xstring

v1.5

User's manual

Christian Tellechea
unbonpetit@gmail.com

December 31st 2008

Abstract

This package which requires ε-TEX, provides macros manipulating strings of tokens. For a basic use, tokens can be alphanumeric chars, but the macros can also be useful for manipulating tokens, i.e. TEX code. Main features are:

- ▷ tests:
  - does a string contains at least n times an another?
  - does a string starts (or ends) with another? etc.
  - is a string an integer? A decimal?
  - are 2 strings equal?
- ▷ extractions of substrings:
  - what is on the left (or the right) of the n^{th} occurrence of a substring;
  - what is between the occurrences of 2 substrings;
  - substring between 2 positions;
  - serach of a group with its identifier.
- ▷ substitution of all, or the n first occurrences of a substring for an other substring;
- ▷ calculation of numbers:
  - length of a string;
  - position of the n^{th} occurrence of a substring;
  - how many times a string contains a substring?
  - comparison of 2 strings: position of the first difference;
  - identifier of the group in which a macro made a cut or a search.

Other macros allow to use special characters forbiden in arguments (`#` and `%`) and manage differences between catcodes for advanced programming purposes.

Contents

This manual is a translation of the french manual. I apologize for my poor english but I did my best[1], and I hope that the following is comprehensible!

1 Presentation

1.1 Description

This extension[2] provides macros and tests operating on strings of tokens, i.e. TEX code, as other programmation languages have. They provides the usual strings operations, such as: test if a string contains another, begins or ends with another, extractions of strings, calculation of the position of a substring, of the number of occurrences, etc.

xstring reads the arguments of the macros syntax unit by syntax unit[3] : when syntax units are "simple" chars (catcode 10, 11 and 12), xstring logically read the argument char by char. xstring can also be used for programming purpose, including in arguments other tokens such as control sequences, braces and tokens with other catcodes. See chapter on reading mode and arguments expansion (page 12), the command `\verbtocs` (page 16) and the command `\scancs` (page 17).

As the arguments may contain any token, advanced users could have problems with catcodes leading to unexpected behaviours. These behaviours can be controlled: read page 13.

Certainly, other packages exist (for example `substr` and `stringstrings`), but as well as differences on features, they do not take into account occurrences so I found them too limited and difficult to use for programming.

1.2 Motivation

I decided to write this package of macros because I have never really found tools in LATEX suiting my needs for strings. So, over the last few months, I wrote a few macros that I occasionally or regularly used. Their numbers have increased and become a little too dispersed in directories in my computer, so I have grouped them together in this package.
Thus, writing a coherent set of macros forces more discipline and leads to necessary improvements, which took most of the time I spent writing this package. This package is my first one as I recently discoverd LATEX[4], so my main motivation was to make progress in programming with TEX, and to tackle its specific methods.

2 The macros

Important: in the following, a ⟨*number*⟩ can be an integer written with numeric chars, a counter, or the result of an arithmetic operation made with the command `\numexpr`.

2.1 Presentation of macros

For a better understanding, let's see first the macros with the simpler arguments possible. No special catcode, no exotic token, no control sequence neither: only alphanumeric chars will be contained in the arguments.

In the following chapters, all the macros will be presented this plan:

- the syntax[5] and the value of optional arguments
- a short description of the operation;
- the operation under special conditions. For each conditions considered, the operation described has priority on that (those) below;
- finally, several examples[6] are given. I tried to find them most easily comprehensible and most representative of the situations met in normal use. If a doubt is possible with spaces in the result, this one will be delimited by "|", given that an empty string is represented by "||".

[1] Any email to tell me errors would be appreciated!
[2] This extension does not require LATEX and can be compiled with Plain ε-TEX.
[3] In the TEX code, a syntax unit is a control sequence, a group between brace or a single char. See also page 12.
[4] In november 2007, I will be a noob for a long time. . .
[5] The optional star, the optional argument in last position will be explained later. See page 13 for starred macros and page 12 for the optional argument.
[6] For much more examples, see the test file.

2.2 The tests

2.2.1 \IfSubStr

`\IfSubStr`⟨`[*]`⟩`[`⟨*number*⟩`]{`⟨*string*⟩`}{`⟨*stringA*⟩`}{`⟨*true*⟩`}{`⟨*false*⟩`}`

The value of the optional argument ⟨*number*⟩ is 1 by default.

Tests if ⟨*string*⟩ contains at least ⟨*number*⟩ times ⟨*stringA*⟩ and runs ⟨*true*⟩ if so, and ⟨*false*⟩ otherwise.

- ▷ If ⟨*number*⟩ ⩽ 0, runs ⟨*false*⟩;
- ▷ If ⟨*string*⟩ or ⟨*stringA*⟩ is empty, runs ⟨*false*⟩.

```
\IfSubStr{xstring}{tri}{true}{false}  true
  \IfSubStr{xstring}{a}{true}{false}  false
\IfSubStr{a bc def }{c d}{true}{false}  true
 \IfSubStr{a bc def }{cd}{true}{false}  false
  \IfSubStr[2]{1a2a3a}{a}{true}{false}  true
  \IfSubStr[3]{1a2a3a}{a}{true}{false}  true
  \IfSubStr[4]{1a2a3a}{a}{true}{false}  false
```

2.2.2 \IfSubStrBefore

`\IfSubStrBefore`⟨`[*]`⟩`[`⟨*number1*⟩`,`⟨*number2*⟩`]{`⟨*string*⟩`}{`⟨*stringA*⟩`}{`⟨*stringB*⟩`}{`⟨*true*⟩`}{`⟨*false*⟩`}`

The values of the optional arguments ⟨*number1*⟩ and ⟨*number2*⟩ are 1 by default.

In ⟨*string*⟩, tests if the ⟨*number1*⟩$^{\text{th}}$ occurrence of ⟨*stringA*⟩ is on the left of the ⟨*number2*⟩$^{\text{th}}$ occurrence of ⟨*stringB*⟩. Runs ⟨*true*⟩ if so, and ⟨*false*⟩ otherwise.

- ▷ If one of the occurrences is not found, it runs ⟨*false*⟩;
- ▷ If one of the arguments ⟨*string*⟩, ⟨*stringA*⟩ or ⟨*stringB*⟩ is empty, runs ⟨*false*⟩;
- ▷ If one of the optional arguments is negative or zero, runs ⟨*false*⟩.

```
\IfSubStrBefore{xstring}{st}{in}{true}{false}  true
 \IfSubStrBefore{xstring}{ri}{s}{true}{false}  false
 \IfSubStrBefore{LaTeX}{LaT}{TeX}{true}{false}  false
\IfSubStrBefore{a bc def }{ b}{ef}{true}{false}  true
\IfSubStrBefore{a bc def }{ab}{ef}{true}{false}  false
\IfSubStrBefore[2,1]{b1b2b3}{b}{2}{true}{false}  true
\IfSubStrBefore[3,1]{b1b2b3}{b}{2}{true}{false}  false
\IfSubStrBefore[2,2]{baobab}{a}{b}{true}{false}  false
\IfSubStrBefore[2,3]{baobab}{a}{b}{true}{false}  true
```

2.2.3 \IfSubStrBehind

`\IfSubStrBehind`⟨`[*]`⟩`[`⟨*number1*⟩`,`⟨*number2*⟩`]{`⟨*string*⟩`}{`⟨*stringA*⟩`}{`⟨*stringB*⟩`}{`⟨*true*⟩`}{`⟨*false*⟩`}`

The values of the optional arguments ⟨*number1*⟩ and ⟨*number2*⟩ are 1 by default.

In ⟨*string*⟩, tests if the ⟨*number1*⟩$^{\text{th}}$ occurrence of ⟨*stringA*⟩ is on the right of the ⟨*number2*⟩$^{\text{th}}$ occurrence of ⟨*stringB*⟩. Runs ⟨*true*⟩ if so, and ⟨*false*⟩ otherwise.

- ▷ If one of the occurrences is not found, it runs ⟨*false*⟩;
- ▷ If one of the arguments ⟨*string*⟩, ⟨*stringA*⟩ or ⟨*stringB*⟩ is empty, runs ⟨*false*⟩;
- ▷ If one of the optional arguments is negative or zero, runs ⟨*false*⟩.

```
\IfSubStrBehind{xstring}{ri}{xs}{true}{false}  false
  \IfSubStrBehind{xstring}{s}{i}{true}{false}  false
 \IfSubStrBehind{LaTeX}{TeX}{LaT}{true}{false}  false
\IfSubStrBehind{a bc def }{ d}{a}{true}{false}  false
\IfSubStrBehind{a bc def }{cd}{a b}{true}{false}  false
\IfSubStrBehind[2,1]{b1b2b3}{b}{2}{true}{false}  false
\IfSubStrBehind[3,1]{b1b2b3}{b}{2}{true}{false}  true
\IfSubStrBehind[2,2]{baobab}{b}{a}{true}{false}  false
\IfSubStrBehind[2,3]{baobab}{b}{a}{true}{false}  false
```

2.2.4 \IfBeginWith

`\IfBeginWith`⟨`[*]`⟩`{`⟨*string*⟩`}{`⟨*stringA*⟩`}{`⟨*true*⟩`}{`⟨*false*⟩`}`

Tests if ⟨*string*⟩ begins with ⟨*stringA*⟩, and runs ⟨*true*⟩ if so, and ⟨*false*⟩ otherwise.

