

A tutorial for the `knowledge` package

Enthusiastic users of the `knowledge` package

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Abstract

This is a tutorial on how to use the `knowledge` package, together with `knowledge-clustering`. It shows the basic features of the package, namely how to introduce internal and external hyperlinks on text and math commands, as well as more advanced features. It also contains a guide on how to install and use `knowledge-clustering`, a “nifty software tool” that aims to ease the use of `knowledge`.

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1 Introduction

1.1 The `knowledge` package

The package `knowledge` is a package for \LaTeX that helps associating information to terms. It can be used for:

- managing external urls, for instance separating the file containing the addresses from their use;
- managing internal references's such as linking every use of a concept to the place of its introduction (in particular avoiding the use of labels);
- managing the index in a centralized way;
- replacing some macros.

Primarily, the goal of `knowledge` is to produce of scientific documents (the longer, the more interesting, such as a thesis or a book) in order to improve their readability on electronic devices. Ultimately, the goal is to produce documents that are more semantic-aware.

1.2 This tutorial

This tutorial starts with a description of the **basic features of `knowledge`** in Section 2, followed by an introduction on how to use `knowledge-clustering`, which is a **command-line tool designed to greatly speed up the process of writing a document with `knowledge`** in Section 3. Finally, Section 4 deals with more **advanced features** of the `knowledge` package.

Throughout this document, we will refer to the [knowledge documentation](#). It can be accessed locally by typing `texdoc knowledge` in a prompt or [online](#).

2 Basic features

Try compiling this document (two compilation phases to have proper links) using `pdflatex` and see how some notions are hyperlinked to their introduction point (some viewers make it more obvious than others by displaying a preview of the target of a link inside a document).

2.1 Using `knowledge` in your \LaTeX document

To use `knowledge` in your \LaTeX document, write in the preamble:

```

\usepackage[breaklinks]{hyperref}
\usepackage{xcolor}

\usepackage{knowledge}

\knowledgeconfigure{notion, quotation}

```

By default, `knowledge` is loaded in **composition mode**, which renders links and warnings. The document can be switched to **paper mode**, which is made for printing (links still exist but are displayed in black) or **electronic mode** (links are colored, warnings and **anchor points** are hidden), by writing

- `\usepackage[paper]{knowledge}` or
- `\usepackage[electronic]{knowledge}`.

2.2 Aesthetical changes and external links

Knowledges are the key concept in the `knowledge` package. Essentially, a **knowledge** corresponds to a concept used in the document. To invoke a **knowledge** named “tomato”, one simply has to write `\kl{tomato}` (or simply “tomato” if the ‘quotation’ configuration is enabled) in their document. At compilation, this will print the text “tomato” and apply (aesthetical or semantical) changes that are associated with the **knowledge** “tomato”.

To specify what modifications should be performed on a **knowledge**, you must define it, either in the beginning of your document or in an external file (in `notions.tex` in this example) included in your preamble. The basic syntax to do so is:

```

\knowledge{
| tomato

```

Directives can be written between the pair of brackets. A complete list of **directives** can be found in §5.3 of the `knowledge` documentation. Common **directives** include:

- `url=<LINK>` to add an external hyperlink;
- `color=<COLOR>` to change the color of the **knowledge**;
- `italic` and `up` to force/unforce italic;
- `boldface` and `md` to force/unforce boldface;
- `smallcaps` to force small capitals;
- `underline` to underline;
- `lowercase` and `uppercase` to render the text in lowercase or uppercase;
- `typewriter` to render the text in typewriter;

- `text=<TEXT>` to change the text that is displayed.

You will often want to define synonyms, i.e. to have multiple names associated to a single `knowledge`: for instance you might want “tomatoes”, “Tomato” and “Tomatoes” to all refer to the same `knowledge` as “tomato”. This can be achieved by defining each synonym on a new line, preceded by a pipe. For example:

```
\knowledge{url={https://en.wikipedia.org/wiki/Tomato},
  color=olive, boldface}
| tomato
| tomatoes
| Tomato
| Tomatoes
```

will produce the following result when one writes `\kl{Tomatoes}` or “Tomatoes”:

Tomatoes

namely it will write the text “Tomatoes” in bold, olive, and insert a link to the Wikipedia page named “Tomato”.

