

# DocOnce Description

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## 1 What Is DocOnce?

DocOnce is a very simple and minimally tagged markup language that looks like ordinary ASCII text, much like what you would use in an email, but the text can be transformed to numerous other formats, including HTML, Sphinx,  $\LaTeX$ , PDF, reStructuredText (reST), Markdown, MediaWiki, Google wiki, Creole wiki, blogger.com, wordpress.com, Epytext, and also plain (untagged) text for email. From reST or Markdown you can go to XML, OpenOffice, MS Word, HTML,  $\LaTeX$ , PDF, DocBook, GNU Texinfo, and more.

DocOnce supports a working strategy of never duplicating information. Text is written in a single place and then transformed to a number of different destinations of diverse type: scientific reports, software manuals, books, thesis, software source code, wikis, blog posts, emails, etc. The slogan is: “Write once, include anywhere”.

Here are some DocOnce features:

- DocOnce addresses small and large documents containing *text with much computer source code and  $\LaTeX$  mathematics*, where the output is desired in different formats such as  $\LaTeX$ , PDF $\LaTeX$ , Sphinx, HTML, MediaWiki, blogger.com, and wordpress.com. A piece of DocOnce text can enter (e.g.) a classical science book, an ebook, a web document, and a blog post.
- DocOnce offers a range of HTML designs, including many Bootstrap and Sphinx styles and [solarized color schemes](#). A special feature is the many styles for admonitions (boxes for warning, notice, question, etc.) in HTML and  $\LaTeX$ .
- DocOnce targets in particular large book projects where many different pieces of text and software can be assembled in different ways and published in different formats for different devices.

- DocOnce enables authors who write for many times of media (blog posts, wikis,  $\LaTeX$  manuscripts, Sphinx, HTML) to use a common source language such that lots of different pieces can easily be brought together later to form a coherent (big) document.
- DocOnce has good support for copying computer code directly from the source code files via regular expressions for the start and end lines.
- DocOnce first runs two preprocessors (Preprocess and Mako), which allow programming constructs (includes, if-tests, function calls) as part of the text. This feature makes it easy to write *one text* with different flavors: long vs short text, Python vs Matlab code examples, experimental vs mature content.
- DocOnce can be converted to plain *untagged* text, often desirable for email and computer code documentation.
- DocOnce markup does include tags, so the format is more tagged than Markdown, but less than reST, and very much less than  $\LaTeX$  and HTML.
- Compared to the related tools Sphinx and Markdown, DocOnce allows more types of equations (especially systems of equations with references), has more flexible inclusion of source code, integrates preprocessors, has special support for exercises, and produces cleaner  $\LaTeX$  and HTML output.

**History.** The DocOnce development started in 2006 at a time when most popular markup languages used quite some tagging ( $\LaTeX$ , reStructuredText, HTML). Later, almost untagged markup languages, especially [Markdown](#) and its sisters [MultiMarkdown](#) and [Pandoc-extended Markdown](#), became popular. DocOnce looks much like Markdown and is in particular close to the functionality and nature of MultiMarkdown. The advantage of DocOnce, however, is a series of features for supporting both small and large documents (books in particular) with much mathematics and computer code. DocOnce can also output Sphinx (not supported by Pandoc or MultiMarkdown), a format that is very attractive for presenting scientific material and software documentation on the web. (DocOnce allows basic [Markdown syntax](#) as input, extended with DocOnce syntax as you like.)

**Disclaimer.** DocOnce applies *text transformations*, mostly via regular expressions. This is not a fool-proof method of translation compared to real parsing. The possibility for tweaking the layout in the DocOnce document is obviously limited (at least compared to  $\LaTeX$  and HTML) since the text can go to all sorts of markup languages. This can be compensated, however, by clever use of the programmable Mako preprocessor used by DocOnce and by automatic editing of the generated output (e.g., via regular expressions).

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## 1.1 Demos

The current text is generated from a DocOnce format stored in the directory

```
doc/manual/manual.do.txt
```

file in the DocOnce source code tree. Here you can run a `make.sh` script to generate a lot of different formats: HTML,  $\text{\LaTeX}$ , plain text, etc., stored in the subdirectory `demo`. To successfully run this script and compile all the different versions, you must have quite a lot of software installed, see the Section 12 for detailed information. However, the most commonly used formats of this manual are fortunately also accessible through the web: [HTML](#), [Sphinx](#), and [PDF](#). DocOnce supports a lot of different layouts of documents, see the [collection of various versions of a scientific report](#).

Another demo is found in

```
doc/tutorial/tutorial.do.txt
```

In the `tutorial` directory there is also a `make.sh` file producing a lot of formats in the subdirectory `demo`. The three most common formats can be found on the web: [HTML](#), [Sphinx](#), and [PDF](#).

**This guide is for the experience DocOnce writer.**

Do not read the detailed descriptions of DocOnce syntax that follows (this is a manual!) before you have read the tutorial and played a little around with a simple document.

## 2 Markup Based on Special Lines

The DocOnce markup language has a concept called *special lines*. Such lines starts with a markup at the very beginning of the line and are used to mark document title, authors, date, sections, subsections, paragraphs, figures, movies, lists, etc.

### 2.1 Heading with title and author(s)

Lines starting with `TITLE:`, `AUTHOR:`, and `DATE:` are optional and used to identify a title of the document, the authors, and the date. The title is treated as the rest of the line, so is the date, but the author text consists of the name and associated institution(s) with the syntax

```
name at institution1 and institution2 and institution3
```

The `at` with surrounding spaces is essential for adding information about institution(s) to the author name, and the `and` with surrounding spaces is essential as delimiter between different institutions. An email address can optionally be included, using the syntax

```
name Email: somename@site.net at institution1 and institution2
```

Multiple authors require multiple `AUTHOR:` lines. All information associated with `TITLE:` and `AUTHOR:` keywords must appear on a single line. Here is an example:

```
TITLE: On an Ultimate Markup Language
AUTHOR: H. P. Langtangen at Center for Biomedical Computing, Simula Research Laboratory & Dept.
AUTHOR: Kaare Dump Email: dump@cyb.space.com at Segfault, Cyberspace Inc.
AUTHOR: A. Dummy Author
DATE: November 9, 2016
```

Note how one can specify a single institution, multiple institutions (with `&` as separator between institutions), and no institution. In some formats (including `rst` and `sphinx`) only the author names appear. Some formats have “intelligence” in listing authors and institutions, e.g., the plain text format:

```
Hans Petter Langtangen [1, 2]
Kaare Dump (dump@cyb.space.com) [3]
A. Dummy Author
```

```
[1] Center for Biomedical Computing, Simula Research Laboratory
[2] Department of Informatics, University of Oslo
[3] Segfault, Cyberspace Inc.
```

Similar typesetting is done for  $\text{\LaTeX}$  and HTML formats.

The current date can be specified as `today`.

## 2.2 Table of contents

A table of contents can be generated by the line

TOC: on

This line is usually placed after the DATE: line. The value off turns off the table of contents.