▷ If ⟨*string*⟩ or ⟨*stringA*⟩ is empty, runs ⟨*false*⟩.

```
\IfBeginWith{xstring}{xst}{true}{false}  true
    \IfBeginWith{LaTeX}{a}{true}{false}  false
\IfBeginWith{a bc def }{a b}{true}{false}  true
 \IfBeginWith{a bc def }{ab}{true}{false}  false
```

2.2.5 \IfEndWith

`\IfEndWith`⟨`[*]`⟩`{`⟨*string*⟩`}{`⟨*stringA*⟩`}{`⟨*Behind*⟩`}{`⟨*false*⟩`}`

Tests if ⟨*string*⟩ ends with ⟨*stringA*⟩, and runs ⟨*true*⟩ if so, and ⟨*false*⟩ otherwise.

▷ If ⟨*string*⟩ or ⟨*stringA*⟩ is empty, runs ⟨*false*⟩.

```
\IfEndWith{xstring}{ring}{true}{false}  true
     \IfEndWith{LaTeX}{a}{true}{false}  false
\IfEndWith{a bc def }{ef }{true}{false}  true
 \IfEndWith{a bc def }{ef}{true}{false}  false
```

2.2.6 \IfInteger

`\IfInteger{`⟨*number*⟩`}{`⟨*true*⟩`}{`⟨*false*⟩`}`

Tests if ⟨*number*⟩ is an integer, and runs ⟨*true*⟩ if so, and ⟨*false*⟩ otherwise.

If test is false because unexpected characters, the control sequence `\@xs@afterinteger` contains the illegal part of ⟨*number*⟩.

```
  \IfInteger{13}{true}{false}  true
\IfInteger{-219}{true}{false}  true
  \IfInteger{+9}{true}{false}  true
\IfInteger{3.14}{true}{false}  false
   \IfInteger{0}{true}{false}  true
 \IfInteger{49a}{true}{false}  false
   \IfInteger{+}{true}{false}  false
   \IfInteger{-}{true}{false}  false
\IfInteger{0000}{true}{false}  true
```

2.2.7 \IfDecimal

`\IfDecimal{`⟨*number*⟩`}{`⟨*true*⟩`}{`⟨*false*⟩`}`

Tests if ⟨*number*⟩ is a decimal, and runs ⟨*true*⟩ if so, and ⟨*false*⟩ otherwise.

Counters `\integerpart` and `\decimalpart` contain the integer part and decimal part of ⟨*number*⟩.
If test is false because unexpected characters, the control sequence `\@xs@afterdecimal` contains the illegal part of ⟨*number*⟩, whereas if test is false because decimal part is empty after decimal separator, it contains "X".

▷ Decimal separator can be a dot or a comma;
▷ If what is on the right of decimal separator (if it exists) is empty, the test is false;
▷ If what is on the left of decimal separator (if it exists) is empty, the integer part is assumed to be 0;

```
\IfDecimal{3.14}{true}{false}  true
\IfDecimal{3,14}{true}{false}  true
\IfDecimal{-0.5}{true}{false}  true
  \IfDecimal{.7}{true}{false}  true
  \IfDecimal{,9}{true}{false}  true
\IfDecimal{1..2}{true}{false}  false
  \IfDecimal{+6}{true}{false}  true
 \IfDecimal{-15}{true}{false}  true
  \IfDecimal{1.}{true}{false}  false
  \IfDecimal{2,}{true}{false}  false
   \IfDecimal{.}{true}{false}  false
   \IfDecimal{,}{true}{false}  false
   \IfDecimal{+}{true}{false}  false
   \IfDecimal{-}{true}{false}  false
```

2.2.8 \IfStrEq

\IfStrEq⟨[*]⟩{⟨*stringA*⟩}{⟨*stringB*⟩}{⟨*true*⟩}{⟨*false*⟩}

Tests if the strings ⟨*stringA*⟩ and ⟨*stringB*⟩ are equal, i.e. if they contain successively the same syntax units in the same order. Runs ⟨*true*⟩ if so, and ⟨*false*⟩ otherwise.

```
\IfStrEq{a1b2c3}{a1b2c3}{true}{false}  true
\IfStrEq{abcdef}{abcd}{true}{false}  false
\IfStrEq{abc}{abcdef}{true}{false}  false
\IfStrEq{3,14}{3,14}{true}{false}  true
\IfStrEq{12.34}{12.340}{true}{false}  false
\IfStrEq{abc}{}{true}{false}  false
\IfStrEq{}{abc}{true}{false}  false
\IfStrEq{}{}{true}{false}  true
```

2.2.9 \IfEq

\IfEq{⟨*stringA*⟩}{⟨*stringB*⟩}{⟨*true*⟩}{⟨*false*⟩}

Tests if the strings ⟨*stringA*⟩ and ⟨*stringB*⟩ are equal, *except* if both ⟨*stringA*⟩ and ⟨*stringB*⟩ contain numbers in which case the macro tests if these numbers are equal. Runs ⟨*true*⟩ if so, and ⟨*false*⟩ otherwise.

- ▷ The definition of *number* is given with the macro `IfDecimal` (see page 4), and thus :
- ▷ "+" signs are optional;
- ▷ Decimal separator can be a dot or a comma.

```
\IfEq{a1b2c3}{a1b2c3}{true}{false}  true
\IfEq{abcdef}{ab}{true}{false}  false
\IfEq{ab}{abcdef}{true}{false}  false
\IfEq{12.34}{12,34}{true}{false}  true
\IfEq{+12.34}{12.340}{true}{false}  true
\IfEq{10}{+10}{true}{false}  true
\IfEq{-10}{10}{true}{false}  false
\IfEq{+0,5}{,5}{true}{false}  true
\IfEq{1.001}{1.01}{true}{false}  false
\IfEq{3*4+2}{14}{true}{false}  false
\IfEq{\number\numexpr3*4+2}{14}{true}{false}  true
\IfEq{0}{-0.0}{true}{false}  true
\IfEq{}{}{true}{false}  true
```

2.2.10 \IfStrEqCase

```
\IfStrEqCase⟨[*]⟩{⟨string⟩}{%
    {⟨string1⟩}{⟨code1⟩}%
    {⟨string2⟩}{⟨code2⟩}%
    etc...
    {⟨stringN⟩}{⟨codeN⟩}}[⟨other cases code⟩]
```

Tests successively if ⟨*string*⟩ is equal to ⟨*string1*⟩, ⟨*string2*⟩, etc. Comparison is made with `\IfStrEq` (see above). If the test number i is positive (the ⟨*string*⟩ matches ⟨*string* i⟩), the macro runs ⟨*code* i⟩ and ends. If all tests fail, the macro runs the optional ⟨*other cases code*⟩, if present.

```
\IfStrEqCase{b}{{a}{AA}{b}{BB}{c}{CC}}  BB
\IfStrEqCase{abc}{{a}{AA}{b}{BB}{c}{CC}}  ||
\IfStrEqCase{c}{{a}{AA}{b}{BB}{c}{CC}}[other]  CC
\IfStrEqCase{d}{{a}{AA}{b}{BB}{c}{CC}}[other]  other
\IfStrEqCase{+3}{{1}{one}{2}{two}{3}{three}}[other]  other
\IfStrEqCase{0.5}{{0}{zero}{.5}{half}{1}{one}}[other]  other
```

2.2.11 \IfEqCase

```
\IfEqCase⟨[*]⟩{⟨string⟩}{%
    {⟨string1⟩}{⟨code1⟩}%
    {⟨string2⟩}{⟨code2⟩}%
    etc...
    {⟨stringN⟩}{⟨codeN⟩}}[⟨other cases code⟩]
```

Tests successively if ⟨*string*⟩ is equal to ⟨*string1*⟩, ⟨*string2*⟩, etc. Comparison is made with `\IEq` (see above). If the test number i is positive (the ⟨*string*⟩ matches ⟨*string* i⟩), the macro runs ⟨*code* i⟩ and ends. If all tests fail, the macro runs the optional ⟨*other cases code*⟩, if present.

```
\IfEqCase{b}{{a}{AA}{b}{BB}{c}{CC}}                BB
\IfEqCase{abc}{{a}{AA}{b}{BB}{c}{CC}}              ||
\IfEqCase{c}{{a}{AA}{b}{BB}{c}{CC}}[other]         CC
\IfEqCase{d}{{a}{AA}{b}{BB}{c}{CC}}[other]         other
\IfEqCase{+3}{{1}{one}{2}{two}{3}{three}}[other]   three
\IfEqCase{0.5}{{0}{zero}{.5}{half}{1}{one}}[other] half
```

2.3 Extraction of substrings

2.3.1 `\StrBefore`

`\StrBefore`⟨`[*]`⟩`[`⟨*number*⟩`]{`⟨*string*⟩`}{`⟨*stringA*⟩`}[`⟨*name*⟩`]`

The value of the optional argument ⟨*number*⟩ is 1 by default.