2.3 Internal hyperlinks: the `notion` directive

The `notion` directive allows you to easily introduce internal hyperlinks. Say that you have defined a `knowledge`:

```
\knowledge{notion, <OTHER_DIRECTIVES>}
| name
| synonym
```

By writing `\intro{name}` (or `\intro{synonym}`, or “`name`”, or “`synonym`”) you will **introduce** your knowledge. Then, whenever you will write `\kl{name}` (or `\kl{synonym}`, or “`name`”, or “`synonym`”) `knowledge` will add an internal hyperlink to the place where your `notion` was **introduced**. The default behaviour¹ is to add a link to the beginning of the section in which the `notion` was introduced. Since this is very often unsatisfying, the command `\AP` allows you to define custom **anchor points**, depicted as small red corners in the left margin of your document when you are in **composition mode**². Internal hyperlinks will refer to the last anchor point preceding the **introduction** of your `notion`.

By default, **notions** appear in blue, and **introduction of notions** appear in dark blue and italics. Note that a single `notion` should only be introduced once—even if you have synonyms. Should you want to reintroduce an already introduced `notion`, you can use the `\reintro{...}` command.

¹Inherited from `hyperref`.

²This document was compiled in **electronic mode** so the anchor points are not shown. However, you can observe **anchor points** in the **minimal example**.

2.4 Scopes and extended syntax

Sometimes the same piece of text can refer to different concepts: for example, in this document, “knowledge” refers both to the `knowledge` package and to the concept of `knowledges`. In this case, `scopes` allow you to distinguish these concepts, by defining the two `knowledges`:

```
\knowledge{url={https://ctan.org/pkg/knowledge}, typewriter}
| knowledge@package

\knowledge{notion}
| knowledge@concept
```

To invoke one or the other, you can write:

```
"knowledge@@scope"
or
\kl(scope){knowledge}
```

where `scope` is either `package` or `concept`. More informations on `scopes` can be found in §3.5 of the [documentation](#).

Finally, if you want to display some “text” that behaves like some `knowledge` named “name”, you can write:

```
"text@name"
or
\kl[name]{text}
```

This is useful when you do not want “text” to be a synonym of “name” throughout the paper but only locally. For instance:

```
(...) "These vegetables@tomato" are (...)
```

produces:

```
(...) These vegetables are (...)
```

namely the style of the `knowledge` “tomato” is applied to the string “These vegetables”.

2.5 Mathematical commands

The previous sections can mostly be applied to mathematical commands:

```
 $\kl[tomato]{\Pi^P_2}$ 
```

will produce Π_2^P . However, as a rule of thumb, this should be avoided as there is a more elegant syntax for knowledgefyed mathematical commands. It is recommended to use semantic macros instead of syntactic ones: for example, instead of defining a macro `\Ac` that displays \mathcal{A} , define `\automata` or `\algebra`.

The basic syntax to define a new mathematical command is:

```
\knowledgegenewrobustcmd<COMMAND_NAME>{\cmdkl{
  <YOUR_MACRO>
}}
```

For example:

```
\knowledgegenewrobustcmd\automata{\cmdkl{
  \mathcal{A}
}}
```

defines a macro named `\automata` that prints an ‘ \mathcal{A} ’ and defines a **notion** named `\automata`. Using the command `\automata` (e.g: \mathcal{A}) will result in **knowledge** automatically inserting a link to the last **anchor point** preceding the introduction of the **notion** `\automata`. This notion can be introduced by writing:

```
\intro*\automata
```

which produces the following result: \mathcal{A} .

The `\cmdkl` command allows you to control which part of the macro will be knowledgefied/clickable. For instance, if you define the macro:

```
\knowledgegenewrobustcmd\interval[2]{
  \cmdkl{[] #1, #2 \cmdkl{[]}
}
```

then `\interval{a}{b}` will produce $[a, b]$: only the two brackets will be clickable.

3 Knowledge-Clustering

3.1 Goal

Knowledge-clustering is a command-line tool that aims to automate part of the process of writing a document with **knowledge**. As of today, **knowledge-clustering** has two main features:

- the **clustering** feature, which automates the definitions of synonyms. For example, if at some point you already defined the **knowledge** `tomato` and write in your document "Tomatoes" then, at compilation, \LaTeX will rightfully produce a warning, saying that the knowledge `Tomatoes` is undefined. At this point, you should run **knowledge-clustering**, which will suggest to you to define `Tomatoes` as a synonym of `tomato`.
- the **add quotes** feature, that can be used at the very end of your writing process, to check if every piece of text that is defined as a **knowledge** is surrounded by quotes. For example, this feature would suggest to replace the string Let `\$x\$` be a tomato such that (...) in you `.tex` file by Let `\$x\$` be a "tomato" such that (...).

