The *cloze* package*

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1 Introduction

cloze is a LaTeX package to generate cloze texts. It uses the capabilities of the modern TeX engine *LuaTeX*. Therefore, you must use LuaLaTeX to create documents containing gaps.

```
lualatex cloze-text.tex
```

The main feature of the package is that the formatting doesn't change when using the `hide` and `show` (→ 2.2.9) options.

Lorem ipsum *dolor sit* amet, consectetur *adipisicing* elit, sed do eiusmod tempor incididunt ut labore et *dolore magna* aliqua. Ut enim ad minim veniam, quis nostrud *exercitation* ullamco laboris nisi ut *aliquip* ex ea commodo consequat.

The command `\clozeset{hide}` only shows gaps. When you put both texts on top of each other you will see that they perfectly match.

Lorem ipsum _____ amet, consectetur _____ elit, sed do eiusmod tempor incididunt ut labore et _____ aliqua. Ut enim ad minim veniam, quis nostrud _____ ullamco laboris nisi ut _____ ex ea commodo consequat.

2 Usage

There are the commands `\cloze`, `\clozefix`, `\clozefil`, `\clozenol`, `\clozestrike` and the environments `clozepar` and `clozebox` to generate cloze texts.

2.1 The commands and environments

2.1.1 `\cloze`

`\cloze` `\cloze[`⟨*options*⟩`]{`⟨*some text*⟩`}`: The command `\cloze` is similar to a command that offers the possibility to underline the texts. `\cloze` does not prevent line breaks. The width of a gap depends on the number of letters and the font used. The only option which affects the widths of a gap is the option `margin` (→ 2.2.11).

Lorem ipsum *dolor* sit amet, *consectetur* adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore *magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi* ut aliquip ex ea commodo consequat.

It is possible to convert a complete paragraph into a 'gap'. But don't forget: There is a special environment for this: `clozepar` (→ 2.1.7).

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat.

The command `\cloze` doesn't change the behavior of the hyphenation. Let's try some long German words:

es *Telekommunikationsüberwachung* geht *Unternehmenssteuerfortentwicklungsgesetz* *Abteilungsleiterin* *Oberkommisarin* auch *Fillialleiterin* kurz *Oberkommisarin* *Unternehmenssteuerfortentwicklungsgesetz* *Fillialleiterin* *Metzgermeisterin* in *Abteilungsleiterin* der *Oberkommisarin* *Hochleistungsflüssigkeitschromatographie* *Fillialleiterin* Kürze *Unternehmenssteuerfortentwicklungsgesetz* *Metzgermeisterin* liegt *Abteilungsleiterin* die *Metzgermeisterin* *Abteilungsleiterin* Würze *Oberkommisarin*

2.1.2 `\clozesetfont`

`\clozesetfont` The gap font can be changed by using the command `\clozesetfont`. `\clozesetfont` redefines the command `\clozefont` which contains the font definition. Thus, the command `\clozesetfont{\Large}` has the same effect as `\renewcommand{\clozefont}{\Large}`.

Excepteur *sint* occaecat *cupidatat* non proident.

Please do not put any color definitions in `\clozesetfont`, as it won't work. Use the option `textcolor` instead (→ 2.2.10).

`\clozesetfont{\ttfamily\normalsize}` changes the gap text for example into a normal sized typewriter font.

Excepteur *sint* occaecat *cupidatat* non proident.

2.1.3 `\clozefix`

`\clozefix` `\clozefix[`⟨*options*⟩`]{`⟨*some text*⟩`}`: The command `\clozefix` creates gaps with a fixed width. The clozes are default concering the width `2cm`.

Lorem ipsum dolor sit amet:

1. *consectetur*
2. *adipisicing*
3. *elit*

sed do eiusmod.

Gaps with a fixed width are much harder to solve.

Lorem ipsum dolor *sit* amet, *consectetur* adipisicing elit, sed do eiusmod tempor incididunt *ut* labore et dolore magna aliqua.

Using the option `align` you can make nice tabulars like this:

Composer	Life span
Joseph Haydn	*1723-1809*
Wolfgang Amadeus Mozart	*1756-1791*
Ludwig van Beethoven	*1770-1827*

2.1.4 `\clozenol`

`\clozenol` `\clozenol[`⟨*options*⟩`]{`⟨*some text*⟩`}`: The macro name `clozenol` stands for *"cloze no line"*. As the the name suggests this macro typesets cloze texts without a line.

```
Lorem \clozenol{ipsum dolor} sit amet.
```

Lorem *ipsum dolor* sit amet.

```
Lorem \clozenol[textcolor=green]{ipsum dolor} sit amet.
```

Lorem *ipsum dolor* sit amet.

2.1.5 `\clozefil`

`\clozefil` `\clozefil[`⟨*options*⟩`]{`⟨*some text*⟩`}`: The name of the command is inspired by `\hfil`, `\hfill`, and `\hfilll`. Only `\clozefil` fills out all available horizontal spaces with a line.

Lorem ipsum dolor sit amet, *consectetur adipisicing elit, sed do eiusmod.*
Ut enim *ad minim veniam* exercitation.

2.1.6 `\clozeextend`

`\clozeextend` `\clozeextend[`⟨*spaces*⟩`]`: The command `\clozeextend` adds some invisible placeholders to extend some cloze texts with blank space.

```
\begin{itemize}
\item \clozefil{Lorem ipsum dolor sit amet, consectetur adipisicing
elit, sed do eiusmod tempor incididunt ut labore et dolore magna
aliqua.}
\item \clozefil{Ut enim ad minim veniam \clozeextend[20]}
```

```
\item \clozefil{quis nostrud \clozeextend[20]}
\end{itemize}
```

- *Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.*
- *Ut enim ad minim veniam*
- *quis nostrud*

2.1.7 clozepar

clozepar `\begin{clozepar}`[⟨*options*⟩] …*some text* …`\end{clozepar}`: The environment `clozepar` transforms a complete paragraph into a cloze text. The options `align`, `margin` and `width` have no effect on this environment.

Lorem ipsum dolor sit amet, consectetur adipisicing elit ullamco laboris nisi. *Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum.* Excepteur sint occaecat cupidatat non proident.

2.1.8 clozebox

clozebox `\begin{clozebox}`*[⟨*options*⟩] …*some text* …`\end{clozebox}`: The environment `clozebox` surrounds a text with a box. The starred version omits the line around the box. Use the options `boxwidth` and `boxheight` to specify the dimensions of the box. By default the width of the box is `\linewidth`.

```
\begin{clozebox}
Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod
tempor incididunt ut labore et dolore magna aliqua.
\end{clozebox}
```

`\clozehide`

`\clozeshow`

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

2.1.8.1 Option boxwidth

See the documentation about the option (→ 2.2.7).

```
\begin{clozebox}[boxwidth=5cm]
Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod
tempor incididunt ut labore et dolore magna aliqua.
\end{clozebox}
```

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

2.1.8.2 Option boxheight

See the documentation about the option (→ 2.2.6).

```
\begin{clozebox}[boxwidth=5cm,boxheight=5cm]
Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod
tempor incididunt ut labore et dolore magna aliqua.
\end{clozebox}
```

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

2.1.8.3 starred

```
\begin{clozebox}*[boxwidth=5cm,boxheight=5cm]
Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod
tempor incididunt ut labore et dolore magna aliqua.
\end{clozebox}
```

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

2.1.9 clozespace

clozespace `\begin{clozespace}[`⟨*options*⟩`]` …*some text* …`\end{clozespace}`

```
\begin{clozespace}[spacing=2]
\clozesetfont{\ttfamily\Huge}
Lorem \cloze{ipsum} dolor sit \cloze{amet}, consectetur adipisicing
elit, sed do eiusmod tempor incididunt ut labore et dolore magna
aliqua. Ut enim ad minim veniam, quis \cloze{nostrud}
exercitation ullamco \cloze{laboris} nisi ut aliquip ex ea commodo
consequat.
\end{clozespace}
```

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat.