## 2.3 Section headings

Section headings are recognized by being surrounded by equal signs (=) or underscores before and after the text of the headline. Different section levels are recognized by the associated number of underscores or equal signs (=):

- 9 = characters for chapters
- 7 for sections
- 5 for subsections
- 3 for subsubsections
- 2 *underscores* (only! - it looks best) for paragraphs (paragraph heading will be inlined)

Headings can be surrounded by as many blanks as desired.

DocOnce also supports abstracts. This is typeset as a paragraph, but *must* be followed by a section heading (everything up to the first section heading is taken as part of the text of the abstract).

Here are some examples:

```
__Abstract.__ The following text just attempts to exemplify
various section headings.
```

```
Appendix is supported too: just let the heading start with 'Appendix: '
(this affects only 'latex' output, where the appendix formatting
is used - all other formats just leave the heading as it is written).
```

```
==== Example on a Section Heading =====
```

```
The running text goes here.
```

```
==== Example on a Subsection Heading =====
```

```
The running text goes here.
```

```
=== Example on a Subsubsection Heading ===
```

```
The running text goes here.
```

```
__A Paragraph.__ The running text goes here.
```

## 2.4 Figures

Figures are recognized by the special line syntax

FIGURE:[filename, height=400 width=600 frac=0.8] caption

The filename can be without extension, and DocOnce will search for an appropriate file with the right extension. If the extension is wrong, say .eps when requesting an HTML format, DocOnce tries to find another file, and if not, the given file is converted to a proper format (using ImageMagick's `convert` utility).

The height, width, and frac keywords can be included if desired and may have effect for some formats: the height and width are used for output in the formats `html`, `rst`, `sphinx`, while the frac specification is used for `latex` and `pdflatex` to specify the width of the image as a fraction of the text width.

The figure caption is optional. If omitted, the figure appears “inline” in the text without any figure environment in  $\text{\LaTeX}$  formats or HTML. The caption may contain a label for referencing the figure.

### Warning.

Note the comma between the filename and the figure size specifications and that there should be no space around the = sign. This syntax must be strictly followed.

Note also that, like for `TITLE:` and `AUTHOR:` lines, all information related to a figure line *must be written on the same line*. Introducing new-lines in a long caption will destroy the formatting (only the part of the caption appearing on the same line as `FIGURE:` will be included in the formatted caption).

Combining several image files into one, in a table fashion, can be done by the `montage` program from the ImageMagick suite:

```
montage -background white -geometry 100% -tile 2x \  
file1.png file2.png ... file4.png result.png
```

The option `-tile XxY` gives `X` figures in the horizontal direction and `Y` in the vertical direction (`tile 2x` means two figures per row and `-tile x2` means two rows).

The `montage` program is only appropriate for bitmap images (PNG, JPEG, GIF, TIFF). Images in the PDF format should be mounted together using `pdftk` (to combine images to one file), `pdfnup` (to align them in tabular format), and `pdfcrop` (to remove surrounding whitespace):

```
Terminal> pdftk file1.pdf file2.pdf ... file4.pdf output tmp.pdf  
Terminal> pdfnup --nup 2x2 tmp.pdf # output in tmp-nup.pdf  
Terminal> pdfcrop tmp-nup.pdf result.png # output in FE1.png
```



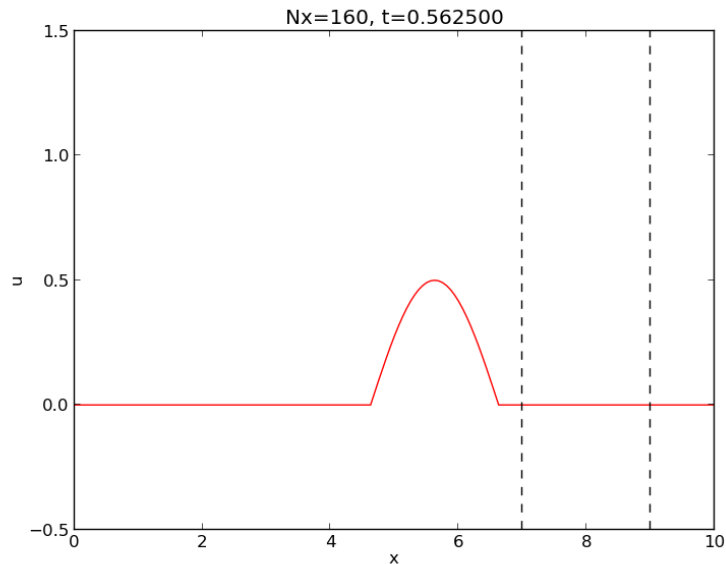


Figure 1: A wave.

## 2.5 Movies

Movies/videos are inserted using the `MOVIE:` keyword. This feature works well for the `latex`, `html`, `rst`, and `sphinx` formats. Other formats try to generate some HTML file and link to that file for showing the movie.

**The Basic Command.** As with `FIGURE`, the `MOVIE` command expands just *one line* and is of the form

`MOVIE: [filename, height=xxx width=yyy] possible caption`

Note that there must be a blank line after every `MOVIE:` command. The width and height parameters are not required, but leaving them out may lead to movie sizes you do not want.

Here is a movie in the MPEG format:

`mov/wave.mpeg`

realized by the specific command

`MOVIE: [mov/wave.mpeg, width=600 height=470]`

And here is a movie in the Ogg format:

`mov/wave.ogg`

Movie 2: A movie in Ogg format.

A URL works too as movie address:

MOVIE: [http://hplgit.github.io/animate/doc/pub/mov-animate/demo.ogg] Ogg movie in cyberspace.

<http://hplgit.github.io/animate/doc/pub/mov-animate/demo.ogg>

Movie 3: Ogg movie in cyberspace.

**Important.**

Movies will not work properly in `sphinx` format unless they are located in a directory (tree) with a name starting with `mov`. Make it a habit to place figures in `fig-X` and movies in `mov-X` directories, where `X` is a short logical name for the current document (or let the names of the directories be just `fig` and `mov`).

**MP4, WebM, and Ogg Movies in HTML.** If a movie is in Ogg, MP4, or WebM format, and the output format is HTML, DocOnce will check if the movie file is also in the other formats among Ogg, MP4, and WebM, and include these as well such that the movie has backup formats in case the browser does not support a particular format. Providing a movie in Ogg, MP4, and WebM format is therefore the safest way to ensure that the movie can be played in any browser on any device.

**Notice.**

If you specify a movie in Ogg or WebM format and it also exists in MP4 format, the MP4 format will be loaded first. To avoid having alternative movie formats in HTML, use the `--no_mp4_webm_ogg_alternatives` command-line option when running `doconce format`.

**Movie Handling in Various Formats.** Movies are easiest shown in the HTML format. The reST and Sphinx formats apply the same raw HTML code as the HTML format and therefore have the same capabilities. The  $\text{\LaTeX}$  format supports different methods for embedding movies via the option `-latex_movie=...`. Proper values are listed below.

1. `href`: the `\href{run:file}{link}` is used for all movies (default).