3.2 Installation

To install `knowledge-clustering`, you need to have a machine with `python3` and `pip3`. To install, or upgrade, `knowledge-clustering`, you can simply run

```
pip3 install --upgrade knowledge-clustering
```

in your shell. Then, you should run

```
knowledge init
```

to download some data (roughly 35Mb), used by the `clustering` algorithm³.

Autocomplete If the autocomplete of the command `knowledge` does not work, you can follow the following procedure: if you are using `zsh` (resp. `bash`), then add

```
eval "$(pip completion --zsh)"
```

or

```
eval "$(pip completion --bash)"
```

in your `.zshrc` file (resp. `.bashrc`). For the change to take effect, you either need to launch a new terminal or run `source ~/.zshrc` (resp. `source ~/.bashrc`).

3.3 Clustering knowledges

3.3.1 Basic use

The `clustering` feature is meant to be used when you are writing your `LATEX` document with `knowledge`. Maintaining the list of all the `knowledges` you are using can be burdensome, so usually you will write your `LATEX` code and use, in this code, some `knowledges` that are yet to be defined.

For example, Figure 1 illustrates the following situation: in the file containing all your defined `knowledges`, you have four `knowledges`, one of which is “word”. In your main `.tex` file—which is not reproduced here—you used some undefined `knowledges`, such as “words” and “semigroup”. At compilation, `LATEX` will produce a warning, saying that you have undefined `knowledges` and write in a `.diagnose` file a list of these undefined `knowledges`.

At this point, you have two options: you can either define every undefined `knowledge`, by hand, and say that “words” is a synonym of “word” while “semigroup” is a new `knowledge`. Or, you can use the `clustering` feature of `knowledge-clustering`: feed it both files (the file `small.tex` containing the defined `knowledges` and the `small.diagnose` file containing the undefined `knowledges`) by running the command

```
knowledge cluster -k small.tex -d small.diagnose
```

³This downloads some data used by `NLTK`, a natural language package used by `knowledge`.

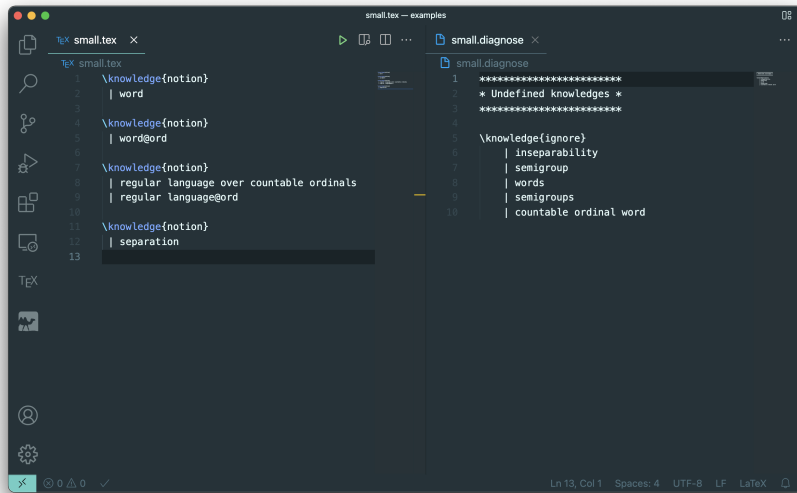


Figure 1: Content of the file containing the defined `knowledges` (left-hand side) and of the `.diagnose` file produced by L^AT_EX at compilation (right-hand side), before running `knowledge-clustering`.

which will write suggestions in your file `small.tex`, as depicted in Figure 2. These suggestions take the form of comments: if you agree with the suggestion, you can just uncomment the line and otherwise, you should move it, by hand.

3.3.2 Advanced features

To display the help, you can run `knowledge cluster --help`.

Language The `clustering` algorithm relies on natural language processing and is language-specific. As of today, only two languages are supported: english (which is the default language) and french. To use `knowledge-clustering` on a document written in french, simply add `-l fr` or `--lang fr` at the end of your command.

