this package a better one.
References

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[2] Olga Lapko:  
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[3] Sebastian Rahtz & Heiko Oberdiek:  
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[4] Heiko Oberdiek:  
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