2. `media9`: the `media9` package is used for Flash and MP4 movies, `movie15` for MPEG and AVI files, and a simple `\href{run:file}{link}` command for other formats. Only Acrobat Reader supports displaying these type of movies.
3. `multimedia`: the `\movie` command (known from  $\text{\LaTeX}$  Beamer) is used for movies.
4. `movie15`: the old `movie15` package is used.

For all other formats, an HTML file that acts as a movie player is generated and linked from the output document. This movie player has essentially the same code as the HTML format would have, except that the `video` tag is not used, only the `embed` tag. Some wiki types do have support for videos, e.g., Wikipedia can work with Ogg files, but DocOnce has not yet implemented robust schemes for anything but  $\text{\LaTeX}$ , HTML, and Sphinx output.

**YouTube and Vimeo Movies.** Many publish their scientific movies on YouTube or Vimeo, and DocOnce recognizes YouTube and Vimeo URLs as movies. When the output from DocOnce is an HTML file, the movie will be embedded, otherwise a URL to the YouTube or Vimeo page is inserted. You should equip the `MOVIE:` command with the right width and height of *embedded* YouTube and Vimeo movies. The recipe goes as follows:

1. click on *Share* (and on YouTube then *Embed*)
2. note the height and width of the embedded movie

A typical `MOVIE` command with a YouTube movie is then

```
MOVIE: [http://www.youtube.com/watch?v=sI2uCHH3qIM, width=420 height=315]
```

```
MOVIE: [http://vimeo.com/55562330, width=500 height=278] CFD.
```

**Animation Based on Filename Generators.** It is possible to define a movie from a set of files, usually plot files, which can be shown in sequence to create an animation. If the files are local on the computer, one can specify them by a simple Unix wildcard notation, as in

```
MOVIE: [../experiments/frame_*.png]
```

Output in the HTML, reST, and Sphinx formats will make use of inline JavaScript code to show the frames in sequence.  $\text{\LaTeX}$  employs the `animate` package for the same purpose. Other formats generates a file (`movie_playerX.py`, where `X` is a number) containing the HTML code with JavaScript to show and control the animation. The DocOnce document has a link to this movie viewer.

There is an alternative syntax to the Unix wildcard notation:

```
MOVIE: [../experiments/frame_%04d.png:0->320]
```

The filename is specified via printf syntax (typically the same syntax as used to generate the individual frame files). The postfix `:0->320` specifies the lower and upper limit of the counter that is used in the printf specification `%04d`. This latter syntax must be used if the plot files reside on some web server, e.g.,

```
MOVIE: [http://some.where.net/experiments/frame_%04d.png:0->320]
```

Here is an example:

```
http://hplgit.github.io/animate/doc/pub/mov-animate/frames/frame_%04d.png:0->320:  
load movie_player1.html into a browser
```

### Recommendations.

It is challenging to write robust DocOnce code with movies. The recommended formats in HTML are MP4, WebM, and Ogg. One should preferably make all three. These also works in reST and Sphinx.

The filename generation works very well in  $\text{\LaTeX}$ , while true movie formats pose big challenges. On Linux systems, the `media9` does not work well because a proper Flash player for embedding in the PDF file is not always available. The `movie15` package also leads to problems because Acrobat Reader depends on an external player to show the files, and the correct plugins to launch players with support for a given format are not trivial to install. Even the plain `href{run:file}` command relies on an external player and not all formats will be supported on a given computer.

To have really robust code, use filename generators and not movie files.

```
MOVIE: [../experiments/frame_*.png]
```

One can, of course, write flexible DocOnce code and decide at run time if HTML output should have movie files or filename generators. A relevant snippet using Mako is

```
% FORMAT in ("latex", "pdflatex") or HTMLMOVIE == "files":  
MOVIE: [../experiments/frame_*.png]  
  
% else:  
MOVIE: [../experiments/movie.ogg]  
  
% endif
```

With the `-DHTMLMOVIE=files` flag, animation of individual files will be performed, while any other value than `files` leads to use of the `movie.ogg` in all but  $\text{\LaTeX}$  formats. In HTML one will try to load `movie.mp4` (if it exists) and then `movie.webm` (if it exists) and then finally `movie.ogg`.

There is no way to control the number of frames per second in  $\text{\LaTeX}$  animations based on filename generators such as `myframes*.png`. However, with a little auto editing in a script one can control the frame rates of the various movies. The rate is specified as 2 in lines on the form

```
\begin{animateinline}[controls,loop]{2} % frames: f000.png -> f098.png
```

Setting the rate to 12 instead for this particular movie based on the `f%03.png` files, the following `doconce subst` command does the job in a script:

```
doconce subst ',loop]{2}(.+: f000)' ',loop{12}\g<1>' mydoc.do.txt
```

## 2.6 Copying Computer Code from Source Files

Another type of special lines starts with `@@@CODE` and enables copying of computer code from a file directly into a verbatim environment, see Section 4.2 below.

## 2.7 Inserting the Output from Operating System Commands

When DocOnce is used to document computer program and results from computer code it is important to ensure that the document contains the latest version of the code and the corresponding output. The former is handled by the `@@@CODE` directive, while the latter has its own directive `@@@OSCMD`. The syntax reads

```
@@@OSCMD cmd
```

where `cmd` is any text that can be run in the operating system. The output is copied into the DocOnce source. For example,

```
@@@OSCMD python -c 'print "Hello,\nWorld!"'
```

results in

```
Terminal> python -c 'print "Hello,\nWorld!"'
Hello,
World!
```

There is a command-line option `--os_prompt=` that can be used to set the (terminal) prompt that prefixes the command:

- `--os_prompt=None` results in no prompt, just the command.
- `--os_prompt=nocmd` results in no prompt and no command, just the output.
- `--os_prompt=Terminal>` is the default setting (as in the example above).

## 2.8 Comments

Comments intended to be (sometimes) visible in the output document and read by readers are known as *inline comments* in DocOnce and described in Section 3.

Here we address comments in the DocOnce source file that are not intended to be visible in the output document. Basic comment lines start with the hash #:

```
#
# Here are some comment lines that do not affect any formatting.
# These lines are converted to comments in the output format.
#
```

Such comment lines may have some side effects in the `rst` and `sphinx` formats because following lines are taken as part of the comment if there is not a blank line after the comment.

The Mako preprocessor supports comments that are filtered out *before* DocOnce starts translating the document. Such comments are very valuable as they will never interfere with the output format and they are only present in the DocOnce source. Mako has two types of comments: lines starting with a double hash `##` and lines enclosed by the `<%doc>` (beginning) and `<%doc/>` (closing) tags.

If you need a lot of comments in the DocOnce file, consider using Mako comments instead of the single hash, unless you want the comments to be in the source code of the output document.

To comment out or remove large sections, consider using the Preprocess preprocessor and an if-else block with a variable that is undefined (typically something like a test `# ifndef EXTRA` in Preprocess).