2.1.10 \clozeline

\clozeline `\clozeline[`⟨*options*⟩`]`: To create a cloze line of a certain width, use the command `\clozeline`. The default width of the line is `2cm`. In combination with the other cloze commands you can create for example an irregular alignment of the cloze text.

```
Ut enim ad
\clozeline[width=1cm]\cloze{minim}\clozeline[width=3cm]
minim veniam
```

Ut enim ad _____*minim*_____ minim veniam,

2.1.11 \clozelinefil

\clozelinefil

\clozelinefil[⟨*options*⟩]: This command \clozelinefil fills the complete available horizontal space with a line. Moreover, \clozelinefil was used to create \clozefil.

Lorem_____

2.1.12 \clozestrike

\clozestrike

\clozestrike[⟨*options*⟩]{⟨*wrong text*⟩}{⟨*correct text*⟩}

```
Lorem \clozestrike{ipsum}{dolor} sit amet.
```

dolor
Lorem ~~ipsum~~ sit amet.

```
Lorem \clozestrike[textcolor=red]{ipsum}{dolor} sit amet.
```

dolor
Lorem ~~ipsum~~ sit amet.

et dolore magna aliquyam erat *et accusam et justo*
invidunt ut ~~labore~~, sed diam voluptua. At ~~vero eos~~ duo dolores et ea
clita kasd gubergren
~~rebum. Stet~~, no sea takimata sanctus est Lorem ipsum dolor sit amet. Lorem
sadipscing elitr, sed diam
ipsum ~~dolor sit amet, consetetur~~ nonumy eirmod tempor invidunt ut labore
At vero
et dolore magna aliquyam erat, ~~sed diam voluptua~~.

invidunt ut labore, sed diam voluptua. At vero eos duo dolores et ea rebum. Stet, no sea takimata sanctus est Lorem ipsum dolor sit amet. Lorem

ipsum dolor sit amet, consetetur nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua.

2.2 The options

2.2.1 Local and global options

The *cloze* package distinguishs between *local* and *global* options. Besides the possiblity to set *global* options in the `\usepackage[`⟨*global options*⟩`]{`⟨*cloze*⟩`}` declaration, the cloze package offers a special command to set *global* options: `\clozeset{`⟨*global options*⟩`}`

2.2.2 `\clozeset`

`\clozeset` `\clozeset{`⟨*global options*⟩`}`: The command can set *global* options for each paragraph.

```
\clozeset{textcolor=red} Lorem \cloze{ipsum} dolor \par
\clozeset{textcolor=green} Lorem \cloze{ipsum} dolor
```

Lorem *ipsum* dolor
Lorem *ipsum* dolor

`\clozeset` does not change the options within a paragraph. As you can see in the example below the last `\clozeset` applies the color green for both gaps.

```
\clozeset{textcolor=red} Lorem \cloze{ipsum} dolor
\clozeset{textcolor=green} Lorem \cloze{ipsum} dolor
```

Lorem *ipsum* dolor Lorem *ipsum* dolor

2.2.3 `\clozereset`

`\clozereset` `\clozereset`: The command resets all *global* options to the default values. It has no effect on the *local* options.

```
\clozeset{
  thickness=3mm,
  linecolor=yellow,
  textcolor=magenta,
  margin=-2pt
}
```

Very *silly* global *options*

```
\clozereset
```

Relax! We can reset *those* options.

2.2.4 `\clozeshow` and `\clozehide`

`\clozeshow` `\clozeshow` and `\clozehide`: This commands are shortcuts for `\clozeset{`⟨*show*⟩`}` and `\clozeset{`⟨*hide*⟩`}`.
`\clozehide`

```
\clozehide
```

Lorem _____ amet, consectetur _____ elit.

```
\clozeshow
```

Lorem *ipsum dolor sit* amet, consectetur *adipisicing* elit.

2.2.5 `align`

`[align=`⟨*left/center/right*⟩`]`: Only the macro `\clozefix` (→ 2.1.3) takes the option `align` into account. Possible values are `left`, `center` and `right`. This option only makes sense, if the width of the line is larger than the width of the text.

Lorem ipsum	(`left`)
Lorem ipsum	(`center`)
Lorem ipsum	(`right`)

2.2.6 `boxheight`

`boxheight` specifies the height of a cloze box. This option has only an effect on the environment `clozebox` (→ 2.1.8). An example can be found in the section about the environment (→ 2.1.8.2).

2.2.7 `boxwidth`

`boxwidth` specifies the width of a cloze box. This option has only an effect on the environment `clozebox` (→ 2.1.8). An example can be found in the section about the environment (→ 2.1.8.1).

2.2.8 `distance`

`[distance=`⟨*dimen*⟩`]`: The option `distance` specifies the spacing between the baseline of the text and the gap line. The larger the dimension of the option `distance`, the more moves the line down. Negative values cause the line to appear above the baseline. The default value is `1.5pt`.

Lorem ipsum dolor sit amet. (1.5pt)
Lorem ipsum dolor sit amet. (3pt)
Lorem ipsum dolor sit amet. (-3pt)

2.2.9 `hide` and `show`

`[hide]` and `[show]`: By default the cloze text is displayed. Use the option `hide` to remove the cloze text from the output. If you accidentally specify both options – `hide` and `show` – the last option "wins".

Lorem ipsum _____, consectetur _____ elit. (hide)
Lorem ipsum *dolor sit amet*, consectetur *adipisicing* elit. (show)
Lorem ipsum _____, consectetur _____ elit. (show,hide)
Lorem ipsum *dolor sit amet*, consectetur *adipisicing* elit. (hide,show)

2.2.10 `linecolor` and `textcolor`

`[linecolor=`⟨*color name*⟩`]` and `[textcolor=`⟨*color name*⟩`]`: Values for both color options are color names used by the xcolor package. To define your own color use the following command:

```
\definecolor{myclozecolor}{rgb}{0.1,0.4,0.6}
\cloze[textcolor=myclozecolor]{Lorem ipsum}
```

Lorem ipsum dolor sit amet, consectetur (myclozecolor)
Lorem ipsum dolor sit amet, consectetur (red)
Lorem ipsum dolor sit amet, consectetur (green)

You can use the same color names to colorize the cloze lines.

Lorem ipsum dolor sit amet, consectetur (myclozecolor)
Lorem ipsum dolor sit amet, consectetur (red)
Lorem ipsum dolor sit amet, consectetur (green)

And now hide the clozes:

(myclozecolor)
(red)

(green)

2.2.11 margin

[margin=⟨*dimen*⟩]: The option margin indicates how far the line sticks up from the text. The option can be used with the commands \cloze, \clozefix and \clozefil. The default value of the option is 3pt.

Lorem ipsum *dolor* sit amet. (0pt)
Lorem ipsum *dolor* sit amet. (5mm)
Lorem ipsum *dolor* sit amet. (1cm)
Lorem ipsum *dolor* sit amet. (6em)
Lorem ipsum*dolor*sit amet. (-4pt)

Is a punctation mark placed directly after a gap, then the line breaks after this punctation mark. Even the most large value of margin does not affect this behavior.

Lorem , *ipsum* . *dolor* ; *sit* : *amet* , *consectetur* . *adipisicing* ;
elit : *sed* , *do* . *eiusmod* ; *tempor* .

2.2.12 spacing

[spacing=⟨*number*⟩]: This option provides support for setting the spacing between lines. A larger font used for the cloze texts needs more line space to avoid unsteady line distances. This option only affects the environment clozespace (→ 2.1.9).

2.2.13 thickness

[thickness=⟨*dimen*⟩]: The option thickness indicates how thick the line is. The option distance (→ 2.2.8) is not affected by this option, because the bottom of the line moves down. The default value of this option is 0.4pt.

Lorem *ipsum dolor sit* amet. (0.01pt)
Lorem *ipsum dolor sit* amet. (1pt)
Lorem *ipsum dolor sit* amet. (2pt)

2.2.14 width

[width=⟨*dimen*⟩]: The only command which can be changed by the option width is \clozefix (→ 2.1.3). The default value of the option is 2cm.

Lorem *dolor* amet. (3cm)

Lorem *dolor* _____ amet. (5cm)
Lorem *dolor* _____ amet. (7cm)

2.3 Special application areas

This section lists examples that didn't work in older versions of the cloze package and required special treatment to work as expected.