In ⟨*string*⟩, returns what is leftwards the ⟨*number*⟩$^{\text{th}}$ occurrence of ⟨*stringA*⟩.

- ▷ If ⟨*string*⟩ or ⟨*stringA*⟩ is empty, an empty string is returned;
- ▷ If ⟨*number*⟩ < 1 then the macro behaves as if ⟨*number*⟩ $= 1$;
- ▷ If the occurrence is not found, an empty string is returned.

```
\StrBefore{xstring}{tri}   |xs|
    \StrBefore{LaTeX}{e}   |LaT|
    \StrBefore{LaTeX}{p}   ||
    \StrBefore{LaTeX}{L}   ||
\StrBefore{a bc def }{def} |a bc |
 \StrBefore{a bc def }{cd} ||
  \StrBefore[1]{1b2b3}{b}  |1|
  \StrBefore[2]{1b2b3}{b}  |1b2|
```

2.3.2 `\StrBehind`

`\StrBehind`⟨`[*]`⟩`[`⟨*number*⟩`]{`⟨*string*⟩`}{`⟨*stringA*⟩`}[`⟨*name*⟩`]`

The value of the optional argument ⟨*number*⟩ is 1 by default.

In ⟨*string*⟩, returns what is rightwards the ⟨*number*⟩$^{\text{th}}$ occurrence of ⟨*stringA*⟩.

- ▷ If ⟨*string*⟩ or ⟨*stringA*⟩ is empty, an empty string is returned;
- ▷ If ⟨*number*⟩ < 1 then the macro behaves as if ⟨*number*⟩ $= 1$;
- ▷ If the occurrence is not found, an empty string is returned.

```
\StrBehind{xstring}{tri}   |ng|
    \StrBehind{LaTeX}{e}   |X|
    \StrBehind{LaTeX}{p}   ||
    \StrBehind{LaTeX}{X}   ||
\StrBehind{a bc def }{bc}  | def |
\StrBehind{a bc def }{cd}  ||
  \StrBehind[1]{1b2b3}{b}  |2b3|
  \StrBehind[2]{1b2b3}{b}  |3|
  \StrBehind[3]{1b2b3}{b}  ||
```

2.3.3 `\StrBetween`

`\StrBetween`⟨`[*]`⟩`[`⟨*number1*⟩`,`⟨*number2*⟩`]{`⟨*string*⟩`}{`⟨*stringA*⟩`}{`⟨*stringB*⟩`}[`⟨*name*⟩`]`

The values of the optional arguments ⟨*number1*⟩ and ⟨*number2*⟩ are 1 by default.

In ⟨*string*⟩, returns the substring between[7] the ⟨*number1*⟩$^{\text{th}}$ occurrence of ⟨*stringA*⟩ and ⟨*number2*⟩$^{\text{th}}$ occurrence of ⟨*stringB*⟩.

- ▷ If the occurrences are not in this order — ⟨*stringA*⟩ *followed by* ⟨*stringB*⟩ — in ⟨*string*⟩, an empty string is returned;
- ▷ If one of the 2 occurrences doesn't exist in ⟨*string*⟩, an empty string is returned;

[7] In a strict sense, i.e. *without* the strings ⟨*stringA*⟩ and ⟨*stringB*⟩

▷ If one of the optional arguments ⟨*number1*⟩ ou ⟨*number2*⟩ is negative or zero, an empty string is returned.

`\StrBetween{xstring}{xs}{ng}`	|tri|
`\StrBetween{xstring}{i}{n}`	||
`\StrBetween{xstring}{a}{tring}`	||
`\StrBetween{a bc def }{a}{d}`	| bc |
`\StrBetween{a bc def }{a }{f}`	|bc de|
`\StrBetween{a1b1a2b2a3b3}{a}{b}`	|1|
`\StrBetween[2,3]{a1b1a2b2a3b3}{a}{b}`	|2b2a3|
`\StrBetween[1,3]{a1b1a2b2a3b3}{a}{b}`	|1b1a2b2a3|
`\StrBetween[3,1]{a1b1a2b2a3b3}{a}{b}`	||
`\StrBetween[3,2]{abracadabra}{a}{bra}`	|da|

2.3.4 `\StrSubstitute`

`\StrSubstitute[`⟨*number*⟩`]{`⟨*string*⟩`}{`⟨*stringA*⟩`}{`⟨*stringB*⟩`}[`⟨*name*⟩`]`

The value of the optional argument ⟨*number*⟩ is 0 by default.

In ⟨*string*⟩, substitute the ⟨*number*⟩ first occurrences of ⟨*stringA*⟩ for ⟨*stringB*⟩, except if ⟨*number*⟩ = 0 in which case *all* the occurrences are substituted.

▷ If ⟨*string*⟩ is empty, an empty string is returned;
▷ If ⟨*stringA*⟩ is empty or doesn't exist in ⟨*string*⟩, the macro is ineffective;
▷ If ⟨*number*⟩ is greater than the number of occurrences of ⟨*stringA*⟩, then all the occurrences are substituted;
▷ If ⟨*number*⟩ < 0 the macro behaves as if ⟨*number*⟩ = 0;
▷ If ⟨*stringB*⟩ is empty, the occurrences of ⟨*stringA*⟩, if they exist, are deleted.

`\StrSubstitute{xstring}{i}{a}`	xstrang
`\StrSubstitute{abracadabra}{a}{o}`	obrocodobro
`\StrSubstitute{abracadabra}{br}{TeX}`	aTeXacadaTeXa
`\StrSubstitute{LaTeX}{m}{n}`	LaTeX
`\StrSubstitute{a bc def }{ }{M}`	aMbcMdefM
`\StrSubstitute{a bc def }{ab}{AB}`	a bc def
`\StrSubstitute[1]{a1a2a3}{a}{B}`	B1a2a3
`\StrSubstitute[2]{a1a2a3}{a}{B}`	B1B2a3
`\StrSubstitute[3]{a1a2a3}{a}{B}`	B1B2B3
`\StrSubstitute[4]{a1a2a3}{a}{B}`	B1B2B3

2.3.5 `\StrDel`

`\StrDel`⟨`[*]`⟩`[`⟨*number*⟩`]{`⟨*string*⟩`}{`⟨*stringA*⟩`}[`⟨*name*⟩`]`

The value of the optional argument ⟨*number*⟩ is 0 by default.

Delete the ⟨*number*⟩ first occurrences of ⟨*stringA*⟩ in ⟨*string*⟩, except if ⟨*number*⟩ = 0 in which case *all* the occurrences are deleted.

▷ If ⟨*string*⟩ is empty, an empty string is returned;
▷ If ⟨*stringA*⟩ is empty or doesn't exist in ⟨*string*⟩, the macro is ineffective;
▷ If ⟨*number*⟩ greater then the number of occurrences of ⟨*stringA*⟩, then all the occurrences are deleted;
▷ If ⟨*number*⟩ < 0 the macro behaves as if ⟨*number*⟩ = 0;

`\StrDel{abracadabra}{a}`	brcdbr
`\StrDel[1]{abracadabra}{a}`	bracadabra
`\StrDel[4]{abracadabra}{a}`	brcdbra
`\StrDel[9]{abracadabra}{a}`	brcdbr
`\StrDel{a bc def }{ }`	abcdef

2.3.6 `\StrGobbleLeft`

`\StrGobbleLeft{`⟨*string*⟩`}{`⟨*number*⟩`}[`⟨*name*⟩`]`

In ⟨*string*⟩, delete the ⟨*number*⟩ first characters on the left.