Scopes In the example of Figures 1 and 2 you can see that `knowledge-clustering` inferred that the scope “ord” meant “countable ordinals”⁴. If you want the list of scopes it saw and their inferred meaning, you can use the `-S` or `--scope` option. For instance, running:

```
knowledge cluster -k small.tex -d small.diagnose --scope
```

⁴This was inferred by reading the `small.tex` file and was used to cluster the `knowledge` “countable ordinal word” with “word@ord”.

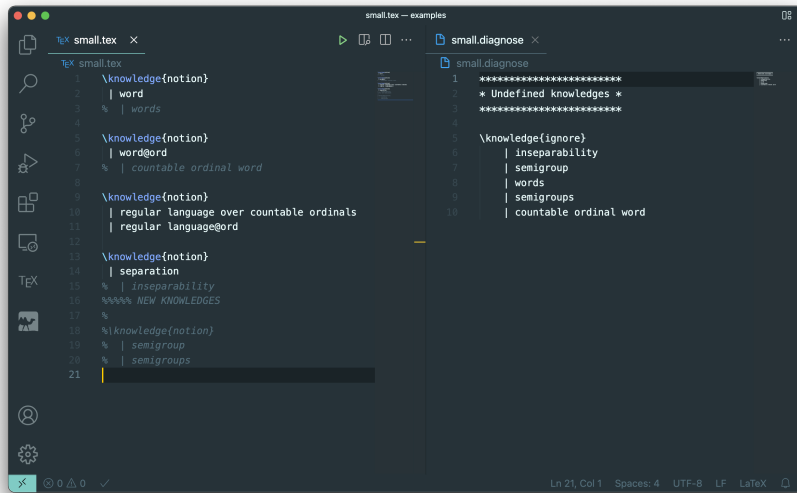


Figure 2: After running `knowledge-clustering`, the `small.diagnose` file is left unchanged, while `small.tex` now contains suggestions of how to define the new `knowledges`.

will print in your prompt

```
Defined scopes:
@ord : [['ordinals', 'countable'], ['ord']]
```

3.4 Forgotten quotes

The `add quotes` feature is meant to be used when your document is (nearly) finished and you want to check that you have not forgotten quotes symbols (or a `k1{}` command) before and after defined `knowledges`.

The basic syntax is the following:

```
knowledge addquotes -t <TEX_FILE> -k <NOTION_FILE>
```

where:

- `<TEX_FILE>` is the `.tex` file containing your \LaTeX document;
- `<NOTION_FILE>` is the file containing the `knowledges` you have defined.

Then, your prompt will display something like

```
Found a match for 'blabla' at line 41.
Add quotes? [y/n]
```

Depending on your answer, the `add quotes` feature will add a quote " before, and a quote " after the piece of text "blabla" found at line 41.

If you want more precision, you can also print the columns (a tabulation counting as 4 columns) using the option `-c` or `--column`.

```
Found a match for 'blabla' between line 41, column 13 and line
41, column 19.
```

```
Add quotes? [y/n]
```

Finally, the option `-F` or `--force` adds quote symbols around every match, without asking your consent first. It is **highly discouraged** to use this option.

3.5 Contributing to `knowledge-clustering`

If you have bugs to report or suggestions, you can submit a [new issue](#), or a [new pull request](#) on [github](#), or get in touch by email with one of the maintainers.

4 Advanced features

This section is dedicated on more advanced features of `knowledge`.

4.1 Changing the default colors

By default, `knowledge` will print notions in blue and introductions of notions in dark blue if the document is compiled in `composition mode` or `electronic mode`, but the external hyperlinks will still be printed in black. Moreover, if it is in `composition mode`, undefined `knowledge`s will appear in yellow, and anchor points in red.

