Frame corners in `tcolorbox`

Senan Sekhon

April 14, 2023

This template provides `tcolorbox` styles for "frame corners", i.e. corner pieces of a frame.

These are fully customizable and compatible with other `tcolorbox` options, *except* that they cannot be rendered with the `standard` engine. As a result, any `tcolorbox` that uses any of these styles must also contain one of the following options:

`enhanced` `bicolor` `enhanced jigsaw` `bicolor jigsaw`

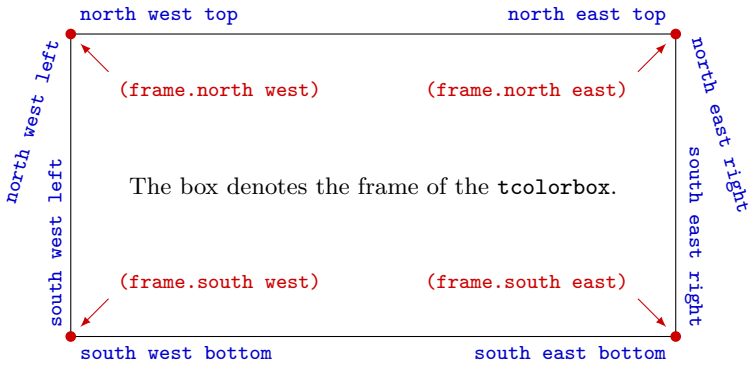
These styles are based on the tcolorbox package and the TikZ/PGF drawing engines.

There are two classes of styles available in this template, the `frame corner` styles (which produce **sharp** corners) and the `frame rounded corner` styles (which produce **rounded** corners). They are to be called as follows:

`frame corner` type={⟨*length*⟩}{⟨*thickness*⟩}{⟨*distance*⟩}{⟨*corner color*⟩}{⟨*edge color*⟩}

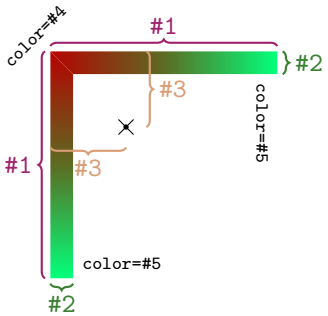
`frame rounded corner` type={⟨*length*⟩}{⟨*thickness*⟩}{⟨*distance*⟩}{⟨*radius*⟩}{⟨*corner color*⟩}{⟨*edge color*⟩}

The type refers to the corner of the box, which may be any of the eight keys outside the box below:

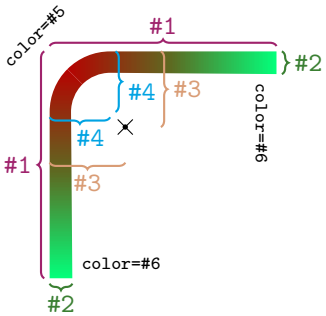


- The `frame corner` styles have 5 arguments, the first 3 of which are lengths and the last 2 are colors.
- The `frame rounded corner` styles have 6 arguments, the first 4 of which are lengths and the last 2 are colors.

Arguments for `frame corner`



Arguments for `frame rounded corner`



In both diagrams, the × marks the upper-left corner of the frame, i.e. the coordinate `(frame.north west)`.

1 Sharp corners

The style `frame corners all` produces *all* corner pieces. Below is a complete example:

```
\begin{tcolorbox}[enhanced,frame hidden,
frame corners all={5mm}{2pt}{1pt}{red}{white}]
This is a \texttt{tcolorbox}.\\

This is some additional text.
\end{tcolorbox}
```

This is a `tcolorbox`.

This is some additional text.

The following styles produce *one half* of a corner piece. For example, `frame corner northwest left` produces the *left* portion of the upper-left corner piece, while `frame corner northwest top` produces the *top portion*.

`frame corner northwest left`

`frame corner northwest top`

`frame corner northeast right`

`frame corner northeast top`

`frame corner southwest left`

`frame corner southwest bottom`

`frame corner southeast right`

`frame corner southeast bottom`

The following styles produce *one full* corner piece. For example, `frame corners northwest` produces the full upper-left corner piece (both the left and top portions).

`frame corners northwest`

`frame corners northeast`

`frame corners southwest`

`frame corners southeast`

The following styles produce *two full* corner pieces.

`frame corners north`

`frame corners south`

`frame corners west`

`frame corners east`

`frame corners uphill`

`frame corners downhill`

You can also combine options:

```
\begin{tcolorbox}[enhanced,frame hidden,
frame corners northwest={5mm}{2pt}{5pt}{red}{white},
frame corners northeast={5mm}{2pt}{1pt}{green}{gray},
frame corners southwest={8mm}{1pt}{0pt}{blue}{yellow},
frame corner southwest bottom={5mm}{3pt}{6pt}{black}{red}]
This is a \texttt{tcolorbox}.\\

This is some additional text.
\end{tcolorbox}
```

This is a `tcolorbox`.

This is some additional text.