▷ If ⟨*string*⟩ is empty, an empty string is returned;
▷ If ⟨*number*⟩ ⩽ 0, no character is deleted;
▷ If ⟨*number*⟩ ⩾ ⟨*lengthString*⟩, all the characters are deleted.

```
\StrGobbleLeft{xstring}{2}   |tring|
\StrGobbleLeft{xstring}{9}   ||
  \StrGobbleLeft{LaTeX}{4}   |X|
 \StrGobbleLeft{LaTeX}{-2}   |LaTeX|
\StrGobbleLeft{a bc def }{4}  | def |
```

2.3.7 \StrLeft

\StrLeft{⟨*string*⟩}{⟨*number*⟩}[⟨*name*⟩]

In ⟨*string*⟩, returns the ⟨*number*⟩ first characters on the left.

- ▷ If ⟨*string*⟩ is empty, an empty string is returned;
- ▷ If ⟨*number*⟩ ⩽ 0, no character is returned;
- ▷ If ⟨*number*⟩ ⩾ ⟨*lengthString*⟩, all the characters are returned.

```
\StrLeft{xstring}{2}   |xs|
\StrLeft{xstring}{9}   |xstring|
  \StrLeft{LaTeX}{4}   |LaTe|
 \StrLeft{LaTeX}{-2}   ||
\StrLeft{a bc def }{5}  |a bc |
```

2.3.8 \StrGobbleRight

\StrGobbleRight{⟨*string*⟩}{⟨*number*⟩}[⟨*name*⟩]

In ⟨*string*⟩, delete the ⟨*number*⟩ last characters on the right.

```
\StrGobbleRight{xstring}{2}   |xstri|
\StrGobbleRight{xstring}{9}   ||
  \StrGobbleRight{LaTeX}{4}   |L|
 \StrGobbleRight{LaTeX}{-2}   |LaTeX|
\StrGobbleRight{a bc def }{4}  |a bc |
```

2.3.9 \StrRight

\StrRight{⟨*string*⟩}{⟨*number*⟩}[⟨*name*⟩]

In ⟨*string*⟩, returns the ⟨*number*⟩ last characters on the right.

```
\StrRight{xstring}{2}   |ng|
\StrRight{xstring}{9}   |xstring|
  \StrRight{LaTeX}{4}   |aTeX|
 \StrRight{LaTeX}{-2}   ||
\StrRight{a bc def }{5}  | def |
```

2.3.10 \StrChar

\StrChar⟨[*]⟩{⟨*string*⟩}{⟨*number*⟩}[⟨*name*⟩]

Returns the syntax unit at the position ⟨*number*⟩ in ⟨*string*⟩.

- ▷ If ⟨*string*⟩ is empty, no caracter is returned;
- ▷ If ⟨*number*⟩ ⩽ 0 or if ⟨*number*⟩ > ⟨*lengthString*⟩, no character is returned.

```
\StrChar{xstring}{4}  r
\StrChar{xstring}{9}  ||
\StrChar{xstring}{-5}  ||
\StrChar{a bc def }{6}  d
```

2.3.11 \StrMid

\StrMid{⟨*string*⟩}{⟨*numberA*⟩}{⟨*numberB*⟩}[⟨*name*⟩]

In ⟨*string*⟩, returns the substring between[8] the positions ⟨*numberA*⟩ and ⟨*numberB*⟩.

- ▷ If ⟨*string*⟩ is empty, an empty string is returned;
- ▷ If ⟨*numberA*⟩ > ⟨*numberB*⟩, an empty string is returned;
- ▷ If ⟨*numberA*⟩ < 1 and ⟨*numberB*⟩ < 1 an empty string is returned;
- ▷ If ⟨*numberA*⟩ > ⟨*lengthString*⟩ et ⟨*numberB*⟩ > ⟨*lengthString*⟩, an empty string is returned;
- ▷ If ⟨*numberA*⟩ < 1, the macro behaves as if ⟨*numberA*⟩ = 1;
- ▷ If ⟨*numberB*⟩ > ⟨*lengthString*⟩, the macro behaves as if ⟨*numberB*⟩ = ⟨*lengthString*⟩.

```
\StrMid{xstring}{2}{5}   stri
\StrMid{xstring}{-4}{2}  xs
\StrMid{xstring}{5}{1}   ||
\StrMid{xstring}{6}{15}  ng
\StrMid{xstring}{3}{3}   t
\StrMid{a bc def }{2}{7} | bc de|
```

2.4 Macros returning a number

2.4.1 \StrLen

\StrLen{⟨*string*⟩}[⟨*name*⟩]

Return the length of ⟨*string*⟩.

```
\StrLen{xstring}  7
\StrLen{A}        1
\StrLen{a bc def } 9
```

2.4.2 \StrCount

\StrCount{⟨*string*⟩}{⟨*stringA*⟩}[⟨*name*⟩]

Counts how many times ⟨*stringA*⟩ is contained in ⟨*string*⟩.

- ▷ If one at least of the arguments ⟨*string*⟩ or ⟨*stringA*⟩ is empty, the macro return 0.

```
\StrCount{abracadabra}{a}   5
\StrCount{abracadabra}{bra} 2
\StrCount{abracadabra}{tic} 0
\StrCount{aaaaaa}{aa}       3
```

2.4.3 \StrPosition

\StrPosition[⟨*number*⟩]{⟨*string*⟩}{⟨*stringA*⟩}[⟨*name*⟩]

The value of the optional argument ⟨*number*⟩ is 1 by default.

In ⟨*string*⟩, returns the position of the ⟨*number*⟩$^{\text{th}}$ occurrence of ⟨*stringA*⟩.

- ▷ If ⟨*number*⟩ is greater than the number of occurrences of ⟨*stringA*⟩, then the macro returns 0;
- ▷ If ⟨*string*⟩ doesn't contain ⟨*stringA*⟩, then the macro returns 0.

```
\StrPosition{xstring}{ring}    4
\StrPosition[4]{abracadabra}{a} 8
\StrPosition[2]{abracadabra}{bra} 9
\StrPosition[9]{abracadabra}{a} 0
\StrPosition{abracadabra}{z}   0
\StrPosition{a bc def }{d}     6
\StrPosition[3]{aaaaaa}{aa}    5
```

[8] In the broad sense, i.e. that the strings characters of the "border" are returned.

2.4.4 \StrCompare

\StrCompare⟨[*]⟩{⟨*stringA*⟩}{⟨*stringB*⟩}[⟨*name*⟩]

This macro has 2 tolerances: the "normal" tolerance, used by default, and the "strict" tolerance.

- The normal tolerance is activated with \comparenormal.

  The macro compares characters from left to right in ⟨*stringA*⟩ and ⟨*stringB*⟩ until a difference appears or the end of the shortest string is reached. The position of the first difference is returned and if no difference is found, the macro return 0.

- The strict tolerance is activated with \comparestrict.

  The macro compares the 2 strings. If they are equal, it returns 0. If not, the position of the first difference is returned.

It is possible to save the comparison mode with \savecomparedmode, then modify this comparison mode and come back to the situation when it was saved with \restoreecomparemode.

Examples with the normal tolerance:

```
\StrCompare{abcd}{abcd}  0
 \StrCompare{abcd}{abc}  0
 \StrCompare{abc}{abcd}  0
\StrCompare{éùçà}{éùçà}  0
\StrCompare{a b c}{abc}  2
 \StrCompare{aaa}{baaa}  1
  \StrCompare{abc}{xyz}  1
\StrCompare{123456}{123457}  6
         \StrCompare{abc}{}  0
```

Examples with the strict tolerance:

```
\StrCompare{abcd}{abcd}  0
 \StrCompare{abcd}{abc}  4
 \StrCompare{abc}{abcd}  4
\StrCompare{éùçà}{éùçà}  0
\StrCompare{a b c}{abc}  2
 \StrCompare{aaa}{baaa}  1
  \StrCompare{abc}{xyz}  1
\StrCompare{123456}{123457}  6
         \StrCompare{abc}{}  1
```

3 Operating modes

3.1 Expansion of arguments

3.1.1 The commands \fullexpandarg, \expandarg and \noexpandarg

The command \fullexpandarg is called by default, so all the arguments are fully expanded (an \edef is used) before the the macro works on them. In most of the cases, this expansion mode avoids chains of \expandafter and allows lighter code.
Of course, the expansion of argument can be canceled to find back the usual behaviour of TEX with the comands \noexpandarg or \normalexpandarg.

Another expansion mode can be called with \expandarg. In this case, the **first token** of each argument is expanded *one time* while all other tokens are left unchanged (if you want the expansion of all tokens one time, you should call the macro \scancs*, see page 17).

The commands \fullexpandarg, \noexpandarg, \normalexpandarg and \expandarg can be called at any moment in the code; they behave as "switches" and they can be locally used in a group.

It is possible to save the expansion mode with \saveexpandmode, then modify this expansion mode and come back to the situation when it was saved with \restoreexpandmode.