## 2.9 Tables

**Basic Syntax.** A table like

time	velocity	acceleration
0.0	1.4186	-5.01
2.0	1.376512	11.919
4.0	1.1E+1	14.717624

is built up of pipe symbols and dashes:

time	velocity	acceleration
0.0	1.4186	-5.01
2.0	1.376512	11.919
4.0	1.1E+1	14.717624

- The pipes and column values do not need to be aligned (but why write the DocOnce source in an ugly way?).
- In the line below the heading, one can insert the characters `c`, `r`, or `l` to specify the alignment of the columns (centered, right, or left, respectively).
- Similar character can be inserted in the line above the header to align the headings.
- There must be a blank line before and after the table

Here is an example with centered headings (which is default anyway), and the numbers are left-adjusted in the first column and right-adjusted in the two others.

```
|--c-----c-----c-----|
|time | velocity | acceleration |
|--l-----r-----r-----|
| 0.0 | 1.4186   | -5.01        |
| 2.0 | 1.376512 | 11.919       |
| 4.0 | 1.1E+1   | 14.717624    |
|-----|
```

Typeset result:

time	velocity	acceleration
0.0	1.4186	-5.01
2.0	1.376512	11.919
4.0	1.1E+1	14.717624

Pipes `|` can also be inserted to indicate vertical rules in  $\text{\LaTeX}$  tables (they are ignored for other formats):

```
|-----|
|time | velocity | acceleration |
|--l---|--r---|--r---|
| 0.0 | 1.4186   | -5.01        |
| 2.0 | 1.376512 | 11.919       |
| 4.0 | 1.1E+1   | 14.717624    |
|-----|
```

**Notice.**

- Not all formats offer alignment of heading or entries in tables (`rst` and `sphinx` are examples).
- DocOnce tables are very simple: neither entries nor headings can span several columns or rows. When that functionality is needed,

one can make use of the preprocessor and if-tests on the format and insert format-specific code for tables.

**Tables to/from CSV Data Files.** The command-line option `--tables2csv` (to `doconce format`) makes DocOnce dump each table to CSV format in a file `table_X.csv`, where `X` is a generated table number. This feature makes it easy to load tables from DocOnce documents into spreadsheet programs for further analysis.

Data in CSV format can be transformed to DocOnce table format by the `doconce csv2table` utility:

```
Terminal> doconce csv2table somefile.csv > table.do.txt
```

This is a quick way of writing tables. For example, we can write a text file `tmp.csv` with

```
time, velocity, acceleration
0.0, 1.4186, -5.01
2.0, 1.376512, 11.919
4.0, 1.1E+1, 14.717624
```

Running `doconce csv2table tmp.csv` creates the table

time	velocity	acceleration
0.0	1.4186	-5.01
2.0	1.376512	11.919
4.0	1.1E+1	14.717624

If the output from `doconce csv2table` is redirected to a file:

```
Terminal> doconce csv2table data.csv > mytable.do.txt
```

one can easily include this file by `# #include "mytable.do.txt"` in the DocOnce source file. This is an efficient method for generating DocOnce tables directly from data.

## 2.10 Lists

An unordered bullet list makes use of the `*` as bullet sign and is *consistently indented* by some chosen spaces as follows

```
* item 1
* item 2
  * subitem 1, if there are more
    lines, each line must
```



```

        be exactly intended as shown here
        (i.e., start in the same column)
    * subitem 2,
      also spans two lines
* item 3

```

This list gets typeset as

- item 1
- item 2
  - subitem 1, if there are more lines, each line must be exactly intended as shown here (i.e., start in the same column)
  - subitem 2, also spans two lines
- item 3

In an ordered list, each item starts with an o (as the first letter in *ordered*):

```

o item 1
o item 2
  * subitem 1
  * subitem 2
o item 3

```

resulting in

1. item 1
2. item 2
  - subitem 1
  - subitem 2
3. item 3

Ordered lists cannot have an ordered sublist, i.e., the ordering applies to the outer list only.

In a description list, each item is recognized by a dash followed by a keyword followed by a colon:

```

- keyword1: explanation of keyword1
- keyword2: explanation
  of keyword2 (remember to indent properly
  if there are multiple
  lines)

```

The result becomes

**keyword1:** explanation of keyword1

**keyword2:** explanation of keyword2 (remember to indent properly if there are multiple lines)

#### No indentation - except in lists!

DocOnce syntax is sensitive to whitespace! No lines should be indented, only lines belonging to lists. Indented lines may give strange output in some formats. Also note that extra whitespace after “item” indicators (\*, o, or -) in lists may give strange behavior.

### 3 Inline Tagging

DocOnce supports tags for *emphasized phrases*, **boldface phrases**, and `verbatim text` (also called type writer text, for inline code), [colored words](#), plus LaTeX/Tex inline mathematics, such as  $\nu = \sin(x)$ . Links are easy to define, either with a [text](#) or just a plain <http://google.com>. Also a non-breaking space (to avoid `linebreak`), `linebreak`, `m-dash` (as in m—dash), and horizontal rule can be specified (below).

#### Limitation of inline tagging.

Since DocOnce applies regular expressions to recognize inline tagging, there might be cases where the tags are not correctly interpreted and translated. Fortunately, most such pitfalls are easily circumvented. The [troubleshooting document](#) shows some examples.

#### 3.1 Emphasized Words

Emphasized text is typeset inside a pair of asterisk, and there should be no spaces between an asterisk and the emphasized text, as in

```
*emphasized words*
```

Boldface font is recognized by an underscore instead of an asterisk:

```
_several words in boldface_ followed by *emphasized text*.
```

The line above gets typeset as **several words in boldface** followed by *emphasized text*. One should only have pure text (no mathematical formulas) between the boldface or emphasize markers, and no leading or trailing blanks (with such blanks, the text will not be recognized as boldface or emphasize).

Colored text is formatted as

```
some text color{red}{more text in red}
```

## 3.2 Inline Verbatim Text

Verbatim text, typically used for short inline code, is typeset between backticks:

```
'call myroutine(a, b)' looks like a Fortran call
while 'void myfunc(double *a, double *b)' must be C.
```

The typesetting result looks like this: `call myroutine(a, b)` looks like a Fortran call while `void myfunc(double *a, double *b)` must be C. Note that there must be no leading or trailing spaces inside the backticks.

It is recommended to have inline verbatim text on the same line in the DocOnce file, because some formats (L<sup>A</sup>T<sub>E</sub>X in combination with the `ptex2tex` program (but not `doconce pretext`)) will have problems with inline verbatim text that is split over two lines.

### Notice.

Watch out for mixing backticks and asterisk (i.e., verbatim and emphasized code): the DocOnce interpreter is not very smart in detecting such errors. A missing backtick will also quickly create strange output. If you suspect inline code to be the source of problems in the final format, examine the DocOnce source and the output.

## 3.3 Links to Web Addresses

Web addresses with links are typeset as

```
some URL like "Search Google": "http://google.com".
```

which appears as some URL like [Search Google](http://google.com). The space after colon is optional, but it is important to enclose the link and the URL in double quotes.

To have the URL address itself as link text, put an "URL" or URL before the address enclosed in double quotes:

```
Click on this link: URL: "https://github.com/hplgit/doconce".
```

which gets rendered as Click on this link: <https://github.com/hplgit/doconce>.