2 Rounded corners

The style `frame rounded corners all` produces *all* corner pieces. Below is a complete example:

```
\begin{tcolorbox}[enhanced,frame hidden,
frame rounded corners all={5mm}{2pt}{1pt}{5pt}{blue}{white}]
This is a \texttt{tcolorbox}.\\

This is some additional text.
\end{tcolorbox}
```

This is a `tcolorbox`.

This is some additional text.

The following styles produce *one half* of a corner piece. For example, `frame rounded corner northwest left` produces the *left* portion of the upper-left corner piece, while `frame rounded corner northwest top` produces the *top portion*.

`frame rounded corner northwest left`

`frame rounded corner northwest top`

`frame rounded corner northeast right`

`frame rounded corner northeast top`

`frame rounded corner southwest left`

`frame rounded corner southwest bottom`

`frame rounded corner southeast right`

`frame rounded corner southeast bottom`

The following styles produce *one full* corner piece. For example, `frame rounded corners northwest` produces the full upper-left corner piece (both the left and top portions).

`frame rounded corners northwest`

`frame rounded corners northeast`

`frame rounded corners southwest`

`frame rounded corners southeast`

The following styles produce *two full* corner pieces.

`frame rounded corners north`

`frame rounded corners south`

`frame rounded corners west`

`frame rounded corners east`

`frame rounded corners uphill`

`frame rounded corners downhill`

You can also combine options and add extra Ti*k*Z/PGF options:

```
\begin{tcolorbox}[enhanced,frame hidden,
frame code={\draw (frame.south east) circle (1mm);}, % circle in the corner
frame rounded corner northwest top={7mm}{5pt}{3pt}{3pt}{green}{blue},
frame rounded corner northeast right={10mm}{1pt}{1pt}{12pt}{orange}{teal},
frame rounded corner southwest left={10mm}{3pt}{6pt}{9pt}{violet}{white}]
This is a \texttt{tcolorbox}.\\

This is some additional text.
\end{tcolorbox}
```

This is a `tcolorbox`.

This is some additional text.

Note that the upper-right corner piece is partially hidden as the interior of the box is drawn over it. Adding `interior hidden` to the `tcolorbox` options or specifying `interior code={...}` will fix this.

3 Other examples

```
\begin{tcolorbox}[enhanced,frame hidden,interior hidden,
frame corners all={7mm}{2pt}{-4pt}{blue!50!black}{blue!10},
frame rounded corners all={7mm}{1.5pt}{0pt}{3pt}{red!50!blue!50!black}{blue!10},
frame rounded corners all={7mm}{1pt}{3pt}{6pt}{red!50!black}{blue!10},
]
For every non-negative integer $n$, we have:
\begin{equation*}
    \int_0^\infty x^ne^{-ax}\,dx=\frac{n!}{a^{n+1}} \tag{$a>0$}
\end{equation*}
Prove this by induction.
\end{tcolorbox}
```

For every non-negative integer n, we have:

$$\int_0^\infty x^n e^{-ax}\,dx = \frac{n!}{a^{n+1}} \qquad (a > 0)$$

Prove this by induction.

```
\begin{tcolorbox}[enhanced,frame hidden,interior hidden,
frame corner northwest top={7mm}{2pt}{-6pt}{green!80!black}{gray!10},
frame corner northeast right={7mm}{2pt}{-6pt}{green!80!black}{gray!10},
frame corner southwest left={7mm}{2pt}{-6pt}{green!80!black}{gray!10},
frame corner southeast bottom={7mm}{2pt}{-6pt}{green!80!black}{gray!10},
frame rounded corner northwest top={12mm}{3pt}{0pt}{5pt}{violet!40!black}{gray!20},
frame rounded corner northeast right={12mm}{3pt}{0pt}{5pt}{violet!40!black}{gray!20},
frame rounded corner southwest left={12mm}{3pt}{0pt}{5pt}{violet!40!black}{gray!20},
frame rounded corner southeast bottom={12mm}{3pt}{0pt}{5pt}{violet!40!black}{gray!20},
]
Prove that:
\begin{equation*}
    \sum_{n=1}^\infty \frac{n}{4n^4+1}=\frac{1}{4}
\end{equation*}
\end{tcolorbox}
```

Prove that:

$$\sum_{n=1}^{\infty} \frac{n}{4n^4+1} = \frac{1}{4}$$

```
\begin{tcolorbox}[enhanced,frame hidden,interior hidden,
frame corners north={5mm}{2pt}{2pt}{teal}{white},
frame rounded corners south={5mm}{2pt}{2pt}{10pt}{orange}{white}]
    \begin{tcolorbox}[enhanced,frame hidden,interior hidden,
    frame rounded corners uphill={3mm}{1pt}{4pt}{5pt}{violet}{white},
    frame corners downhill={3mm}{1pt}{4pt}{green}{white}]
    This is a \texttt{tcolorbox} within a \texttt{tcolorbox}.\\

    Both boxes contain \texttt{frame corner} and \texttt{frame rounded corner} options.
    \end{tcolorbox}
\end{tcolorbox}
```

This is a `tcolorbox` within a `tcolorbox`.

Both boxes contain `frame corner` and `frame rounded corner` options.