In the following list, for every macro of the previous chapter, the arguments colored in red will possibly be expanded, according to the expansion mode:

- \IfSubStr⟨[*]⟩[⟨*number*⟩]{⟨*string*⟩}{⟨*stringA*⟩}{⟨*true*⟩}{⟨*false*⟩}

- \IfSubStrBefore⟨[*]⟩[⟨*number1*⟩,⟨*number2*⟩]{⟨*string*⟩}{⟨*stringA*⟩}{⟨*stringB*⟩}{⟨*true*⟩}{⟨*false*⟩}
- \IfSubStrBehind⟨[*]⟩[⟨*number1*⟩,⟨*number2*⟩]{⟨*string*⟩}{⟨*stringA*⟩}{⟨*stringB*⟩}{⟨*true*⟩}{⟨*false*⟩}
- \IfBeginWith⟨[*]⟩{⟨*string*⟩}{⟨*stringA*⟩}{⟨*true*⟩}{⟨*false*⟩}
- \IfEndWith⟨[*]⟩{⟨*string*⟩}{⟨*stringA*⟩}{⟨*true*⟩}{⟨*false*⟩}
- \IfInteger{⟨*number*⟩}{⟨*true*⟩}{⟨*false*⟩}
- \IfDecimal{⟨*number*⟩}{⟨*true*⟩}{⟨*false*⟩}
- \IfStrEq⟨[*]⟩{⟨*stringA*⟩}{⟨*stringB*⟩}{⟨*true*⟩}{⟨*false*⟩}
- \IfEq⟨[*]⟩{⟨*stringA*⟩}{⟨*stringB*⟩}{⟨*true*⟩}{⟨*false*⟩}
- \IfStrEqCase⟨[*]⟩{⟨*string*⟩}{{⟨*string1*⟩}{⟨*code1*⟩}
  {⟨*string2*⟩}{⟨*code2*⟩}
  ...
  {⟨*string n*⟩}{⟨*code n*⟩}}[⟨*other cases code*⟩]
- \IfEqCase⟨[*]⟩{⟨*string*⟩}{{⟨*string1*⟩}{⟨*code1*⟩}
  {⟨*string2*⟩}{⟨*code2*⟩}
  ...
  {⟨*string n*⟩}{⟨*code n*⟩}}[⟨*other cases code*⟩]
- \StrBefore⟨[*]⟩[⟨*number*⟩]{⟨*string*⟩}{⟨*stringA*⟩}[⟨*name*⟩]
- \StrBehind⟨[*]⟩[⟨*number*⟩]{⟨*string*⟩}{⟨*stringA*⟩}[⟨*name*⟩]
- \StrBetween⟨[*]⟩[⟨*number1*⟩,⟨*number2*⟩]{⟨*string*⟩}{⟨*stringA*⟩}{⟨*stringB*⟩}[⟨*name*⟩]
- \StrSubstitute[⟨*number*⟩]{⟨*string*⟩}{⟨*stringA*⟩}{⟨*stringB*⟩}[⟨*name*⟩]
- \StrDel[⟨*number*⟩]{⟨*string*⟩}{⟨*stringA*⟩}[⟨*name*⟩]
- \StrSplit{⟨*string*⟩}{⟨*number*⟩}{⟨*stringA*⟩}{⟨*stringB*⟩} (see macro StrSplit page 16)
- \StrGobbleLeft{⟨*string*⟩}{⟨*number*⟩}[⟨*name*⟩]
- \StrLeft{⟨*string*⟩}{⟨*number*⟩}[⟨*name*⟩]
- \StrGobbleRight{⟨*string*⟩}{⟨*number*⟩}[⟨*name*⟩]
- \StrRight{⟨*string*⟩}{⟨*number*⟩}[⟨*name*⟩]
- \StrChar{⟨*string*⟩}{⟨*number*⟩}[⟨*name*⟩]
- \StrMid{⟨*string*⟩}{⟨*number1*⟩}{⟨*number2*⟩}[⟨*name*⟩]
- \StrLen{⟨*string*⟩}[⟨*name*⟩]
- \StrCount{⟨*string*⟩}{⟨*stringA*⟩}[⟨*name*⟩]
- \StrPosition[⟨*number*⟩]{⟨*string*⟩}{⟨*stringA*⟩}[⟨*name*⟩]
- \StrCompare{⟨*stringA*⟩}{⟨*stringB*⟩}[⟨*name*⟩]

3.1.2 Chars allowed in arguments

First of all, whatever be the current expansion mode, **tokens with catcode 6 and 14 (usually # and %) are forbidden in all the arguments**[9].

When full expansion mode is activated with `\fullexpandarg`, arguments are expanded with an `\edef` before they are read by the macro. Consequently, are allowed in arguments :

- letters (uppercase or lowercase, accented[10] or not), figures, spaces, and any other character with a catcode of 10, 11 ou 12 (punctuation signs, calculation signs, parenthesis, square bracket, etc).;
- tokens with catcode 1 to 4, usually : `{ }`[11] `$ &`
- tokens with catcode 7 and 8, usually : `^ _`
- any purely expandable control sequence[12] or tokens with catcode 13 (active chars) whose expansion is allowed chars.

On the other hand, some chars[13] like €, ¤, ¶, etc. will provoke errors.

When expansion is not full (`\expandarg` or `\noexpandarg` are active), allowed char in arguments are:

- those cited above;
- any control sequence or token catocode 13, even undefined;
- the special chars (€, ¤, ¶, etc.).

3.2 Expansion of macros, optional argument

The macros of this package are not purely expandable, i.e. they cannot be put in the argument of an `\edef`. Nestling macros is not possible neither.

For this reason, all the macros returning a result (i.e. all excepted the tests) have an optional argument in last position. The syntax is `[`⟨*name*⟩`]`, where ⟨*name*⟩ is the name of the control sequence that will receive the result of the macro: the assignment is made with an `\edef` which make the result of the macro ⟨*name*⟩ purely expandable. Of course, if an optional argument is present, the macro does not display anything.

Thus, this structure not allowed, supposed to assign to `\Result` the 4 chars on the left of `xstring`:

```
\edef\Result{\StrLeft{xstring}{4}}
```

is equivalent to :

```
\StrLeft{xstring}{4}[\Result]
```

And this not allowed nested structure, supposed to remove the first and last char of `xstring`:

```
\StrGobbleLeft{\StrGobbleRight{xstring}{1}}{1}
```

should be written like this:

```
\StrGobbleRight{xstring}{1}[\mystring]
\StrGobbleleft{\mystring}{1}
```

3.3 How does xstring read the arguments?

3.3.1 Syntax unit by syntax unit

The macros of xstring read their arguments syntax unit par syntax unit. In the TEX code, a syntax unit[14] is either:

- a control sequence;
- a group, i.e. what is between 2 balanced braces (usually tokens catcode 1 and 2);
- a char.

[9] Maybe, the token # will be allowed in a further version.

[10] For a reliable operation with accented letters, the `\fontenc` package with option `[T1]` and `\inputenc` with appropriated option must be loaded

[11] Warning : braces **must** be balanced in arguments !

[12] i.e. this control sequence can be `\edef`ed.

[13] These chars are obtained with the keys AltGr + letter under GNU/Linux distributions.

[14] For advanced users used to LATEX programming, a syntax unit is what is gobbled by the macro `\@gobble` whose code is: `\def\@gobble#1{}`

Let's see what is a syntax unit with an example. Let's take this argument : "ab\textbf{xyz}cd"
It has 6 syntax units: "a", "b", "\textbf", "{xyz}", "c" and "d".

What will happen if, while \noexpandarg is active, we ask xstring to find the length of this argument and find its 4th "char"

```
\noexpandarg
\StrLen{ab\textbf{xyz}cd}\par
\StrChar{ab\textbf{xyz}cd}{4}[\mychar]
\meaning\mychar
```

6
macro:->{xyz}

It is necessary to use \meaning to see the real expansion of \mychar, and not simply call \mychar to display it, which make loose informations (braces here). We do not obtain a "char" but a syntax unit, as expected.

3.3.2 Exploration of groups

By default, the command \noexploregroups is called, so in the argument containing the string of tokens, xstring does not look into groups, and simply consider them as a syntax unit.
For specific uses, it can be necessary to look into groups: \exploregroups changes the exploration mode and forces the macros to look inside groups.

What does this exploration mode in the previous example? xstring does not count the group as a single syntax unit but looks inside it and counts the syntax unit found inside (x, y and z), and so on if there were several nested groups:

```
\noexpandarg
\exploregroups
\StrLen{ab\textbf{xyz}cd}\par
\StrChar{ab\textbf{xyz}cd}{4}[\mychar]
\meaning\mychar
```

8
macro:->x

Exploring the groups can be usefull for counting a substring in a string (\StrCount), for the position of a substring in a string (\StrPosition) or for tests, but has a severe limitation with macros returning a string: when a string is cut inside a group, **the result does not take into account what is outside this group**. This exploration mode must be used knowingly this limitation when calling macros returning a string.