(There is also support for lazy writing of URLs: any http or https web address with a leading space and a trailing space, comma, semi-colon, or question mark (but not period!) becomes a link with the web address as link text.)

## 3.4 Links to Mail Addresses

Links that launches a mail to a specified address is written as ordinary URLs, typically as

```
Send "mail": "mailto:hpl@simula.no"
# Alternative:
to "'hpl@simula.no'": "mailto:hpl@simula.no".
```

which appears as Send [mail](mailto:hpl@simula.no) to [hpl@simula.no](mailto:hpl@simula.no).

### 3.5 Links to Local Files

Links to files ending in `.txt`, `.html`, `.pdf`, `.py`, `.f`, `.f77`, `.f90`, `.f95`, `.sh`, `.csh`, `.ksh`, `.zsh`, `.c`, `.cpp`, `.cxx`, `.pl`, and `.java` follows the same setup:

see the "DocOnce Manual": `"manual.do.txt"`.

which appears as see the [DocOnce Manual](#). However, linking to local files like this needs caution:

- In the `html` format the links work well if the files are supplied with the `.html` with the same relative location.
- In the `latex` and `pdflatex` formats, such links in PDF files will unless the `.tex` file has a full URL specified through a `\hyperbaseurl` command and the linked files are located correctly relative to this URL. Otherwise full URL must be used in links.
- In the `sphinx` format, links to local files do not work unless the files reside in a `_static` directory (a warning is issued about this).

As a consequence, we strongly recommend that one copies the relevant files to a `_static` or `_static-name` directory and makes links to files in this directory only (name is the nickname of the DocOnce document, usually the name of the parent directory or main document). Other links to files should use the full URL. If DocOnce is used for HTML output only, then plain links to local files work fine.

If you want a link to a local source code file and have it viewed in the browser rather than being downloaded, we recommend to transform the source code file to HTML format by running `pygmentize`, e.g.,

```
Terminal> pygmentize -l bash -f html -O full,style=emacs \
           -o _static/make.sh.html subdir/make.sh
```

Then you can link to `_static/make.sh.html` instead of `subdir/make.sh`. Here is an example where the reader has the file available as `src/myprog.py` in her software and the document links to `_static/myprog.py`:

See the code URL: `"src/myprog.py"` ("view: `"_static/myprog.py.html"`").

Links to files with other extensions are typeset with *the filename as link text*. The syntax consists of the keyword URL, followed by a colon, and then the filename enclosed in double quotes:

URL: `"manual.html"`

resulting in the link [manual.html](#).

### 3.6 Quotes

Quotations employ either the emphasized font or double quotation marks. In the latter case, one should not use the character " but rather the (LaTeX-inspired) construction with double backticks and two single quotes:

This is a sentence with ‘words to be quoted’.

To candidates for find double quotes that should be transferred to the above type of quotation (which is a common mistake), one can run a regular expression search like

```
Terminal> find . -name '*.do.txt' -exec grep -E \
'[^(""[A-Za-z0-9 ,]+" *[:'')"]' {} \; -print
```

This search may give many false hits as double quotes are frequently used in computer code and preprocessor instructions (URLs and hyperlinks should not give hits in the above regular expressions).

### 3.7 Non-Breaking Space

The non-breaking space character is tilde:

Here comes a long line with a specification of a number with unit at the end, which is an example that requires a "non-breaking space character":  
"http://en.wikipedia.org/wiki/Non-breaking\_space": 7.4~km is traveled in~\$7.4/5.5\approx 1.345\$~s. (Computer code, where the tilde has a meaning, as in 'y = ~x', is not affected. The non-breaking character only works between characters, numbers, and the math dollar sign.)

This is rendered as

Here comes a long line with a specification of a number with unit at the end, which is an example that requires a [non-breaking space character](#): 7.4 km is traveled in 7.4/5.5  $\approx$  1.345 s. (Computer code, where the tilde has a meaning, as in  $y = \sim x$ , is not affected. The non-breaking character only works between characters, numbers, and the math dollar sign.)

### 3.8 Horizontal rule

A horizontal rule for separating content vertically, like this:

-----  
is typeset as four or more hyphens on a single line:

-----

### 3.9 Em-dash

The `latex`, `pdflatex`, `sphinx`, and `html` formats support em-dash, indicated by three hyphens: `---`. The em-dash has two applications: 1) as alternative to a hyphen with space around in a sentence—except that there are no spaces around the em-dash, and 2) origin of quotes, where there is no space between the end of the quote and the m-dash:

*Premature optimization is the root of all evil.*— Donald Knuth.

The associated DocOnce source reads

```
!bquote
*Premature optimization is the root of all evil.*--- Donald Knuth.
!equote
```

### 3.10 Ampersand

An ampersand, as in Guns & Roses or Texas A&M, is written as a plain `&` *with space(s) on both sides*. Single upper case letters on each side of `&`, as in Texas A & M, remove the spaces and result in Texas A&M, while words on both sides of `&`, as in Guns & Roses, preserve the spaces: Guns & Roses. Failing to have spaces before and after `&` will result in wrong typesetting of the ampersand in the `html`, `latex`, and `pdflatex` formats.

### 3.11 Footnotes

Typesetting of footnotes employs a common email or Extended Markdown syntax:

Footnotes are typeset according to the output format`[^typesetting]`. The syntax is optional spaces, opening bracket, hat, a name without spaces `[^remedy-for-name-with-spaces]`, and closing bracket. The logical name of the footnote is not used in LaTeX, HTML, reStructuredText, or Sphinx, because these languages employ numbered footnotes. Other formats employ the logical name.

`[^typesetting]`: Typesetting of the footnote depends on the format. Plain text does nothing, LaTeX removes the definition and inserts the footnote as part of the LaTeX text. reStructuredText and Sphinx employ a similar type of typesetting as Extended Markdown and DocOnce, and in HTML we keep the same syntax, just displayed properly in HTML.

Footnotes are preferably defined after the paragraph they are used. The definition is the footnote syntax (some optional space, bracket, hat, name, bracket) followed by colon and a text.

`[^remedy-for-name-with-spaces]`: Just put in dashes or underscores in case of spaces.

The text above looks as follows.

Footnotes are typeset according to the output format<sup>1</sup>. The syntax is optional spaces, opening bracket, hat, a name without spaces<sup>2</sup>, and closing bracket. The logical name of the footnote is not used in  $\LaTeX$ , HTML, reStructuredText, or Sphinx, because these languages employ numbered footnotes. Other formats employ the logical name.

Footnotes are preferably defined after the paragraph they are used. The definition is the footnote syntax (some optional space, bracket, hat, name, bracket) followed by colon and a text.

### 3.12 Inline Comments

DocOnce also supports inline comments in the text:

```
[name: comment]
```

where `name` is (e.g.) the name of the author of the comment, and `comment` is a plain text text. Note that *there must be a space after the colon*, otherwise the comment is not recognized. The name can contain upper and lower case characters, digits, single quote, + and -, as well as space. Next is an example.

