Intelligent brackets
The ibrackets package

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2022/12/26, v1.1

1 Introduction

Open intervals are usually represented with parenthesis $(0,+\infty)$ but sometimes we find also square brackets $]0,+\infty[$, for example in French mathematics. When using these, spacing is often unsuitable, e.g. $x \in]0,+\infty[$. This small package redefines brackets symbols [and] for mathematical mode to get correct spacing: $x \in]0,+\infty[$.

Originally implemented in the mismath package [1] and also in frenchmath [2] since version 2.1, our previous redefinitions produce however incorrect spacing when the left bound of the interval begins with a sign - or +, which was then interpreted as a binary operation. Thus blank spaces surrounding the sign would have been too large. This problem was pointed out by Jean-François Burnol, and an easy solution, that has been documented, consisted to nest the operator or the left bound within a pair of braces, e.g. `$x \in ]{-}\infty, 0]$`, or use `\left` and `\right` or even `\mathopen{]}`.

Inspired by the icomma package [3] of Walter Schmidt, we now provide an improved bracket definition that works correctly without these pairs of curly brackets.

Let's also mention other approaches e.g. `\DeclarePairedDelimiters`, a macro from the mathtools package [4], or the interval package [5] with his `\interval` macro. Nevertheless our solution is lighter.

2 Usage

You just have to type intervals in an easy way: `$x\in]0,\pi[\cup]2\pi, 3\pi[$` produce

$$x \in]0,\pi[\cup]2\pi,3\pi[\quad \text{with ibrackets,}$$

instead of

$$x \in]0,\pi[\cup]2\pi,3\pi[\quad \text{without ibrackets.}$$

Generally [and] symbols are not defined anymore as delimiters, but as ordinary characters. Thereby a line break could occur between the two square brackets, but it is always possible to transform them into delimiters with `\left` and `\right`.

The problem of a sign following the first bracket is solved with this package, so the example in the introduction is simply obtained with `$x \in ]-\infty, 0]$` which gives $x \in]-\infty, 0]$.

However, you don't have to leave a space between the first bracket and the sign: e.g. `$x \in ] -\infty, 0]$` yields $x \in] - \infty, 0]$ with bad spacing around the minus sign. Contrariwise, when you want to write algebra on intervals then *you must leave a blank space between the second bracket and the +/- operations*, e.g. `$[a, b] + [c, d]$` yields $[a, b] + [c, d]$ but `$[a, b]+ [c, d]$` yields $[a, b]+[c, d]$. To summarize the new behavior of a bracket: it is an ordinary character, but an open delimiter when it is immediately followed by a + or - character.

3 Implementation

At `\begin{document}`, we memorize the `\mathcode` of the original brackets, in the `\math...bracket` macros, and we make the brackets in math mode active:

```
\AtBeginDocument{%
  \mathchardef\mathopenbracket\mathcode`[%
  \mathcode`[="8000
  \mathchardef\mathclosebracket\mathcode`]%
  \mathcode`]="8000
}

```

The active brackets check the next input character. If this is a - or a +, the active brackets return `\mathopen` with the saved `\math...bracket` so that no space will be added after the bracket; otherwise, `\mathord\math...bracket` is returned :

```
{\catcode`[=\active
  \gdef[{\futurelet\@next\sm@rtopenbracket}}
\def\sm@rtopenbracket{%
  \ifx\@next- \mathopen \else
  \ifx\@next+ \mathopen \else
    \mathord\fi\fi \mathopenbracket}

{\catcode`]=\active
  \gdef]{\futurelet\@next\sm@rtclosebracket}}
\def\sm@rtclosebracket{%
  \ifx\@next- \mathopen \else
  \ifx\@next+ \mathopen \else
    \mathord\fi\fi \mathclosebracket}
```

We could have use the internal TEX command `\@ifnextchar` to skip blank spaces after the bracket, and look if there is a + or - after, but then it would become tricky when you really want to follow an interval with an operation plus or minus.

References

[1] *mismath – Miscellaneus mathematical macros*. Antoine Missier, CTAN, v2.0 2022/11/11.

[2] *L'extension frenchmath*. Antoine Missier, CTAN, v2.2 2022/12/15.

[3] *The icomma package for LaTeX 2ε*. Walter Schmidt, CTAN, v2.0 2002/03/10.

[4] *The mathtool package*. Morten Høgholm, Lars Madsen, CTAN, v1.21 2018/01/08.

[5] *The interval package*. Lars Madsen, CTAN, v0.4 2019/03/06.