2.3.1 The math mode

By default the package uses `\itshape` to format the cloze text. In math mode you have to reset the cloze text format by calling `\clozesetfont{}`. A known bug ist: You can't show and hide single display math formulas. Only the last `\clozeshow` or `\clozehide` takes effect on the whole document. Side note: The usage of the TEXprimitive syntax `$$` is not recommended.

```
\clozesetfont{}
$$1 + 1 = \cloze{2}$$
\clozesetfont{\itshape}
```

$$1 + 1 = \underline{2}$$

`\[\]` should be used instead.

```
\[123 + 456 = \cloze{579}\]
```

$$123 + 456 = \underline{579}$$

```
\begin{displaymath}
2^{\cloze{2}} = 4
\end{displaymath}
```

$$2^{\underline{2}} = 4$$

The inline math mode works too:

```
${\sqrt[3]{\cloze{8}}} = 2$ and ${\sqrt[\cloze{3}]{\cloze{8}}} = 2$
```

$\sqrt[3]{\underline{8}} = 2$ and $\sqrt[\underline{3}]{\underline{8}} = 2$

2.3.2 The `tabbing` environment

```
\begin{tabbing}
col1 \hspace{1cm} \= col2 \hspace{1cm} \= col3 \hspace{1cm} \= col4 \\
\cloze{col1} \> \> \clozefix{col3} \\
\end{tabbing}
```

col1 col2 col3 col4
col1 *col3*

2.3.3 The picture environment

```
\begin{picture}(320,100)
\put(80,25){\cloze{Lorem}}
\put(160,50){\clozefix{ipsum}}
\put(240,75){\clozefil{dolor}}
\end{picture}
```

dolor

ipsum

Lorem

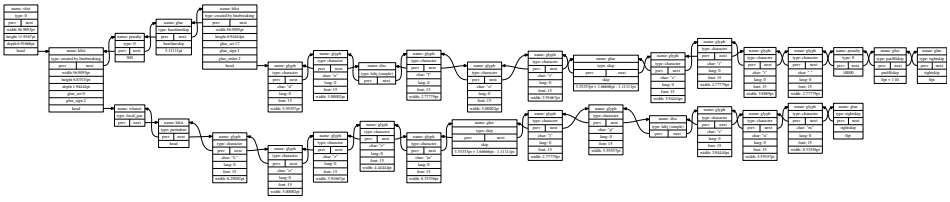
2.3.4 The tabular environment

```
\begin{tabular}{l c}
\cloze{Lorem} & \cloze{ipsum} \\
\clozefix{amet} & \clozefix{consectetur} \\
\cloze{sed} & \cloze{do} \\
\end{tabular}
```

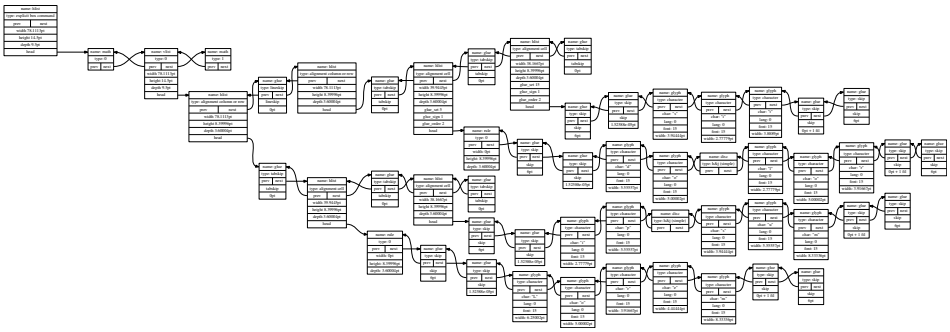
Lorem	*ipsum*
amet	*consectetur*
sed	*do*

3 Some graphics for better understanding of the node tree

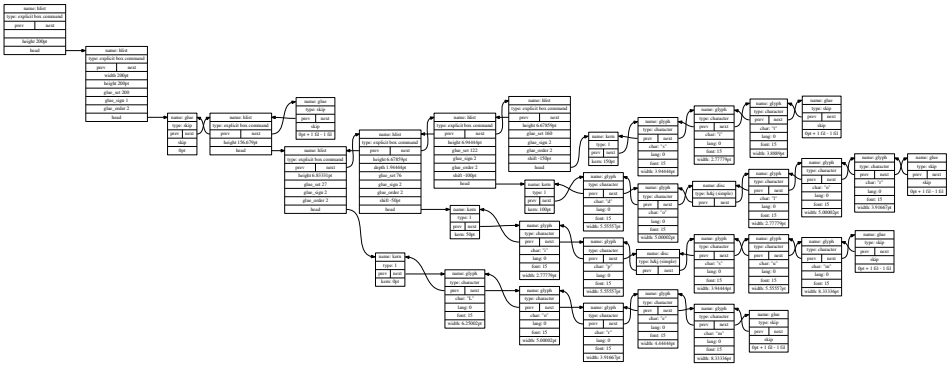
3.1 Paragraph



3.2 Tabular environment



3.3 Picture environment



4 Implementation

4.1 The file `cloze.sty`

This packages are used to build *cloze*:

4.1.1 Dependencies

The package fontspec is not necessarily required. When using LuaLaTeX it is good form to load it. Apart from this the package supplies helpful messages, when you compile a LuaLaTeX document with pdfLaTeX.

```
\RequirePackage{fontspec}
```

The package luatexbase allows to register multiple Lua callbacks.

```
\RequirePackage{luatexbase-mcb}
```

The package kvoptions takes the handling of the options.

```
\RequirePackage{kvoptions}
```

The package setspace is used by the environment `clozespace`.

```
\RequirePackage{setspace}
```

The package xcolor is required to colorize the text and the line of a gap.

```
\RequirePackage{xcolor}
```

The package xparse is used by the environment `clozebox`.

```
\RequirePackage{xparse}
```

The package stackengine is required by the command `\clozestrike{}{}`.

```
\RequirePackage{stackengine}
```

The package ulem is required by the command `\clozestrike{}{}`.

```
\RequirePackage{ulem}
\normalem
```

```
\RequirePackage{transparent}
```

Load the cloze lua module and put all return values in the variable `cloze`.

```
\directlua{
  cloze = require('cloze')
}
```

```
\newif\ifclozeshow\clozeshowtrue
```

4.1.2 Internal macros

`\cloze@set@to@global` Set the Lua variable `registry.is_global` to `true`. All options are then stored in the variable `registry.global_options`.

```
\def\cloze@set@to@global{%
 \directlua{cloze.set_is_global(true)}%
}
```

`\cloze@set@to@local` First unset the variable `registry.local_options`. Now set the Lua variable `registry.is_global` to `false`. All options are then stored in the variable `registry.local_options`.

```
\def\cloze@set@to@local{%
  \directlua{
    cloze.unset_local_options()
    cloze.set_is_global(false)
  }%
}
```

`\cloze@set@option` `\cloze@set@option` is a wrapper for the Lua function `registry.set_option`. `\cloze@set@option[`⟨*key*⟩`]{`⟨*value*⟩`}` sets a key ⟨*key*⟩ to the value ⟨*value*⟩.

```
\def\cloze@set@option[#1]#2{%
  \directlua{cloze.set_option('#1', '#2')}%
}
```

`\cloze@color` Convert a color definiton name to a PDF colorstack string, for example convert the color name `blue` to the colorstack string `0 0 1 rg 0 0 1 RG`. The macro definition `\cloze@color{blue}` builds itself the macro `\color@blue`, which expands to the PDF colorstack string. The colorstack string is necessary to generate a PDF colorstack whatsit.

```
\def\cloze@color#1{\csname\string\color@#1\endcsname}
```

`\cloze@set@local@options` This macro is used in all cloze commands to handle the optional arguments. First it sets the option storage to local and then it commits the options to the package *kvoptions* via the macro `\kvsetkeys{CLZ}{}`.

```
\def\cloze@set@local@options#1{%
  \cloze@set@to@local%
  \kvsetkeys{CLZ}{#1}%
}
```

`\cloze@start@marker` At the begining `\cloze@start@marker` registers the required Lua callbacks. Then it inserts a whatsit marker which marks the begin of a gap.

```
\def\cloze@start@marker#1{%
  \strut\directlua{
```

```
    cloze.register('#1')
    cloze.marker('#1', 'start')
  }%
}
```

`\cloze@stop@marker` `\cloze@stop@marker` inserts a whatsit marker that marks the end of gap.

```
\def\cloze@stop@marker#1{%
  \strut\directlua{
    cloze.marker('#1', 'stop')
  }%
}
```

`\cloze@margin` `\cloze@margin` surrounds a text in a gap with two `kerns`.

```
\def\cloze@margin#1{%
  \directlua{cloze.margin()}%
  #1%
  \directlua{cloze.margin()}%
}
```

4.1.3 Options

cloze offers key-value pairs to use as options. For processing the key-value pairs we use the package kvoptions. To make all key-value pairs accessibly to Lua code, we use the declaration `\define@key{`⟨*CLZ*⟩`}{`⟨*option*⟩`}[`⟨*/*⟩`]{`⟨*…*⟩`}`. This declaration comes from the package keyval.