**hpl's comment 1:** Inline comments can span several lines, if desired.

The name and comment are visible in the output unless `doconce` format is run with a command-line argument `--skip_inline_comments` (see Section 10 for an example). Inline comments are helpful during development of a document since different authors and readers can comment on formulations, missing points, etc. All such comments can easily be removed from the `.do.txt` file by `doconce remove_inline_comments` (see Section 10).

Inline comments are typeset in a simple way: boldface name, a numbering of the comment, and then the comment, all in red and in parenthesis. However, with the `--latex_todonotes` option,  $\LaTeX$  will apply the `todonotes` package to typeset the comments in very visible color boxes.

### 3.13 Inline Comments for Editing

Inline comments can also be used to markup editing of the text. The following syntax is supported:

```
[add: ,]  
[add: .]  
[add: ;]  
[del: ,]  
[del: .]  
[del: .]  
[del: ;]  
[add: some text]
```

---

<sup>1</sup>Typesetting of the footnote depends on the format. Plain text does nothing,  $\LaTeX$  removes the definition and inserts the footnote as part of the  $\LaTeX$  text. reStructuredText and Sphinx employ a similar type of typesetting as Extended Markdown and DocOnce, and in HTML we keep the same syntax, just displayed properly in HTML.

<sup>2</sup>Just put in dashes or underscores in case of spaces.

```
[del: some text]
[edit: some text -> some replacement for text]
[name: some text -> some replacement for text]
```

That is, one can add, delete, and replace text, and adding or deleting a comma, period, or semicolon leads to special typesetting where such a small edit is highlighted. Below is an example of a text with inline editing.

Originally, we have the text

```
First consider a quantity  $Q$ . Without loss of generality, we assume
 $Q > 0$ . There are three, fundamental, basic property of  $Q$ .
```

Then, some reader wants to change this text and explicitly demonstrate what is deleted, added, and replaced (as when using track changes in Microsoft Word). The use of the add, del, and replacement construction with -> may look as follows.

```
First[add: ,] consider [edit: a quantity -> the flux]
[del:  $Q$ . Without loss of generality,
we assume]  $Q > 0$ . There are three[del: ,] fundamental[del: , basic]
[edit: property -> properties] of  $Q$ . [add: These are not
important for the following discussion.]
```

The text gets rendered as

First, (**edit 2: add comma**) consider (**edit 3: a quantity the flux (edit 4:)**  $Q$ . ~~Without loss of generality, we assume~~  $Q > 0$ . There are three (**edit 5: delete comma**) fundamental(**edit 6:)** ~~,basic~~ (**edit 7:)** ~~property~~ properties of  $Q$ . (**edit 8:)** These are not important for the following discussion.

Such inline comments with edits are only given special typesetting in the output formats latex, pdflatex, html, and sphinx. Otherwise, just the DoOnce syntax is shown (but that is also quite readable as edit instructions.)

The editing implied by the edit comments can be implemented in the DoOnce file by the command

```
Terminal> doonce apply_edit_comments mydoc.do.txt
```

### 3.14 Forced Line Breaks

By *ending* a line in the DocOnce file with <linebreak> the output format has a forced linebreak at this point. This can be used to typeset poems, songs (if not in a verbatim block), or the origin of quotes. Here is an example:

```
!bquote
*Program writing is substantially more demanding than book
writing. Why is it so? I think the main reason is that a larger
attention span is needed when working on a large computer program
than when doing other intellectual tasks.* <linebreak>
Donald Knuth cite[p. 18]{Knuth85}, computer scientist, 1938-.
!equote
```



is rendered as

*Program writing is substantially more demanding than book writing.  
Why is it so? I think the main reason is that a larger attention span  
is needed when working on a large computer program than when  
doing other intellectual tasks.*

Donald Knuth [1, p. 18], computer scientist, 1938-.

The `<linebreak>` is a newline in  $\text{\LaTeX}$  if it has preceding text, otherwise it is a `\vspace{3mm}`. In HTML, `<linebreak>` is `<br>`. Both constructions can be used to either force a linebreak or add vertical space.

**Tip on using forced linebreaks.**

The `<linebreak>` tag is often useful in slides to avoid overfull lines in bullet lists, partition such lines into separate lines, or to insert vertical space. It can be used in admonitions too to get more space between the title and the text. Remember to have `<linebreak>` at the end of the line.

### 3.15 Inline Mathematics

Inline mathematics is written as in  $\text{\LaTeX}$ , i.e., inside dollar signs. Many formats leave this syntax as it is (including the two dollar signs), hence nice math formatting is only obtained in  $\text{\LaTeX}$ , HTML, MediaWiki, and Sphinx (Epytext has some inline math support that is utilized).

The following text

Let  $a = \sin(x) + \cos(x)$ . Then  $a^2 = 2\sin(x)\cos(x)$   
because  $\sin^2 x + \cos^2 x = 1$ .

is rendered as “Let  $a = \sin(x) + \cos(x)$ . Then  $a^2 = 2\sin(x)\cos(x)$  because  $\sin^2 x + \cos^2 x = 1$ .”

Mathematical expressions in  $\text{\LaTeX}$  syntax often contains special formatting commands, which may appear annoying in plain text. DocOnce therefore supports an extended inline math syntax where the writer can provide an alternative syntax suited for formats close to plain ASCII:

Here is an example on a linear system  
 $\mathbf{A}\mathbf{x} = \mathbf{b}$ ,  
where  $\mathbf{A}$  is an  $n \times n$  matrix, and  
 $\mathbf{x}$  and  $\mathbf{b}$  are vectors of length  $n$ .

That is, we provide two alternative expressions, both enclosed in dollar signs and separated by a pipe symbol, the expression to the left is used in formats with  $\text{\LaTeX}$  support (latex, pdflatex, html, sphinx, mwiki), while the expression to the right is used for all other formats. The above text is typeset as “Here is an example on a linear system  $\mathbf{Ax} = \mathbf{b}$ , where  $\mathbf{A}$  is an  $n \times n$  matrix, and  $\mathbf{x}$  and  $\mathbf{b}$  are vectors of length  $n$ .”

### 3.16 Cross-Referencing

References and labels are supported. The syntax is simple:

```
label{section:verbatim}    # defines a label
For more information we refer to Section ref{section:verbatim}.
```

This syntax is close to that of labels and cross-references in  $\text{\LaTeX}$ . When the label is placed after a section or subsection heading, the plain text, Epytext, and StructuredText formats will simply replace the reference by the title of the (sub)section. All labels will become invisible, except those in math environments. In the rst and sphinx formats, the end effect is the same, but the “label” and “ref” commands are first translated to the proper reST commands by doconce format. In the HTML and (Google Code) wiki formats, labels become anchors and references become links, and with  $\text{\LaTeX}$  “label” and “ref” are just equipped with backslashes so these commands work as usual in  $\text{\LaTeX}$ .

It is, in general, recommended to use labels and references for (sub)sections, equations, and figures only. By the way, here is an example on referencing Figure 1 (the label appears in the figure caption in the source code of this document). Additional references to Sections 4.3 and 4.4 are nice to demonstrate, as well as a reference to equations, say (??)-(??). A comparison of the output and the source of this document illustrates how labels and references are handled by the format in question.

Hyperlinks to files or web addresses are handled as explained in Section 3.