Unfortunately, the default colors are ~~ugly~~ not maximizing the aesthetical potential of your L^AT_EX document. Using `\knowledgestyle` (§3.3.4 of the [documentation](#)), you can customise these colors. Moreover, `\hypersetup` from the [hyperref](#) package lets you change the colors of external hyperlinks. Finally, using

```
\knowledgeconfigure{anchor point color={...}}
```

lets detailed-oriented users change the color of `anchors points`. However, you want some of these changes to only take effect when you are in `paper mode`, `electronic mode` or `composition mode`⁵: this can be achieved using the commands:

```
\IfKnowledgePaperModeTF{...}{...}
\IfKnowledgeCompositionModeTF{...}{...}
```

For example, this document was produced using the following configuration:

⁵Fun fact: the `paper mode` is used by `LIPICs` when compiling proceedings. Should you decide to color your links even in `paper mode`, you might make Dagstuhl annoyed.

```

\definecolor{Midnight Green Eagle}{HTML}{005566}
\definecolor{Gamboge}{HTML}{ee9b00}
\definecolor{Ruby Red}{HTML}{9b2226}

\IfKnowledgePaperModeTF{
  %
}{
  % If we are NOT in paper mode (i.e. in composition mode or
  electronic mode)
  \knowledgestyle{intro notion}{color={Ruby Red}, emphasize}
  \knowledgestyle{notion}{color={Midnight Green Eagle}}
  \hypersetup{
    colorlinks=true,
    breaklinks=true,
    linkcolor={Midnight Green Eagle}, % Links to sections,
    pages, etc.
    citecolor={Midnight Green Eagle}, % Links to bibliography
    filecolor={Midnight Green Eagle}, % Links to local file
    urlcolor={Midnight Green Eagle},
  }
}
\IfKnowledgeCompositionModeTF{
  % If we are in composition mode, highlight unknown stuff (in
  yellow) and display the anchor point.
  \knowledgeconfigure{anchor point color={Ruby Red}, anchor point
  shape=corner}
  \knowledgestyle{intro unknown}{color={Gamboge}, emphasize}
  \knowledgestyle{intro unknown cont}{color={Gamboge}, emphasize}
  \knowledgestyle{kl unknown}{color={Gamboge}}
  \knowledgestyle{kl unknown cont}{color={Gamboge}}
}{
  %
}

```

This produces the following result: in **composition mode**, every link (both internal and external) appears in a nice shade of blue, called “Midnight Green Eagle”, definitions and **anchor points** are displayed in dark red (“Ruby Red”), and unknown **knowledges** are displayed in dark yellow (“Gamboge”). In **electronic mode**, everything works the same except that **anchor points** are not displayed and unknown **knowledges** are not highlighted. Finally, in **paper mode**, everything is printed in black.

4.2 Weird spacing in math commands

Say you want to define a binary relation: without **knowledge** you would write something like:

```

\newrobustcmd{\myrelation}{%
  \mathrel{\mathcal{R}}}%
}

```

which will have the desired behaviour: writting `$x \myrelation y$` will produce $x \mathcal{R} y$ (i.e. the relation symbol is preceded and followed by spaces), and writting `let $ \myrelation$ be a relation` produces “let \mathcal{R} be a relation”: everything works as expected. Now try to knowledgeify this command, by defining it like:

```

\knowledge\newrobustcmd{\myklrelation}{%
  \mathrel{\cmdkl{\mathcal{R}}}%
}

```

which will produce $x \mathcal{R} y$ and “let \mathcal{R} be a relation”⁶. The command does not behave as expected in the second case! This is because of the definition of `\knowledge\newrobustcmd` (see §3.9.1 of the [documentation](#)), which is essentially equivalent to:

```

\newrobustcmd\myklrelation{%
  \withkl{\kl[\myklrelation]}{%
    \mathrel{\cmdkl{\mathcal{R}}}}
}
\knowledge{\myklrelation}{notion}

```

To obtain the desired behaviour, one has to change the position of the `\mathrel` command like so:

```

\newrobustcmd\mynewklrelation{%
  \mathrel{%
    \withkl{\kl[\mynewklrelation]}{%
      \cmdkl{\mathcal{R}}}
    }%
}
\knowledge{\mynewklrelation}{notion}

```

which produces the following result: $x \mathcal{R} y$ and “let \mathcal{R} be a relation”. More details can be found in §3.9.2 of the [documentation](#).

4.3 Other functionalities

This tutorial is far from being exhaustive: you can take a look at the [documentation](#) to see all the possible wonders `knowledge` has to offer, such as [handling indexes](#), [knowledgeifying already-defined commands](#), [defining command behaving differently depending on whether they are used in text or math mode](#), etc.

⁶You can observe here a fun phenomenon: if a `knowledge` is defined but not introduced, it will still be displayed in blue—but it will not be clickable.