At start all values are declared as global options. At the Lua side all values are now stored in the `registry.global_options` table.

```
\cloze@set@to@global
```

We use the abbreviation `CLZ` for *cloze* as family name and prefix.

```
\SetupKeyvalOptions{
  family=CLZ,
  prefix=CLZ@
}
```

4.1.3.1 `align`

Please read the section (→ 2.2.5) how to use the option `align`. `align` affects only the command `\clozefix` (→ 2.1.3).

```
\DeclareStringOption{align}
\define@key{CLZ}{align}[]{\cloze@set@option[align]{#1}}
```

4.1.3.2 `boxheight`

Please read the section (→ **??**) how to use the option `boxheight`. `boxheight` affects only the environment `\lozebox`. (→ 2.1.3).

```
\DeclareStringOption{boxheight}
\define@key{CLZ}{boxheight}[]{\cloze@set@option[boxheight]{#1}}
```

4.1.3.3 `boxwidth`

Please read the section (→ **??**) how to use the option `boxwidth`. `boxwidth` affects only the environment `\lozebox`. (→ 2.1.3).

```
\DeclareStringOption{boxwidth}
\define@key{CLZ}{boxwidth}[]{\cloze@set@option[boxwidth]{#1}}
```

4.1.3.4 `distance`

Please read the section (→ 2.2.8) how to use the option `distance`.

```
\DeclareStringOption{distance}
\define@key{CLZ}{distance}[]{\cloze@set@option[distance]{#1}}
```

4.1.3.5 `hide`

If the option `hide` appears in the commands, `hide` will be set to *true* and `show` to *false* on the Lua side. Please read the section (→ 2.2.9) how to use the option `hide`.

```
\DeclareVoidOption{hide}{%
  \clozeshowfalse%
  \cloze@set@option[hide]{true}%
  \cloze@set@option[show]{false}%
}
```

4.1.3.6 `linecolor`

Please read the section (→ 2.2.10) how to use the option `linecolor`.

```
\DeclareStringOption{linecolor}
\define@key{CLZ}{linecolor}[]{%
  \cloze@set@option[linecolor]{\cloze@color{#1}}%
  \cloze@set@option[linecolor_name]{#1}%
}
```

4.1.3.7 `margin`

Please read the section (→ 2.2.11) how to use the option `margin`.

```
\DeclareStringOption{margin}
\define@key{CLZ}{margin}[]{\cloze@set@option[margin]{#1}}
```

4.1.3.8 `show`

If the option `show` appears in the commands, `show` will be set to *true* and `true` to *false* on the Lua side. Please read the section (→ 2.2.9) how to use the option `show`.

```
\DeclareVoidOption{show}{%
  \clozeshowtrue%
  \cloze@set@option[show]{true}%
  \cloze@set@option[hide]{false}%
}
```

4.1.3.9 `spacing`

Please read the section (→ 2.2.12) how to use the option `spacing`.

```
\DeclareStringOption{spacing}
\define@key{CLZ}{spacing}[]{\cloze@set@option[spacing]{#1}}
```

4.1.3.10 `textcolor`

Please read the section (→ 2.2.10) how to use the option `textcolor`.

```
\DeclareStringOption{textcolor}
\define@key{CLZ}{textcolor}[]{%
  \cloze@set@option[textcolor]{\cloze@color{#1}}%
  \cloze@set@option[textcolor_name]{#1}%
}
```

4.1.3.11 `thickness`

Please read the section (→ 2.2.13) how to use the option `thickness`.

```
\DeclareStringOption{thickness}
\define@key{CLZ}{thickness}[]{\cloze@set@option[thickness]{#1}}
```

4.1.3.12 `width`

Please read the section (→ 2.2.14) how to use the option `width`. `width` affects only the command `\clozefix` (→ 2.1.3).

```
\DeclareStringOption{width}
\define@key{CLZ}{width}[]{\cloze@set@option[width]{#1}}

\ProcessKeyvalOptions{CLZ}
```

4.1.4 Public macros

All public macros are prefixed with `\cloze`.

`\clozeset` The usage of the command `\clozeset` is described in detail in section (→ 2.2.2).

```
\newcommand{\clozeset}[1]{%
  \cloze@set@to@global%
  \kvsetkeys{CLZ}{#1}%
}
```

`\clozereset` The usage of the command `\clozereset` is described in detail in section (→ 2.2.3).

```
\newcommand{\clozereset}{%
  \directlua{cloze.reset()}
}
```

`\clozeshow` The usage of the command `\clozeshow` is described in detail in section (→ 2.2.4).

```
\newcommand{\clozeshow}{%
  \clozeset{show}
}
```

`\clozehide` The usage of the command `\clozehide` is described in detail in section (→ 2.2.4).

```
\newcommand{\clozehide}{%
  \clozeset{hide}
}
```

`\clozefont` The usage of the command `\clozefont` is described in detail in section (→ 2.1.2).

```
\newcommand{\clozefont}{\itshape}
```

`\clozesetfont` The usage of the command `\clozesetfont` is described in detail in section (→ 2.1.2).

```
\newcommand{\clozesetfont}[1]{%
  \renewcommand{\clozefont}[1]{%
    #1%
  }%
}
```

`\cloze` The usage of the command `\cloze` is described in detail in section (→ 2.1.1).

```
\newcommand{\cloze}[2][]{%
  \cloze@set@local@options{#1}%
  \cloze@start@marker{basic}%
  {%
    \clozefont\relax%
    \cloze@margin{#2}%
  }%
  \cloze@stop@marker{basic}%
}
```

`\clozefix` The usage of the command `\clozefix` is described in detail in section (→ 2.1.3).

```
\newcommand{\clozefix}[2][]{%
  \cloze@set@local@options{#1}%
  \cloze@start@marker{fix}%
  {%
    \clozefont\relax%
    \cloze@margin{#2}%
  }%
  \cloze@stop@marker{fix}%
}
```

`\clozenol` The usage of the command `\clozenol` is described in detail in section (→ 2.1.4). TODO: Realize this macro with lua code, without ugly `\color{white}`. command.

```
\newcommand{\clozenol}[2][]{%
  {%
    \cloze@set@local@options{#1}%
    \clozefont\relax%
    \ifclozeshow%
      \color{\directlua{tex.print(cloze.get_value('textcolor_name'))}}%
    \else%
      \color{white}%
    \fi%
    #2%
  }%
}
```

`clozepar` The usage of the environment `clozepar` is described in detail in section (→ 2.1.7).

```
\newenvironment{clozepar}[1][]%
{%
  \par%
  \cloze@set@local@options{#1}%
  \cloze@start@marker{par}%
  \clozefont\relax%
}%
```

```
{%
  \cloze@stop@marker{par}%
  \par%
  \directlua{cloze.unregister('par')}%
}
```

`\cloze@get@value`

```
\newcommand{\cloze@get@value}[1]{%
  \directlua{
    tex.print(cloze.get_value('#1'))
  }%
}
```