Let's see what this means with an example. We want to know what is on the left of the second appearance of \a in the argument \a1{\b1\a2}\a3. As groups are explored, this appearance is inside this group : {\b1\a2}. The result will be \b1. Let's check:

```
\noexpandarg
\exploregroups
\StrBefore[2]{\a1{\b1\a2}\a3}{\a}[\mycs]
\meaning\mycs
```

macro:->\b 1

Exploring the groups[15] can change the behaviour of most of the macros of xstring, excepted these macros untouched by the exploration mode; their behaviour is the same in any case: \IfInteger, \IfDecimal, \IfStrEq, \StrEq et \StrCompare.
Moreover, 2 macros run in \noexploregroups mode, whatever be the current mode: \StrBetween et \StrMid.

It is possible to save the exploration mode with \saveexploremode, then modify it and come back to the situation when it was saved with \restoreexploremode.

3.4 Catcode and starred macros

Macros of this package take the catcodes of tokens into account. To avoid unexpected behaviour (particulary with tests), you should keep in mind that tokens *and their catcodes* are examined.

For instance, these two arguments:

{\string a\string b} and {ab}

do *not* expand into equal strings for xstring! Because of the command \string, the first expands into "ab" with catcodes 12 while the second have characters with their natural catcodes 11. Catcodes do not match! It is necessary to be aware of this, particulary with TEX commands like \string whose expansions are a strings with chars catcodes 12 and 10 : \detokenize, \meaning, \jobname, \fontname, \romannumeral, etc.

[15] The file test of xstring has many examples underlining differences between exploration modes.

Starred macros do not take catcodes into account. They simply convert some arguments into arguments with catcodes 10, 11 and 12, and call the non-starred macros with these modified arguments. The optional arguments are not modified and the catcodes are left unchanged.

Here is an example:

```
\IfStrEq{\string a\string b}{ab}{true}{false}\par
\IfStrEq*{\string a\string b}{ab}{true}{false}
```

false
true

The strings do not match because of catcode differences: the test is negative in the non-starred macro.

Warning: the use of a strarred macro has consequences! The arguments are "detokenized", thus, there is no more control sequences, groups, neither any special char: everything is converted into chars with "harmless" catcodes.

For the macros returning a string, if the starred version is used, the result will be a string in which chars have catcodes 12 and 10 for space. For example, after a "`\StrBefore*{a \b c d}{c}[\mytext]`", the control sequence `\mytext` expands to "$\texttt{a}_{12}\sqcup_{10}\backslash_{12}\texttt{b}_{12}\sqcup_{10}$".

The macro with a starred version are listed below. For these macros, if starred version is used, the red arguments will be detokenized:

- `\IfSubStr`⟨`[*]`⟩`[`⟨*number*⟩`]{`⟨*string*⟩`}{`⟨*stringA*⟩`}{`⟨*true*⟩`}{`⟨*false*⟩`}`
- `\IfSubStrBefore`⟨`[*]`⟩`[`⟨*number1*⟩`,`⟨*number2*⟩`]{`⟨*string*⟩`}{`⟨*stringA*⟩`}{`⟨*stringB*⟩`}{`⟨*true*⟩`}{`⟨*false*⟩`}`
- `\IfSubStrBehind`⟨`[*]`⟩`[`⟨*number1*⟩`,`⟨*number2*⟩`]{`⟨*string*⟩`}{`⟨*stringA*⟩`}{`⟨*stringB*⟩`}{`⟨*true*⟩`}{`⟨*false*⟩`}`
- `\IfBeginWith`⟨`[*]`⟩`{`⟨*string*⟩`}{`⟨*stringA*⟩`}{`⟨*true*⟩`}{`⟨*false*⟩`}`
- `\IfEndWith`⟨`[*]`⟩`{`⟨*string*⟩`}{`⟨*stringA*⟩`}{`⟨*true*⟩`}{`⟨*false*⟩`}`
- `\IfStrEq`⟨`[*]`⟩`{`⟨*stringA*⟩`}{`⟨*stringB*⟩`}{`⟨*true*⟩`}{`⟨*false*⟩`}`
- `\IfEq`⟨`[*]`⟩`{`⟨*stringA*⟩`}{`⟨*stringB*⟩`}{`⟨*true*⟩`}{`⟨*false*⟩`}`
- `\IfStrEqCase`⟨`[*]`⟩`{`⟨*string*⟩`}{{`⟨*string1*⟩`}{`⟨*code1*⟩`}`
  `{`⟨*string2*⟩`}{`⟨*code2*⟩`}`
  ...
  `{`⟨*string n*⟩`}{`⟨*code n*⟩`}}[`⟨*other cases code*⟩`]`
- `\IfEqCase`⟨`[*]`⟩`{`⟨*string*⟩`}{{`⟨*string1*⟩`}{`⟨*code1*⟩`}`
  `{`⟨*string2*⟩`}{`⟨*code2*⟩`}`
  ...
  `{`⟨*string n*⟩`}{`⟨*code n*⟩`}}[`⟨*other cases code*⟩`]`
- `\StrBefore`⟨`[*]`⟩`[`⟨*number*⟩`]{`⟨*string*⟩`}{`⟨*stringA*⟩`}[`⟨*name*⟩`]`
- `\StrBehind`⟨`[*]`⟩`[`⟨*number*⟩`]{`⟨*string*⟩`}{`⟨*stringA*⟩`}[`⟨*name*⟩`]`
- `\StrBetween`⟨`[*]`⟩`[`⟨*number1*⟩`,`⟨*number2*⟩`]{`⟨*string*⟩`}{`⟨*stringA*⟩`}{`⟨*stringB*⟩`}[`⟨*name*⟩`]`
- `\StrCompare`⟨`[*]`⟩`{`⟨*stringA*⟩`}{`⟨*stringB*⟩`}[`⟨*name*⟩`]`

4 Advanced macros for programming

Though xstring is able to read arguments containing TEX or LATEX code, for some advanced programming needs, it can be insufficient. This chapter presents other macros able to get round some limitations.

4.1 Finding a group, macros \StrFindGroup and \groupID

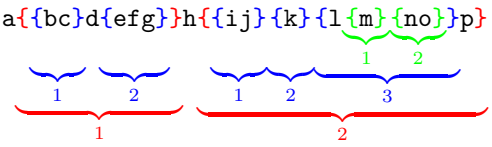
When \exploregroups mode is active, the macro \StrFindGroup finds a group between braces with its identifier:

\StrFindGroup{⟨*argument*⟩}{⟨*identifier*⟩}[⟨*name*⟩]

When the group matching the identifier does not exist, an empty string is assigned to ⟨*name*⟩. If the group is found, this group *with its braces* is assigned to ⟨*name*⟩.

This identifier characterizes the nestling position of the group. It is a list of one or several integers separated with commas. n_1, the first integer is the number of the group (not nestled in another) in which the sought group is. Inside this group, the second integer n_2 is the number of the group (not nestled in another) in which the sought group is... and so on until the necessary nestling depth is reached to obtain the sougth after group.

Let's take an example with 3 levels of nestled groups. In this example, braces delimiting groups are colored in red for nestling level 1, in blue for level 2 and in green for level 3. The groups are numbered with the rule seen above:



In this example:

- the group {{bc}d{efg}} has the identifier: 1
- the group {ij} has the identifier: 2,1
- the group {no} has the identifier: 2,3,2
- the whole argument a{{bc}d{efg}}h{{ij}{k}{l{m}{no}}p} has the identifier 0, only case where the integer 0 is appears in the identifier of a group.

Here is the full example:

```
\exploregroups
\expandarg
\def\string{a{{bc}d{efg}}h{{ij}{k}{l{m}{no}}p}}
\StrFindGroup{\string}{1}[\mygroup]
\meaning\mygroup\par
\StrFindGroup{\string}{2,1}[\mygroup]
\meaning\mygroup\par
\StrFindGroup{\string}{2,3,2}[\mygroup]
\meaning\mygroup\par
\StrFindGroup{\string}{2,5}[\mygroup]
\meaning\mygroup\par
```

macro:->{{bc}d{efg}}
macro:->{ij}
macro:->{no}
macro:->

The reverse process exists, and several macros of xstring provide the identifier of the group in which they made a cut or they found a substring. These macros are: \IfSubStr, \StrBefore, \StrBehind, \StrSplit, \StrLeft, \StrGobbleLeft, \StrRight, \StrGobbleRight, \StrChar, \StrPosition.

After these macros, the control sequence \groupID expands to the identifier of the group where the cut has been done or the search has succeeded. When not cut can be done or the search fails, \groupID is empty. Obvioulsly, the use of \groupID has sense only when \exploregroups mode is acive and when non starred macros are used.

