The interval package

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(on behalf of By the Danish TEX collective)

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Motivation

In mathematics there are two syntax' when it comes to specifying open and closed intervals.

The first use parantheses to mark an open end

$$[a,b] \qquad (a,b] \qquad [a,b) \qquad (a,b),$$

while the other use brackets throughout

$$[a,b] \qquad]a,b] \qquad [a,b[\qquad]a,b[,$$

The former poses no problem in TEX, but the later does, as, e.g., a closing bracket is being used in place of an opening fence, and thus have the wrong category when it comes to spacing:

$$]-a,b[+c \qquad \text{versus} \qquad]-a,b[+c.$$

One could use

```
\mathopen{]}-a,b\mathclose{[}+c
```

to solve the problem, but then `\left`...`\right` can no longer be used to auto scale the fences.

The `\interval` command

The following is the result of a discussion on the Danish TEX Users groups mailing list. Kudos to Martin Heller, for proposing the original version using pgfkeys.

We provide a macro and a way to globally configure it

`\interval[`⟨*options*⟩`]{`⟨*start*⟩`}{`⟨*end*⟩`}`
`\intervalconfig{`⟨*options*⟩`}`

We note that the interval separator symbol is hidden inside the `\interval` macro and can be changed using an option.

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Configuration options

separator symbol
: symbol that separates the start and end of the interval. Default: `{,}`, note that as comma is the separating character in the options specification, the symbol is enclosed in braces, these are automatically removed.

left open fence
: Default: `]`

left closed fence
: Default: `[`

right open fence
: Default: `[`

right closed fence
: Default: `]`

soft open fences
: This is just a fast way of saying

```
left open fence=(,
right open fence=)
```

colorize
: Default: ⟨*empty*⟩. When rewriting an existing document into using the interval package, it turns out to be *very* handy to color the result of the `\interval` macro to keep track of which have been rewritten and which has not. This can be done using

```
\usepackage{xcolor}
\intervalconfig{ colorize=\color{red} }
```

It will colorize the entire interval including the fences.

Usage options

By default `\interval{`⟨*start*⟩`}{`⟨*end*⟩`}` will produce a closed interval. Other types are provided via options:

open
: an open interval

open left
: interval open on the left side

open right
: interval open on the right side

scaled
: auto scale interval fences

scaled=⟨*scaler*⟩
: scale fences using ⟨*scaler*⟩, i.e. using `scaled=\Big`

As some might be guessed, the `interval` package depends on the pgfkeys package to handle its key-value configuration.

Short hands

For convenience the following short hands are provided as of version 0.4.

`\ointerval[`⟨*options*⟩`]{`⟨*start*⟩`}{`⟨*end*⟩`}`
is short for `\interval[open,`⟨*options*⟩`]{`⟨*start*⟩`}{`⟨*end*⟩`}`

`\linterval[`⟨*options*⟩`]{`⟨*start*⟩`}{`⟨*end*⟩`}`
is short for `\interval[open left,`⟨*options*⟩`]{`⟨*start*⟩`}{`⟨*end*⟩`}`

`\rinterval[`⟨*options*⟩`]{`⟨*start*⟩`}{`⟨*end*⟩`}`
is short for `\interval[open right,`⟨*options*⟩`]{`⟨*start*⟩`}{`⟨*end*⟩`}`

Examples

```
\begin{align*}
& A\in\interval{a}{b}                \\
& A\in\interval[open]{a}{b}          \\
& A\in\interval[open left]{a}{b}     \\
& A\in\interval[open right,
  scaled]{a}{\frac{1}{2}b}=B        \\
& A\in\interval[scaled=\big]{a}{b}  \\
& A\in\ointerval[scaled]{%
  \tfrac{1}{3}}{\tfrac{1}{2}}
\end{align*}
```

$$
\begin{aligned}
A &\in [a, b] \\
A &\in]a, b[\\
A &\in]a, b] \\
A &\in \left[a, \frac{1}{2}b\right[= B \\
A &\in \left[a, b\right] \\
A &\in \left]\tfrac{1}{3}, \tfrac{1}{2}\right[
\end{aligned}
$$

And using soft open fences:

```
\intervalconfig{
  soft open fences,
  separator symbol=;,
}
\begin{align*}
& A\in\interval{a}{b}                \\
& A\in\interval[open]{a}{b}          \\
& A\in\interval[open left]{a}{b}     \\
& A\in\interval[open right,
  scaled]{a}{\frac{1}{2}b}=B        \\
& A\in\interval[scaled=\big]{a}{b}  \\
& A\in\rinterval{a}{b}
\end{align*}
```

$$
\begin{aligned}
A &\in [a; b] \\
A &\in (a; b) \\
A &\in (a; b] \\
A &\in \left[a; \frac{1}{2}b\right) = B \\
A &\in \left[a; b\right] \\
A &\in [a; b)
\end{aligned}
$$