`clozebox` The usage of the environment `clozebox` is described in detail in section (→ 2.1.8). TODO: Realize this macro with lua code, without ugly `\color{white}` command.

```
\newsavebox{\cloze@box}
\NewDocumentEnvironment{clozebox}{ s O{} +b}{%
  \cloze@set@local@options{#2}%
  \noindent%
  \begin{lrbox}{\cloze@box}%
  \directlua{
    local boxheight = cloze.get_value('boxheight')
    local boxwidth = cloze.get_value('boxwidth')
    if boxheight then
      tex.print('\\begin{minipage}[t][' .. boxheight .. '][t]{' .. boxwidth .. '}')
    else
      tex.print('\\begin{minipage}[t]{' .. boxwidth .. '}')
    end
  }
    \clozefont\relax%
    \ifclozeshow%
      \color{\directlua{tex.print(cloze.get_value('textcolor_name'))}}#3%
    \else%
      \color{white}#3%
    \fi%
  \end{minipage}%
  \end{lrbox}%
  \IfBooleanTF{#1}%
    {\usebox{\cloze@box}}%
    {\fbox{\usebox{\cloze@box}}}%
}{}
```

`clozespace` The usage of the environment `clozespace` is described in detail in section (→ 2.1.9). TODO: Realization without setspace package.

```
\newenvironment{clozespace}[1][]%
{%
  \cloze@set@local@options{#1}%
```

```
  \begin{spacing}{\directlua{tex.print(cloze.get_value('spacing'))}}%
}{\end{spacing}}
```

\clozefil The usage of the command \clozefil is described in detail in section (→ 2.1.5).

```
\newcommand{\clozefil}[2][]{%
  \cloze[#1]{#2}\clozelinefil[#1]%
}
```

\clozeextend TODO: Use node library to create kern nodes.

```
\newcommand{\clozeextend}[1][1]{%
  \directlua{
    local loop = #1
    for variable = 1, loop do
      tex.print(' \string\\hspace{1em} \string\\strut')
    end
  }
}
```

\clozeline The usage of the command \clozeline is described in detail in section (→ 2.1.10).

```
\newcommand{\clozeline}[1][]{%
  \cloze@set@local@options{#1}%
  \directlua{cloze.line()}%
}
```

\clozelinefil The usage of the command \clozelinefil is described in detail in section (→ 2.1.12).

```
\newcommand{\clozelinefil}[1][]{%
  \cloze@set@local@options{#1}%
  \strut%
  \directlua{cloze.linefil()}%
  \strut%
}
```

\cloze@text@color

```
\newcommand{\cloze@text@color}[1]{%
  \textcolor%
    {\directlua{tex.print(cloze.get_value('textcolor_name'))}}%
    {#1}%
}
```

\cloze@strike@line

```
\newcommand\cloze@strike@line{%
  \bgroup%
```

```
  \markoverwith{%
    \cloze@text@color{%
      \rule[0.5ex]{2pt}{1pt}%
    }%
  }%
  \ULon%
}
```

\clozestrike

```
\newcommand{\clozestrike}[3][]{%
  \cloze@set@local@options{#1}%
  \ifclozeshow%
    \stackengine%
      {\Sstackgap}% \Sstackgap or \Lstackgap or \stackgap or stacklength
      {\cloze@strike@line{#2}}% anchor
      {\cloze@text@color{\clozefont{}#3}}% item
      {O}% O or U
      {c}% \stackalignment or l or c or r
      {\quietstack}% \quietstack or T or F
      {T}% \useanchorwidth or T or F
      {\stacktype}% \stacktype or S or L
  \else%
    \stackengine%
      {\Sstackgap}% \Sstackgap or \Lstackgap or \stackgap or stacklength
      {#2}% anchor
      {\texttransparent{0}{\clozefont{}#3}}% item
      {O}% O or U
      {c}% \stackalignment or l or c or r
      {\quietstack}% \quietstack or T or F
      {T}% \useanchorwidth or T or F
      {\stacktype}% \stacktype or S or L
  \fi%
}
```