Here are some examples with the macro \StrChar:

```
\exploregroups
char no 1 = \StrChar{a{b{cd}{e{f}g}h}ijkl}{1}\qquad
\string\groupID = \groupID\par
char no 4 = \StrChar{a{b{cd}{e{f}g}h}ijkl}{4}\qquad
\string\groupID = \groupID\par
char no 6 = \StrChar{a{b{cd}{e{f}g}h}ijkl}{6}\qquad
\string\groupID = \groupID\par
char no 20 = \StrChar{a{b{cd}{e{f}g}h}ijkl}{20}\qquad
\string\groupID = \groupID
```

char no 1 = a \groupID= 0
char no 4 = d \groupID= 1,1
char no 6 = f \groupID= 1,2,1
char no 20 = \groupID=

4.2 Splitting a string, the macro \StrSplit

Here is the syntax:

`\StrSplit{`⟨*string*⟩`}{`⟨*number*⟩`}{`⟨*stringA*⟩`}{`⟨*stringB*⟩`}`

The ⟨*string*⟩, is splitted after the syntax unit at position ⟨*number*⟩. The left part is assigned to the control sequence ⟨*stringA*⟩ and the right part is assigned to ⟨*stringB*⟩.
This macro returns two strings, so it does *not* display anything. Consequently, it does not provide the optional argument in last position.

- ▷ If ⟨*number*⟩ ⩽ 0, ⟨*stringA*⟩ is empty and ⟨*stringB*⟩ is equal to ⟨*string*⟩;
- ▷ If ⟨*number*⟩ ⩾⟨*lengthString*⟩, ⟨*stringA*⟩ is equal to ⟨*string*⟩ and ⟨*stringB*⟩ is empty;
- ▷ If ⟨*string*⟩ is empty, ⟨*stringA*⟩ and ⟨*stringB*⟩ are empty, whatever be the integer ⟨*number*⟩.

```
\StrSplit{abcdef}{4}{\aa}{\bb}results:  |\aa| and |\bb|  results: |abcd| and |ef|
\StrSplit{a b c }{2}{\aa}{\bb}results:  |\aa| and |\bb|  results: |a | and |b c |
\StrSplit{abcdef}{1}{\aa}{\bb}results:  |\aa| and |\bb|  results: |a| and |bcdef|
\StrSplit{abcdef}{5}{\aa}{\bb}results:  |\aa| and |\bb|  results: |abcde| and |f|
\StrSplit{abcdef}{9}{\aa}{\bb}results:  |\aa| and |\bb|  results: |abcdef| and ||
\StrSplit{abcdef}{-3}{\aa}{\bb}results:  |\aa| and |\bb|  results: || and |abcdef|
```

When the exploration of groups is active and the cut is made at the end of a group, the content of the left string will tbe the entire group while the right string will be empty. The example shows this:

```
\exploregroups
\StrSplit{ab{cd{ef}gh}ij}{6}\strA\strB
\meaning\strA\par
\meaning\strB
```

macro:->ef
macro:->

This macro provides a star version: in this case, the cut is made just before the syntax unit which follows the syntax unit at position ⟨*number*⟩. Both version give same results, except when the cut is made at the end of a group; in that case, `\StrSplit` closes as many group as necessary until it finds the next syntax unit: the cut is made just before this syntax unit.

```
\exploregroups
With natural macro:\par
\StrSplit{ab{cd{ef}gh}ij}{6}\strA\strB
\meaning\strA\par
\meaning\strB\par
\string\groupID = \groupID\par
With star macro:\par
\StrSplit*{ab{cd{ef}gh}ij}{6}\strA\strB
\meaning\strA\par
\meaning\strB\par
\string\groupID\ = \groupID
```

With natural macro:
macro:->ef
macro:->
\groupID= 1,1
With star macro:
macro:->cd{ef}
macro:->gh
\groupID = 1

4.3 Assign a verb content, the macro \verbtocs

The macro `\verbtocs` allow to read the content of a "verb" argument containing special characters: `&`, `~`, `\`, `{`, `}`, `_`, `#`, `$`, `^` and `%`. The catcodes of "normal" characters are left unchanged while special characters take a catcode 12. Then, these characters are assigned to a control sequence. The syntax is:

`\verbtocs{`⟨*name*⟩`}|`⟨*characters*⟩`|`

⟨*name*⟩ is the name of the control sequence receiving, with an `\edef`, the ⟨*characters*⟩. ⟨*name*⟩ thus contains tokens with catcodes 12 (or 10 for space).

By default, the token delimiting the verb content is "|". Obviously, this token cannot be both delimiting and being contained into what it delimits. If you need to verbatimize strings containing "|", you can change at any time the token delimiting the verb content with the macro:

`\setverbdelim{`⟨*character*⟩`}`

Any ⟨*token*⟩ can be used[16]. For example, after `\setverbdelim{=}`, a verb argument look like this: `=`⟨*characters*⟩`=`.

About verb arguments, keep in mind that:

[16]Several tokens can be used, but the syntax of `\verbtocs` becomes less readable ! For this reason, a warning occurs when the argument of `\setverbdelim` contains more than a single token.

- all the characters before |⟨*characters*⟩| are ignored;
- inside the verb argument, all the spaces are taken into account, even if they are consecutive.

Example:

```
\verbtocs{\result}  |a   & b{ c% d$ e \f|
\result
```

a & b{ c% d$ e \f

4.4 Tokenization of a text to a control sequence, the macro \tokenize

The reverse process of what has been seen above is to transform chars into tokens. This is done by the macro:

\tokenize{⟨*name*⟩}{⟨*control sequences*⟩}

⟨*control sequences*⟩ is fully expanded if \fullexpandarg has been called, and is not expanded if \noexpandarg or \expandarg are active. After expansion, the chars are tokenized to tokens and assigned to ⟨*name*⟩ with a \def.

Example:

```
\verbtocs{\text}|\textbf{a} $\frac{1}{2}$|
text: \text
\tokenize{\result}{\text}
\par
result: \result
```

text: \textbf{a} $\frac{1}{2}$
result: **a** $\frac{1}{2}$

Obviously, the control sequence \result can be called at the last line since the control sequences it contains are defined.

4.5 Expansion of a control sequence before verbatimize, the macro \scancs

It is possible to expand a control sequence before converting this expansion into text. This is done by the macro:

\scancs[⟨*number*⟩]{⟨*name*⟩}{⟨*control sequence*⟩}

⟨*number*⟩ = 1 by default and represents the number of times ⟨*control sequence*⟩ will be expanded before being converted in characters with catcodes 12 (or 10 for spaces). These characters are then assigned to ⟨*name*⟩.
If necessary, the depth of expansion can be controlled with the optional argument. If the n^{th} expansion is a control sequence, the control sequence is verbatimized into chars catcodes 12. The following shows all the "depths" of expansion, from 0 to 3:

```
\def\a{1 z 3}
\def\b{\a}
\def\c{\b}
\scancs[0]{\result}{\c}
expansion 0 : \result\par
\scancs[1]{\result}{\c}
expansion 1 : \result\par
\scancs[2]{\result}{\c}
expansion 2 : \result\par
\scancs[3]{\result}{\c}
expansion 3 : \result
```

expansion 0 : \c
expansion 1 : \b
expansion 2 : \a
expansion 3 : 1 z 3

Obviously, it is necessary to ensure that the expansion to the desired depth is possible.

In normal use, the third argument ⟨*control sequence*⟩ (or one of its expansions) must contain a single control sequence that will be expanded. If this third argument or one of its expansion contains several control sequences, compilation stops with an error message asking you to use the starred version. This starred version, more difficult to use allows to expand ⟨*number*⟩ times *all* the control sequences contained in the third argument. It is necessary to keep in mind that if the $n-1^{\text{th}}$ expansion contains a group between braces, this group will be expanded at the n^{th} expansion and will loose its braces! It is the same for spaces[17].

This is an example that shows the deletion of braces during the next expansion:

[17] Any call to \scancs* provoque a warning message warning against this behaviour.

```
\def\a{1 {2}}
\def\b{\a \a}
\scancs*[0]{\result}{{A}\b}
expansion 0 : \result\par
\scancs*[1]{\result}{{A}\b}
expansion 1 : \result\par
\scancs*[2]{\result}{{A}\b}
expansion 2 : \result\par
\scancs*[3]{\result}{{A}\b}
expansion 3 : \result
```

expansion 0 : {A}\b
expansion 1 : A\a \a
expansion 2 : A1 {2}1 {2}
expansion 3 : A1212

4.6 Inside the definition of a macro

Some difficulties arise inside the definition of a macro, i.e. between braces following a `\def\macro` or a `\newcommand\macro`.