### 3.17 Generalized Cross-Referencing

Sometimes a series of individual documents may be assembled to one large document, typically a book. In the book one wants to make cross references between chapters and sections, while these become references to external documents when the chapters (or sections) are compiled as stand-alone documents. For example, one can in a DocOnce file file1.do.txt have text like

```
...as shown in Section ref{sec:eqs}.
```

with \label{sec:eqs} defined in another file file2.do.txt. If file1.do.txt and file2.do.txt are combined to a single document, the reference is treated correctly, but if file1.do.txt is compiled as a single document, the label sec:eqs becomes undefined. Then one would instead write

```
...as shown in the document "Mathematical Equations":
"http://some.net/doc/matheqs.html" cite{math_eqs_2020}.
```

However,  $\text{\LaTeX}$  has functionality for referring to labels in external documents: these work fine when the xr package is used and the external documents are listed as externaldocument{name}. In that case, we would write the above reference as

```
\externaldocument{file2}
...
...as shown in Section ref{sec:eqs} in cite{math_eqs_2020}.
```

To treat all these cases simultaneously, DocOnce features *generalized references* which allows a reference to have different formulations, depending on whether the label is present in the document or is present in an external document. The syntax of generalized references reads

```
ref[internal][cite][external]
```

If all `ref{label}` references in the text `internal` are to labels defined in the DocOnce document, the generalized reference becomes the text `internal`. If one or more labels are not present in the document and `latex` or `pdflatex` is output format, the generalized reference becomes the text `internal plus cite`, while for all other formats the text in `external` is used.

The example above can now be written as the generalized reference

```
...as shown in ref[Section ref{sec:eqs}][ in cite{math_eqs_2020}][
the document "Mathematical Equations":
"http://some.net/doc/matheqs.html" cite{math_eqs_2020}].
```

When `\label{sec:eqs}` is found in the current DocOnce document, the generalized reference becomes

```
Section ref{sec:eqs}
```

If not, and `latex` or `pdflatex` is output, the reference becomes

```
Section ref{sec:eqs} in cite{math_eqs_2020}
```

while in all other cases the reference becomes

```
the document "Mathematical Equations":
"http://some.net/doc/matheqs.html" cite{math_eqs_2020}
```

For the reference to a label in an external document to work in the  $\text{\LaTeX}$  case it is required to list this document in the DocOnce file as

```
# Externaldocuments: file2
```

Several external documents can be listed with comma as delimiter:

```
# Externaldocuments: file2, file3, myfile
```

on a *single line*. The `Externaldocuments` comment leads to use of the `xr` package and insertion of `\externaldocument{file2}` in the  $\text{\LaTeX}$  output file. It is a good habit to place the `Externaldocument` comment after the title, author, and date.

Very often a reference to a chapter in a book becomes just a reference to a complete document, not a specific section, if chapters are compiled individually. For `latex` and `pdflatex` output one would then do a reference `Chapter~\ref{ch:eqs}` as just `\cite{eqs_doc_2008}`. That is, one would just use the `cite` text and not `internal plus cite`. This is enabled by writing the generalized reference with `refch` instead of `ref`:

```
...as shown in refch[Chapter ref{ch:eqs}][cite{eqs_doc_2008}][
the document "Some Equations": "http://some.net/someeqs/"].
```

The `doconce ref_external` command will read all the labels in the external documents listed in the `Externaldocuments:` comment and use the publish file of the current document to automatically generate substitution commands that translates ordinary references to generalized references. For example, `doconce ref_external file1` will find the reference

```
.....as shown in Section ref{sec:eqs}.
```

as a reference to an label `sec:eqs` defined in `file2`, grab the title of `file2.do.txt` and find the bibliographic data in the publish file and make a substitution command

```
doconce subst "Section\s+ref{sec:eqs}" "... " $files
```

where `"..."` is the generalized reference as shown in the examples above. In other words, with `doconce ref_external` one can automatically generate generalized references between, for example, chapters in a book that exist as stand-alone documents.

### Warning.

Generalized references to equations work well in  $\text{\LaTeX}$ , but not in other formats as one cannot resolve the equation number in the external document. It is then better to write different text using the `FORMAT` variable in Mako:

```
% if FORMAT in ("pdflatex", "latex"):
By combining ref[(ref{eqs:g1})-(ref{eqs:g4})][ in cite{some_doc}][
dummy] we can derive the expression ...
% else:
One can from cite{some_doc} derive the expression
% endif
```

The `doconce ref_external` tool generates an external text in case of references to equations that says “reference to specific **equations** (label `eqs:g1` and `eqs:g4`) in external document “name”: “link” is not recommended”. One can then search for this text and make a Mako if-else rewrite as shown above.

### Limited support.

The `doconce ref_external` tool cannot correctly handle references to a range of sections like

```
Sections ref{mydoc:sec1}-ref{mydoc:sec2}
```

The automatically generated generalized references should always be manually checked and edited.

**A Worked Example.** Here is an example on a specific working generalized reference where the  $\text{\LaTeX}$  output also has a hyperlink:

```
As explained in
ref[Section ref{subsec:ex}][in "Langtangen, 2012":
"http://hplgit.github.io/doconce/test/demo_testdoc.html#subsec:ex"
cite{DocOnce:test}][a "section":
"http://hplgit.github.io/doconce/test/demo_testdoc.html#subsec:ex" in
the document "A Document for Testing DocOnce":
"http://hplgit.github.io/doconce/test/demo_testdoc.html"
cite{DocOnce:test}], DocOnce documents may include tables.
```

With latex or pdflatex as output, this translates to

```
As explained in
Section ref{subsec:ex}, DocOnce documents may include tables.
```

if the label {subsec:ex} appears in the present DocOnce source, and otherwise

```
As explained in
Section ref{subsec:ex} in "Langtangen, 2012":
"http://hplgit.github.io/doconce/test/demo_testdoc.html#subsec:ex"
cite{DocOnce:test}, DocOnce documents may include tables.
```

The latter DocOnce code is translated to the following  $\text{\LaTeX}$  code:

```
As explained in
Section~\ref{subsec:ex} in
\href{http://hplgit.github.io/doconce/...}{Langtangen, 2012}
\cite{DocOnce:test}, DocOnce documents may include tables.
```

In a format different from latex and pdflatex, the effective DocOnce text becomes

```
As explained in
a "section":
"http://hplgit.github.io/doconce/test/demo_testdoc.html#subsec:ex" in
the document "A Document for Testing DocOnce":
"http://hplgit.github.io/doconce/test/demo_testdoc.html"
cite{DocOnce:test}, DocOnce documents may include tables.
```

The rendered text in the current format becomes

As explained in Section ??in [Langtangen, 2012](#) [2], DocOnce documents may include tables.

A complete “chapter” reference may look like

```

As explained in
refch[Chapter ref{ch:testdoc}]["Langtangen, 2012":
"http://hplgit.github.io/doconce/test/demo_testdoc.html"
cite{DocOnce:test}][the document
"A Document for Testing DocOnce":
"http://hplgit.github.io/doconce/test/demo_testdoc.html"
cite{DocOnce:test}], DocOnce documents may include tables.