4.2 The file cloze.lua

```
--- Cloze uses [LDoc](https://github.com/stevedonovan/ldoc) for the
--  source code documentation. The supported tags are described on in
--  the [wiki](https://github.com/stevedonovan/LDoc/wiki).
--
-- <h3>Naming conventions</h3>
--
-- * _Variable_ names for _nodes_ are suffixed with `_node`, for example
--   `head_node`.
-- * _Variable_ names for _lengths_ (dimensions) are suffixed with
--   `_length`, for example `width_length`.
--
-- @module cloze

-- __cloze.lua}__
```

```
-- __Initialisation of the function tables__

-- It is good form to provide some background informations about this Lua
-- module.
if not modules then modules = { } end modules ['cloze'] = {
  version   = '1.5',
  comment   = 'cloze',
  author    = 'Josef Friedrich, R.-M. Huber',
  copyright = 'Josef Friedrich, R.-M. Huber',
  license   = 'The LaTeX Project Public License Version 1.3c 2008-05-04'
}

--- `nodex` is a abbreviation for __node eXtended__.
local nodex = {}

--- All values and functions, which are related to the option management,
-- are stored in a table called `registry`.
local registry = {}

--- I didn't know what value I should take as `user_id`. Therefore I
-- took my birthday and transformed it to a large number.
registry.user_id = 3121978
registry.storage = {}
registry.defaults = {
  ['align'] = 'l',
  ['boxheight'] = false,
  ['boxwidth'] = '\\linewidth',
  ['distance'] = '1.5pt',
  ['hide'] = false,
  ['linecolor'] = '0 0 0 rg 0 0 0 RG', -- black
  ['linecolor_name'] = 'black',
  ['margin'] = '3pt',
  ['resetcolor'] = '0 0 0 rg 0 0 0 RG', -- black
  ['resetcolor_name'] = 'black',
  ['show_text'] = true,
  ['show'] = true,
  ['spacing'] = '1.6',
  ['textcolor'] = '0 0 1 rg 0 0 1 RG', -- blue
  ['textcolor_name'] = 'blue', -- blue
  ['thickness'] = '0.4pt',
  ['width'] = '2cm',
}
registry.global_options = {}
registry.local_options = {}

-- All those functions are stored in the table `cloze` that are
-- registered as callbacks to the pre and post linebreak filters.
local cloze = {}
-- In the status table are stored state information, which are necessary
-- for the recursive cloze generation.
cloze.status = {}

-- The `base` table contains some basic functions. `base` is the only
-- table of this Lua module that will be exported.
local base = {}
base.is_registered = {}
```

```lua
--- Node precessing (nodex)
-- @section nodex

-- All functions in this section are stored in a table called `nodex`.
-- `nodex` is a abbreviation for __node eXtended__. The `nodex` table
-- bundles all functions, which extend the built-in `node` library.

-- __Color handling (color)__

-- __create_colorstack__
-- Create a whatsit node of the subtype `pdf_colorstack`. `data` is a PDF
-- colorstack string like `0 0 0 rg 0 0 0 RG`.
function nodex.create_colorstack(data)
  if not data then
    data = '0 0 0 rg 0 0 0 RG' -- black
  end
  local whatsit = node.new('whatsit', 'pdf_colorstack')
  whatsit.stack = 0
  whatsit.data = data
  return whatsit
end

---
-- `nodex.create_color()` is a wrapper for the function
-- `nodex.create_colorstack()`. It queries the current values of the
-- options `linecolor` and `textcolor`. The argument `option` accepts the
-- strings `line`, `text` and `reset`.
function nodex.create_color(option)
  local data
  if option == 'line' then
    data = registry.get_value('linecolor')
  elseif option == 'text' then
    data = registry.get_value('textcolor')
  elseif option == 'reset' then
    data = nil
  else
    data = nil
  end
  return nodex.create_colorstack(data)
end

-- __Line handling (line)__

--- Create a rule node, which is used as a line for the cloze texts. The
-- `depth` and the `height` of the rule are calculated form the options
-- `thickness` and `distance`. The argument `width` must have the length
-- unit __scaled points__.
function nodex.create_line(width)
  local rule = node.new(node.id('rule'))
  local thickness = tex.sp(registry.get_value('thickness'))
  local distance = tex.sp(registry.get_value('distance'))
  rule.depth = distance + thickness
  rule.height = - distance
  rule.width = width
  return rule
end
```

```
--- Insert a `list` of nodes after or before the `current`. The `head`
-- argument is optional. In some edge cases it is unfortately necessary.
-- if `head` is omitted the `current` node is used. The argument
-- `position` can take the values `'after'` or `'before'`.
function nodex.insert_list(position, current, list, head_node)
  if not head_node then
    head_node = current
  end
  for i, insert in ipairs(list) do
    if position == 'after' then
      head_node, current = node.insert_after(head_node, current, insert)
    elseif position == 'before' then
      head_node, current = node.insert_before(head_node, current, insert)
    end
  end
  return current
end

--- Enclose a rule node (cloze line) with two PDF colorstack whatsits.
--  The first colorstack node dyes the line, the seccond resets the
--  color.
--
-- __Node list__
--
-- <table>
-- <thead>
--   <tr>
--     <th>`n.color_line`</th>
--     <th>`whatsit`</th>
--     <th>`pdf_colorstack`</th>
--     <th>Line color</th>
--   </tr>
-- </thead>
-- <tbody>
--   <tr>
--     <td>`n.line`</td>
--     <td>`rule`</td>
--     <td></td>
--     <td>`width`</td>
--   </tr>
--   <tr>
--     <td>`n.color_reset`</td>
--     <td>`whatsit`</td>
--     <td>`pdf_colorstack`</td>
--     <td>Reset color</td>
--   </tr>
-- </tbody>
-- </table>
function nodex.insert_line(current, width)
  return nodex.insert_list(
    'after',
    current,
    {
      nodex.create_color('line'),
      nodex.create_line(width),
      nodex.create_color('reset')
```

```
    }
  )
end

--- This function enclozes a rule node with color nodes as it the function
-- `nodex.insert_line` does. In contrast to `nodex.insert_line` the three
-- nodes are appended to \TeX's 'current list'. They are not inserted in
-- a node list, which is accessed by a Lua callback.
--
-- __Node list__
--
-- <table>
-- <thead>
--   <tr>
--     <th>-</th>
--     <th>`whatsit`</th>
--     <th>`pdf_colorstack`</th>
--     <th>Line color</th>
--   </tr>
-- </thead>
-- <tbody>
--   <tr>
--     <td>-</td>
--     <td>`rule`</td>
--     <td></td>
--     <td>`width`</td>
--   </tr>
--   <tr>
--     <td>-</td>
--     <td>`whatsit`</td>
--     <td>`pdf_colorstack`</td>
--     <td>Reset color</td>
--   </tr>
-- </tbody>
-- </table>
function nodex.write_line()
  node.write(nodex.create_color('line'))
  node.write(nodex.create_line(tex.sp(registry.get_value('width'))))
  node.write(nodex.create_color('reset'))
end

-- __Handling of extendable lines (linefil)__

--- This function creates a line which stretchs indefinitely in the
-- horizontal direction.
function nodex.create_linefil()
  local glue = node.new('glue')
  glue.subtype = 100
  glue.stretch = 65536
  glue.stretch_order = 3
  local rule = nodex.create_line(0)
  rule.dir = 'TLT'
  glue.leader = rule
  return glue
end

--- The function `nodex.write_linefil` surrounds a indefinitely strechable
```

```lua
-- line with color whatsits and puts it to \TeX's 'current (node) list'.
function nodex.write_linefil()
  node.write(nodex.create_color('line'))
  node.write(nodex.create_linefil())
  node.write(nodex.create_color('reset'))
end

-- __Kern handling (kern)__

--- This function creates a kern node with a given width. The argument
-- `width` had to be specified in scaled points.
local function create_kern_node(width)
  local kern_node = node.new(node.id('kern'))
  kern_node.kern = width
  return kern_node
end

--- Add at the beginning of each `hlist` node list a strut (a invisible
--  character).
--
-- Now we can add line, color etc. nodes after the first node of a hlist
-- not before - after is much more easier.
--
-- @tparam node hlist_node
--
-- @treturn node hlist_node
-- @treturn node strut_node
-- @treturn node head_node
local function insert_strut_into_hlist(hlist_node)
  local head_node = hlist_node.head
  local kern_node = create_kern_node(0)
  local strut_node = node.insert_before(hlist_node.head, head_node, kern_node)
  hlist_node.head = head_node.prev
  return hlist_node, strut_node, head_node
end

--- Write kern nodes to the current node list. This kern nodes can be used
-- to build a margin.
function nodex.write_margin()
  local kern = create_kern_node(tex.sp(registry.get_value('margin')))
  node.write(kern)
end

--- Search for a `hlist` (subtype `line`).
--
-- Insert a strut node into the list if a hlist is found.
--
-- @tparam node head_node The head of a node list.
--
-- @treturn node|false Return false, if no `hlist` can
-- be found.
local function search_hlist(head_node)
  while head_node do
    if head_node.id == node.id('hlist') and head_node.subtype == 1 then
      return insert_strut_into_hlist(head_node)
    end
    head_node = head_node.next
```

```
  end
  return false
end

--- Option handling.
--
-- The table `registry` bundels functions that deal with option handling.
--
-- <h2>Marker processing (marker)</h2>
--
-- A marker is a whatsit node of the subtype `user_defined`. A marker has
-- two purposes:
--
-- * Mark the begin and the end of a gap.
-- * Store a index number, that points to a Lua table, which holds
--   some additional data like the local options.
-- @section registry

--- We create a user defined whatsit node that can store a number (type
--  = 100).
--
-- In order to distinguish this node from other user defined whatsit
-- nodes we set the `user_id` to a large number. We call this whatsit
-- node a marker. The argument `index` is a number, which is associated