It is forbidden to use the command `\verb` inside the definition of a macro. For the same reasons:

Do not use `\verbtocs` inside the definition of a macro.

But then, how to manipulate special characters and "verbatimize" inside the définition of macros ?

The `\detokenize` primitive of ε-TEXcan be used but it has limitations:

- braces must be balanced;
- consecutive spaces make a single space;
- the `%` sign is not allowed;
- a space is inserted after each control sequence;
- `#` signs become `##`.

It is better to use `\scancs` and define *outside the definition of the macros* control sequences containing special characters with `\verbtocs`. It is also possible to use `\tokenize` to transform the final result (which is generaly $\texttt{text}_{10,11,12}$) into control sequences. See example using these macros at the end of this manual, page 19.

In the following teaching example[18], the macro `\bracearg` adds braces to its argument. To make this possible, 2 control sequences `\Ob` and `\Cb` containing `"{"` and `"}"` are defined outside the definition of `\bracearg`, and expanded inside it:

```
\verbtocs{\Ob}|{|
\verbtocs{\Cb}|}|
\newcommand\bracearg[1]{%
    \def\text{#1}%
    \scancs*{\result}{\Ob\text\Cb}%
    \result}
\bracearg{xstring}\par
\bracearg{\a}
```

{xstring}
{\a }

4.7 The macro `\StrRemoveBraces`

Advanced users may need to remove the braces of an argument.
The macro `\StrRemoveBraces` does this. Its syntax is:

`\StrRemoveBraces{`⟨*string*⟩`}[`⟨*name*⟩`]`

This macro is sensitive to exploration mode and will remove *all* the braces with `\exploregroups` while it will remove braces of lower level with `\noexploregroups`.

```
                          \noexploregroups
\StrRemoveBraces{a{b{c}d}e{f}g}[\mycs]
                            \meaning\mycs   macro:->ab{c}defg
                         \exploregroups
\StrRemoveBraces{a{b{c}d}e{f}g}[\mycs]
                            \meaning\mycs   macro:->abcdefg
```

[18] It is possible to make much more simple using `\detokenize`. The macro becomes:
`\newcommand\bracearg[1]{\detokenize{{#1}}}`

4.8 Examples

Here are some very simple examples involving the macros of this package in programming purposes.

4.8.1 Example 1

We want to substitute the 2 first `\textit` by `\textbf` in the control sequence `\myCS` which contains

```
\textit{A}\textit{B}\textit{C}
```

We expect: **AB***C*

```
\expandarg
\def\myCS{\textit{A}\textit{B}\textit{C}}
\def\pattern{\textit}
\def\replace{\textbf}
\StrSubstitute[2]{\myCS}{\pattern}{\replace}
```

AB*C*

It is possible to avoid to define `\pattern` and `\replace`: a "snare" can be used. It can be a control sequence which expansion is empty, like the famous `\empty`. The code would have been:

```
\StrSubstitute[2]{\myCS}{\empty\textit}{\empty\textbf}
```

With this code, in both arguments, the first token `\empty` is expanded to "nothing" and the following significant tokens `\textit` and `textbf` are left unchanged.

By this way, `\empty` is a way to "hack" `\expandarg`: it allows to avoid the expansion of all the other tokens. The control sequence `\noexpand` can be used instead of `\empty` for the same result.

4.8.2 Exemple 2

Here, we try to write a macro which gobbles `n` syntax units in a string from a given position, and assigns the result to a control sequence.
Let's call this macro `StringDel` and let's give it this syntax:

```
\StringDel{string}{position}{n}{\name_of_result}
```

We can proceed like this: take the string before the position and save it. Then remove `n + position` syntax units from the initial string, and add (concatenate) this result to the string previously saved. This gives the following code:

```
\newcommand\StringDel[4]{%
\begingroup
\expandarg% local inside this group
\StrLeft{\empty#1}{\number\numexpr#2-1}[#4]%
\StrGobbleLeft{\empty#1}{\number\numexpr#2+#3-1}[\StrA]%
\expandafter\expandafter\expandafter\endgroup
\expandafter\expandafter\expandafter\def
\expandafter\expandafter\expandafter#4%
\expandafter\expandafter\expandafter{\expandafter#4\StrA}%
}

\noexploregroups
\StringDel{abcdefgh}{2}{3}{\cmd}
\meaning\cmd

\StringDel{a\textbf{1}b\textbf{2c}3d}{3}{4}{\cmd}
\meaning\cmd
```

macro:->aefgh
macro:->a\textbf 3d

To concatenate, the LaTeX macro `\g@addto@macro` could have been used, leading to a lighter code without the huge bridge of `\expandafter`. The assignment[19] can be written like this:

```
\expandafter\g@addto@macro\expandafter#4\expandafter{\StrA}\endgroup
```

[19]The macro `\g@addto@macro` can be used if the catcode of "`@`" is temporarily changed with `\makeatletter` and restored with `\makeatother`

4.8.3 Example 3

Let's try to write a macro `\tofrac` that transforms an argument of this type "a/b" into "$\frac{a}{b}$".

First of all, let's cancel the expansion of arguments with `\noexpandarg`, we do not need expansion here. Then, it's easy to cut what is before and behind the first occurrence of "/" (assumed there is a single occurrence) and assign it to `\num` and `\den` and simply call the macro `\frac` :

```
\noexpandarg
\newcommand\tofrac[1]{%
  \StrBefore{#1}{/}[\num]%
  \StrBehind{#1}{/}[\den]%
  $\frac{\num}{\den}$%
}
\tofrac{15/9}
\tofrac{u_{n+1}/u_n}
\tofrac{a^m/a^n}
\tofrac{x+\sqrt{x}/\sqrt{x^2+x+1}}
```

$\frac{15}{9}$ $\frac{u_{n+1}}{u_n}$ $\frac{a^m}{a^n}$ $\frac{x+\sqrt{x}}{\sqrt{x^2+x+1}}$

4.8.4 Example 4

Let's try to write a macro `\boldafter` which writes in bold the first word that follows the word contained in the expansion of `\word`.

```
\newcommand\boldafter[2]{%
  \noexpandarg
  \StrBehind[1]{#1 }{ #2 }[\word]%
  \expandarg
  \StrBefore{\word}{ }[\word]%
  \StrSubstitute[1]{#1}{\word}{\textbf{\word}}%
}

\boldafter{The xstring package is new}{xstring}

\boldafter{The xstring package is new}{ring}

\boldafter{The xstring package is new}{is}
```

The xstring **package** is new
The xstring package is new
The xstring package is **new**

4.8.5 Example 5

A control sequence `\myCS` défined with an `\def` contains control sequences with their possible arguments. How to reverse the order of the 2 first control sequences? For this, a macro `\swaptwofirst` does the job and displays the result. But this time, it is not possible to seek the token `\` (catcode 0) with the macros of xstring. This is why the use of `\scancs` is necessary: after the detokenization of the argument, it becomes possible to search the char `\` (catcode 12). After 4 lines, the process made by the macros of xstring (`\StrBefore` and `\StrBehind`) is finish, a retokenization is done by `\tokenize` and `\before` and `\after` are swapped at this moment.

```
\verbtocs{\antislash}|\|
\newcommand\swaptwofirst[1]{%
  \fullexpandarg
  \scancs[0]\chaine{#1}%
  \StrBefore[3]{\chaine}{\antislash}[\firsttwo]%
  \StrBehind{\chaine}{\firsttwo}[\others]
  \StrBefore[2]{\firsttwo}{\antislash}[\before]
  \StrBehind{\firsttwo}{\before}[\after]%
  \tokenize\myCS{\after\before\others}%
  \myCS}

\swaptwofirst{\underline{A}\textbf{B}\textit{C}}

\swaptwofirst{\Large\underline{A}\textbf{B}123}
```

B$\underline{\text{A}}C$
$\underline{\text{A}}$**B**123

4.8.6 Example 6

In a string, we want to find the n^{th} word between 2 given delimiters. For this, let's write a macro `\findword` with an optional argument which content is the delimiter (space by default), 1 argument containing the string and an other argument containing the number n.

The macro `\findword` artfully uses `\StrBetween` and `\numexpr`:

```
\newcommand\findword[3][ ]{%
\StrBetween[#3,\numexpr#3+1]{#1#2#1}{#1}{#1}}
\noexpandarg
|\findword{a bc d\textit{e f} gh}{3}|

|\findword[\@nil]{1 \@nil 2 3 \@nil4\@nil5}{2}|
```

|d*e f*|
| 2 3 |

⋆
⋆ ⋆

That's all, I hope you will find this package useful!
Please, send me an email if you find a bug or if you have any idea of improvement...

Christian Tellechea