-- to values in the `registry.storage` table.
function registry.create_marker(index)
  local marker = node.new('whatsit','user_defined')
  marker.type = 100 -- number
  marker.user_id = registry.user_id
  marker.value = index
  return marker
end

--- Write a marker node to \TeX's current node list.
--
-- The argument `mode` accepts the string values `basic`, `fix` and
-- `par`. The argument `position`. The argument `position` is either set
-- to `start` or to `stop`.
function registry.write_marker(mode, position)
  local index = registry.set_storage(mode, position)
  local marker = registry.create_marker(index)
  node.write(marker)
end

--- This functions checks if the given node `item` is a marker.
function registry.is_marker(item)
  if item.id == node.id('whatsit')
    and item.subtype == node.subtype('user_defined')
    and item.user_id == registry.user_id then
    return true
  else
    return false
  end
end

--- This functions tests, whether the given node `item` is a marker.
--
```

```
-- The argument `item` is a node. The argument `mode` accepts the string
-- values `basic`, `fix` and `par`. The argument `position` is either
-- set to `start` or to `stop`.
function registry.check_marker(item, mode, position)
  local data = registry.get_marker_data(item)
  if data and data.mode == mode and data.position == position then
    return true
  else
    return false
  end
end

--- `registry.get_marker` returns the given marker.
--
-- The argument `item` is a node. The argument `mode` accepts the string
-- values `basic`, `fix` and `par`. The argument `position` is either
-- set to `start` or to `stop`.
function registry.get_marker(item, mode, position)
  local out
  if registry.check_marker(item, mode, position) then
    out = item
  else
    out = false
  end
  if out and position == 'start' then
    registry.get_marker_values(item)
  end
  return out
end

--- `registry.get_marker_data` tests whether the node `item` is a
--  marker.
--
-- The argument `item` is a node of unspecified type.
function registry.get_marker_data(item)
  if item.id == node.id('whatsit')
    and item.subtype == node.subtype('user_defined')
    and item.user_id == registry.user_id then
    return registry.get_storage(item.value)
  else
    return false
  end
end

--- First this function saves the associatied values of a marker to the
-- local options table. Second it returns this values. The argument
-- `marker` is a whatsit node.
function registry.get_marker_values(marker)
  local data = registry.get_marker_data(marker)
  registry.local_options = data.values
  return data.values
end

--- This function removes a given whatsit marker.
--
-- It only deletes a node, if a marker is given.
function registry.remove_marker(marker)
```

```
  if registry.is_marker(marker) then node.remove(marker, marker) end
end

-- __Storage functions (storage)__

--- `registry.index` is a counter. The functions `registry.get_index()`
-- increases the counter by one and then returns it.
function registry.get_index()
  if not registry.index then
    registry.index = 0
  end
  registry.index = registry.index + 1
  return registry.index
end

--- `registry.set_storage()` stores the local options in the Lua table
--  `registry.storage`.
--
-- It returns a numeric index number. This index number is the key,
-- where the local options in the Lua table are stored. The argument
-- `mode` accepts the string values `basic`, `fix` and `par`.
function registry.set_storage(mode, position)
  local index = registry.get_index()
  local data = {
    ['mode'] = mode,
    ['position'] = position
  }
  data.values = registry.local_options
  registry.storage[index] = data
  return index
end

--- The function `registry.get_storage()` retrieves values which belong
--  to a whatsit marker.
--
-- The argument `index` is a numeric value.
function registry.get_storage(index)
  return registry.storage[index]
end

-- __Option processing (option)__

--- This function stores a value `value` and his associated key `key`
--  either to the global (`registry.global_options`) or to the local
--  (`registry.local_options`) option table.
--
-- The global boolean variable `registry.local_options` controls in
-- which table the values are stored.
function registry.set_option(key, value)
  if value == '' or value == '\\color@ ' then
    return false
  end
  if registry.is_global == true then
    registry.global_options[key] = value
  else
    registry.local_options[key] = value
  end
```

```
end

--- `registry.set_is_global()` sets the variable `registry.is_global` to
-- the value `value`. It is intended, that the variable takes boolean
-- values.
function registry.set_is_global(value)
  registry.is_global = value
end

--- This function unsets the local options.
function registry.unset_local_options()
  registry.local_options = {}
end

--- `registry.unset_global_options` empties the global options storage.
function registry.unset_global_options()
  registry.global_options = {}
end

--- Retrieve a value from a given key. First search for the value in the
-- local options, then in the global options. If both option storages are
-- empty, the default value will be returned.
function registry.get_value(key)
  if registry.has_value(registry.local_options[key]) then
    return registry.local_options[key]
  end
  if registry.has_value(registry.global_options[key]) then
    return registry.global_options[key]
  end
  return registry.defaults[key]
end


--- The function `registry.get_value_show()` returns the boolean value
-- `true` if the option `show` is true. In contrast to the function
-- `registry.get_value()` it converts the string value `true' to a
-- boolean value.
function registry.get_value_show()
  if
    registry.get_value('show') == true
  or
    registry.get_value('show') == 'true'
  then
    return true
  else
    return false
  end
end

--- This function tests whether the value `value` is not empty and has a
-- value.
function registry.has_value(value)
  if value == nil or value == '' or value == '\\color@ ' then
    return false
  else
    return true
  end
```

```
end

--- `registry.get_defaults(option)` returns a the default value of the
-- given option.
function registry.get_defaults(option)
  return registry.defaults[option]
end

--- Assembly to cloze texts.
-- @section cloze_functions

--- The function `cloze.basic_make()` makes one gap. The argument `start`
-- is the node, where the gap begins. The argument `stop` is the node,
-- where the gap ends.
function cloze.basic_make(start_node, end_node)
  local node_head = start_node
  if not start_node or not end_node then
    return
  end
  local line_width = node.dimensions(
    cloze.status.hlist.glue_set,
    cloze.status.hlist.glue_sign,
    cloze.status.hlist.glue_order,
    start_node,
    end_node
  )
  local line_node = nodex.insert_line(start_node, line_width)
  local color_text_node = nodex.insert_list('after', line_node,
  ↪  {nodex.create_color('text')})
  if registry.get_value_show() then
    nodex.insert_list('after', color_text_node, {create_kern_node(-line_width)})
    nodex.insert_list('before', end_node, {nodex.create_color('reset')}, node_head)
  else
    line_node.next = end_node.next
    end_node.prev = line_node -- not line_node.prev -> line color leaks out
  end
  -- In some edge cases the lua callbacks get fired up twice. After the
  -- cloze has been created, the start and stop whatsit markers can be
  -- deleted.
  registry.remove_marker(start_node)
  registry.remove_marker(end_node)
end

--- Search for a stop marker.
--
-- @tparam node head_node The head of a node list.
--
-- @treturn node The end node.
function cloze.basic_search_stop(head_node)
  local end_node
  while head_node do
    cloze.status.continue = true
    end_node = head_node
    if registry.check_marker(end_node, 'basic', 'stop') then
      cloze.status.continue = false
      break
    end
```

```
    head_node = head_node.next
  end
  return end_node
end

--- Search for a start marker or begin a new cloze if the value
--  `cloze.status.continue` is true.
--
-- We have to find a hlist node and use its on the field `head`
-- attached node list to search for a start marker.
--
-- @tparam node head_node The head of a node list.
function cloze.basic_search_start(head_node)
  local start_node, end_node, hlist_node
  if cloze.status.continue then
    hlist_node = search_hlist(head_node)
    if hlist_node then
      cloze.status.hlist = hlist_node
      start_node = hlist_node.head
    end
  elseif registry.check_marker(head_node, 'basic', 'start') then
    start_node = head_node
  end
  if start_node then
    end_node = cloze.basic_search_stop(start_node)
    cloze.basic_make(start_node, end_node)
  end
end

--- Parse the node tree recursivley.
--
-- Start and end markers could be nested deeply in the node tree.
--
-- @tparam node head_node The head of a node list.
function cloze.basic_recursion(head_node)
  while head_node do
    if head_node.head then
      cloze.status.hlist = head_node
      cloze.basic_recursion(head_node.head)
    else
      cloze.basic_search_start(head_node)
    end
      head_node = head_node.next
  end
end

--- The corresponding LaTeX command to this lua function is `\cloze`.
--
-- @tparam node head_node The head of a node list.
--
-- @treturn node The head of the node list.
function cloze.basic(head_node)
  cloze.status.continue = false
  cloze.basic_recursion(head_node)
  return head_node
end
```

```
--- Calculate the length of the whitespace before (`l.kern_start`) and
-- after (`l.kern_stop`) the text.
function cloze.fix_length(start, stop)
  local l = {}
  l.width = tex.sp(registry.get_value('width'))
  l.text_width = node.dimensions(start, stop)
  l.align = registry.get_value('align')
  if l.align == 'right' then
    l.kern_start = - l.text_width
    l.kern_stop = 0
  elseif l.align == 'center' then
    l.half = (l.width - l.text_width) / 2
    l.kern_start = - l.half - l.text_width
    l.kern_stop = l.half
  else
    l.kern_start = - l.width
    l.kern_stop = l.width - l.text_width
  end
  return l.width, l.kern_start, l.kern_stop
end

--- The function `cloze.fix_make` generates a gap of fixed width.
--
-- __Node lists__
--
-- __Show text:__
--
-- <table>
-- <tbody>
--   <tr>
--     <td>`n.start`</td>
--     <td>`whatsit`</td>
--     <td>`user_definded`</td>
--     <td>`index`</td>
--   </tr>
--   <tr>
--     <td>`n.line`</td>
--     <td>`rule`</td>
--     <td></td>
--     <td>`l.width`</td>
--   </tr>
--   <tr>
--     <td>`n.kern_start`</td>
--     <td>`kern`</td>
--     <td>&amp;amp; Depends on `align`</td>
--     <td></td>
--   </tr>
--   <tr>
--     <td>`n.color_text`</td>
--     <td>`whatsit`</td>
--     <td>`pdf_colorstack`</td>
--     <td>Text color</td>
--   </tr>
--   <tr>
--     <td></td>
--     <td>`glyphs`</td>
--     <td>&amp;amp; Text to show</td>
```

```
--     <td></td>
--   </tr>
--   <tr>
--     <td>`n.color_reset`</td>
--     <td>`whatsit`</td>
--     <td>`pdf_colorstack`</td>
--     <td>Reset color</td>
--   </tr>
--   <tr>
--     <td>`n.kern_stop`</td>
--     <td>`kern`</td>
--     <td>&amp;amp; Depends on `align`</td>
--     <td></td>
--   </tr>
--   <tr>
--     <td>`n.stop`</td>
--     <td>`whatsit`</td>
--     <td>`user_definded`</td>
--     <td>`index`</td>
--   </tr>
-- </tbody>
-- </table>
--
-- __Hide text:__
--
-- <table>
-- <thead>
--   <tr>
--     <th>`n.start`</th>
--     <th>`whatsit`</th>
--     <th>`user_definded`</th>
--     <th>`index`</th>
--   </tr>
-- </thead>
-- <tbody>
--   <tr>
--     <td>`n.line`</td>
--     <td>`rule`</td>
--     <td></td>
--     <td>`l.width`</td>
--   </tr>
--   <tr>
--     <td>`n.stop`</td>
--     <td>`whatsit`</td>
--     <td>`user_definded`</td>
--     <td>`index`</td>
--   </tr>
-- </tbody>
-- </table>
--
-- Make fixed size cloze.
--
-- @param start The node, where the gap begins
-- @param stop The node, where the gap ends
function cloze.fix_make(start, stop)
  local l = {} -- length
  local n = {} -- node
```

```
  l.width, l.kern_start, l.kern_stop = cloze.fix_length(start, stop)
  n.line = nodex.insert_line(start, l.width)
  if registry.get_value_show() then
    nodex.insert_list(
      'after',
      n.line,
      {
        create_kern_node(l.kern_start),
        nodex.create_color('text')
      }
    )
    nodex.insert_list(
      'before',
      stop,
      {
        nodex.create_color('reset'),
        create_kern_node(l.kern_stop)
      },
      start
    )
  else
    n.line.next = stop.next
  end
  registry.remove_marker(start)
  registry.remove_marker(stop)
end

--- Function to recurse the node list and search after marker.
--
-- @tparam node head_node The head of a node list.
function cloze.fix_recursion(head_node)
  local n = {} -- node
  n.start, n.stop = false
  while head_node do
    if head_node.head then
      cloze.fix_recursion(head_node.head)
    else
      if not n.start then
        n.start = registry.get_marker(head_node, 'fix', 'start')
      end
      if not n.stop then
        n.stop = registry.get_marker(head_node, 'fix', 'stop')
      end
      if n.start and n.stop then
        cloze.fix_make(n.start, n.stop)
        n.start, n.stop = false
      end
    end
    head_node = head_node.next
  end
end

--- The corresponding LaTeX command to this Lua function is `\clozefix`.
--
-- @tparam node head_node The head of a node list.
function cloze.fix(head_node)
  cloze.fix_recursion(head_node)
```

```
  return head_node
end

--- The corresponding LaTeX environment to this lua function is
-- `clozepar`.
--
-- __Node lists__
--
-- __Show text:__
--
-- <table>
-- <thead>
--   <tr>
--     <th>`n.strut`</th>
--     <th>`kern`</th>
--     <th></th>
--     <th>width = 0</th>
--   </tr>
-- </thead>
-- <tbody>
--   <tr>
--     <td>`n.line`</td>
--     <td>`rule`</td>
--     <td></td>
--     <td>`l.width` (Width from hlist)</td>
--   </tr>
--   <tr>
--     <td>`n.kern`</td>
--     <td>`kern`</td>
--     <td></td>
--     <td>`-l.width`</td>
--   </tr>
--   <tr>
--     <td>`n.color_text`</td>
--     <td>`whatsit`</td>
--     <td>`pdf_colorstack`</td>
--     <td>Text color</td>
--   </tr>
--   <tr>
--     <td></td>
--     <td>`glyphs`</td>
--     <td></td>
--     <td>Text to show</td>
--   </tr>
--   <tr>
--     <td>`n.tail`</td>
--     <td>`glyph`</td>
--     <td></td>
--     <td>Last glyph in hlist</td>
--   </tr>
--   <tr>
--     <td>`n.color_reset`</td>
--     <td>`whatsit`</td>
--     <td>`pdf_colorstack`</td>
--     <td>Reset color</td>
--   </tr>
-- </tbody>
```

```
-- </table>
--
-- __Hide text:__
--
-- <table>
-- <thead>
--   <tr>
--     <th>`n.strut`</th>
--     <th>`kern`</th>
--     <th></th>
--     <th>width = 0</th>
--   </tr>
-- </thead>
-- <tbody>
--   <tr>
--     <td>`n.line`</td>
--     <td>`rule`</td>
--     <td></td>
--     <td>`l.width` (Width from hlist)</td>
--   </tr>
-- </tbody>
-- </table>
--
-- @tparam node head_node The head of a node list.
function cloze.par(head_node)
  local l = {} -- length
  local n = {} -- node
  for hlist in node.traverse_id(node.id('hlist'), head_node) do
    for whatsit in node.traverse_id(node.id('whatsit'), hlist.head) do
      registry.get_marker(whatsit, 'par', 'start')
    end
    l.width = hlist.width
    hlist, n.strut, n.head = insert_strut_into_hlist(hlist)
    n.line = nodex.insert_line(n.strut, l.width)
    if registry.get_value_show() then
      nodex.insert_list(
        'after',
        n.line,
        {
          create_kern_node(-l.width),
          nodex.create_color('text')
        }
      )
      nodex.insert_list(
        'after',
        node.tail(head_node),
        {nodex.create_color('reset')}
      )
    else
      n.line.next = nil
    end
  end
  return head_node
end

--- Basic module functions.
-- The `base` table contains functions which are published to the
```

```
-- `cloze.sty` file.
-- @section base

--- This function registers the functions `cloze.par`, `cloze.basic` and
--  `cloze.fix` the Lua callbacks.
--
-- `cloze.par` and `cloze.basic` are registered to the callback
-- `post_linebreak_filter` and `cloze.fix` to the callback
-- `pre_linebreak_filter`. The argument `mode` accepts the string values
-- `basic`, `fix` and `par`. A special treatment is needed for clozes in
-- display math mode. The `post_linebreak_filter` is not called on
-- display math formulas. I'm not sure if the `pre_output_filter` is the
-- right choice to capture the display math formulas.
function base.register(mode)
  local basic
  if mode == 'par' then
    luatexbase.add_to_callback(
      'post_linebreak_filter',
      cloze.par,
      mode
    )
    return true
  end
  if not base.is_registered[mode] then
    if mode == 'basic' then
      luatexbase.add_to_callback(
        'post_linebreak_filter',
        cloze.basic,
        mode
      )
      luatexbase.add_to_callback(
        'pre_output_filter',
        cloze.basic,
        mode
      )
    elseif mode == 'fix' then
      luatexbase.add_to_callback(
        'pre_linebreak_filter',
        cloze.fix,
        mode
      )
    else
      return false
    end
    base.is_registered[mode] = true
  end
end

--- `base.unregister(mode)` deletes the registered functions from the
-- Lua callbacks.
--
-- @tparam string mode The argument `mode` accepts the string values
-- `basic`, `fix` and `par`.
function base.unregister(mode)
  if mode == 'basic' then
    luatexbase.remove_from_callback('post_linebreak_filter', mode)
    luatexbase.remove_from_callback('pre_output_filter', mode)
```

```
  elseif mode == 'fix' then
    luatexbase.remove_from_callback('pre_linebreak_filter', mode)
  else
    luatexbase.remove_from_callback('post_linebreak_filter', mode)
  end
end

-- Publish some functions to the `cloze.sty` file.
base.linefil = nodex.write_linefil
base.line = nodex.write_line
base.margin = nodex.write_margin
base.set_option = registry.set_option
base.set_is_global = registry.set_is_global
base.unset_local_options = registry.unset_local_options
base.reset = registry.unset_global_options
base.get_defaults = registry.get_defaults
base.get_value = registry.get_value
base.marker = registry.write_marker

return base
```

Change History

v0.1

General: Converted to DTX file . 16

v1.0

General: Inital release 16

v1.1

General: Make cloze compatible to LuaTeX version 0.95 16

v1.2

General: The cloze makros are now working in tabular, tabbing and picture environments 16

v1.3

General: Add the new macros `\clozenol` and `\clozeextend` and the environments `clozebox` and `clozespace` (This version was not published on CTAN.) 16

v1.4

General: Add the new macro `\clozestrike` and improve the documentation 16

v1.5

General: The Lua part of the package (cloze.lua) is now being developed in a separate file. The readme file is now a standalone mardown file and not embedded in the dtx file any more. LDoc is being used to generate source code documentation. This version fixes two bugs (cloze in display math, line color and hide). . . . 16

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