```

The output now, if `ch:testdoc` is not a label in the document, becomes in the latex and pdflatex case

```

As explained in
"Langtangen, 2012":
"http://hplgit.github.io/doconce/test/demo_testdoc.html"
cite{DocOnce:test}, DocOnce documents may include tables.

```

That is, the internal reference `Chapter ...` is omitted since it is not meaningful to refer to an external document as “Chapter”. The resulting rendered text in the current format becomes

As explained in [Langtangen, 2012](http://hplgit.github.io/doconce/test/demo_testdoc.html) [2], DocOnce documents may include tables.

Note that  $\text{\LaTeX}$  cannot have links to local files, so a complete URL on the form `http://...` must be used.

#### Tip.

Use `doconce ref_external` to get an overview of the external references in a file. Very often you want to rewrite the text to reduce the amount of external referencing. Remember then to compile your document before running `doconce ref_external` again since the command applies the compiled files to get information (`tmp_preprocess_*` or `tmp_mako_*`) if you use any of the Preprocess or Mako preprocessors.

## 3.18 Index

An index can be created for the `latex`, `rst`, and `sphinx` formats by the `idx` keyword, following a LaTeX-inspired syntax:

```

idx{some index entry}
idx{main entry!subentry}
idx{'verbatim_text' and more}

```

The exclamation mark divides a main entry and a subentry. Backquotes surround verbatim text, which is correctly transformed in a  $\text{\LaTeX}$  setting to

```

\index{verbatim\_text@texttt{\rm\smaller verbatim\_text and more}}

```

Everything related to the index simply becomes invisible in plain text, Epytext, StructuredText, HTML, and wiki formats. Note: `idx` commands should be inserted outside paragraphs and admonitions, not in between the text as this may cause some strange behaviour of reST and Sphinx formatting. As a recommended rule, index items are naturally placed right after section headings, before the text begins, while index items related to a paragraph should be placed above the paragraph on a separate line (and not in between the text or between the paragraph heading and the text body, although this works fine if  $\text{\LaTeX}$  is the output format). For paragraphs with `===` heading, the index keywords should be placed above the heading.

The keywords in the index are automatically placed in a meta tag in html output such that search engines can make use of the them.

### 3.19 Emojis

Emojis are specified by syntax like `:sweat_smile:`, followed by whitespace (blank or newline) before and after. The available emoji names are shown at <http://www.emoji-cheat-sheet.com>. Here is an example: 😓

DocOnce supports emojis for the `html` and `pdflatex` formats. All other formats will just print the raw emoji name (like `:sweat_smile:`). The command-line option `--no_emoji` removes all emojis from the output.

## 4 Environments

### 4.1 Exercises, Problems, Projects, and Examples

DocOnce has special support for four types of “exercises”, named *exercise*, *problem*, *project*, or *example*. These are all typeset as special kind of subsections. Such subsections start with a subsection headline surrounded 5 = characters, and last up to the next headline or the end of the file. The headline itself must consist of the word *Exercise*, *Problem*, *Project*, or *Example*, followed by a colon and a title of the exercise, problem, or project. The next line(s) may contain a label and specification of the name of the result file (if the answer to the exercise is to be handed in) and a solution file. The DocOnce code looks like this:

```
===== Project: Determine the Distance to the Moon =====
label{proj:moondist}
file=earth2moon.pdf
solution=eart2moon_sol.do.txt
```

Here goes the running text of the project....

DocOnce will recognize the exercise, problem, project, or example *title*, the optional *label*, the optional *name of the answer file* (`file=`), the optional name of the *solution* file (`solution=`), and the *running text*. In addition, one can

add subexercise environments, starting with `!bsubex` and ending with `!esubex`, on the beginning of separate lines. Within the main exercise or a subexercise, three other environments are possible: (full) solution, (short) *answer*, and *hints*. The environments have begin-end directives `!bans`, `!eans`, `!bsol`, `!esol`, `!bhint`, `!ehint`, which all must appear on the beginning of a separate line (just as `!bc` and `!ec`).

The solution environment with `!bsol` and `!esol` allows inline solution as an alternative to the `solution=...` directive mentioned above, which requires that the solution is in a separate file. Comment lines are inserted so that the beginning and end of answers and solutions can be identified and removed if desired.

A full exercise set-up can be sketched as follows:

```
===== Exercise: Determine the Distance to the Moon =====
label{exer:moondist}
file=earth2moon.pdf

Here goes main body of text describing the exercise...

!bsubex
Subexercises are numbered a), b), etc.

!bans
Short answer to subexercise a).
!eans

!bhint
First hint to subexercise a).
!ehint

!bhint
Second hint to subexercise a).
!ehint
!esubex

!bsubex
Here goes the text for subexercise b).

!bhint
A hint for this subexercise.
!ehint

!bsol
Here goes the solution of this subexercise.
!esol
!esubex

!bremarks
At the very end of the exercise it may be appropriate to summarize
and give some perspectives. The text inside the !bremarks-!eremarks
directives is always typeset at the end of the exercise.
!eremarks

!bsol
Here goes a full solution of the whole exercise.
!esol
!ec
```

A recommended rule for using the different “exercise” types goes as follows:



- Exercises are smaller problems directly related to the present chapter (e.g., with references to the text).
- Problems are sufficiently independent of the chapter's text that they make sense on their own, separated from the rest of the document.
- Projects are larger problems that also make sense on their own.
- Examples are exercises, problems, or projects with full solutions.

The command line options `--without_answers` and `--without_solutions` turn off output of answers and solutions, respectively, except for examples.

Sometimes one does not want the heading of an exercise, problem, project, or example to contain the keyword `Exercise:`, `Problem:`, `Project:`, or `Example:`. By enclosing the keyword in braces, as in

```
===== {Problem}: Find a solution to a problem =====
```

the keyword is marked for being left out of the heading, resulting in the heading “Find a solution to a problem”.

The various elements of exercises are collected in a special data structure (list of dictionaries) stored in a file `.mydoc.exerinfo`, if `mydoc.do.txt` is the name of the DocOnce file. The file contains a list of dictionaries, where keys in the dictionary corresponds to elements in the exercise: filename, solution file, answer, label, list of hints, list of subexercises, closing remarks, and the main body of text. From this data structure it is easy to generate stand-alone documents with exercises, problems, and projects with or without short answers and full solutions.

Tailored formatting of exercises in special output formats can make use of the elements in an exercise. For example, one can image web formats where the hints are displayed one by one when needed and where the result file can be uploaded. One can also think of mechanisms for downloading the solution file if the result file meets certain criteria. DocOnce does not yet generate such functionality in any output format, but this is an intended future feature to be implemented.

For now, exercises, problems, projects, examples are typeset as ordinary DocOnce sections (this is the most general approach that will work for many formats). One must therefore refer to an exercise, problem, project, or example by its label, which normally will translate to the section number (in  $\text{\LaTeX}$ , for instance) or a link to the title of the section. The *title* is typeset without any leading `Exercise:`, `Problem:`, or `Project:` word, so that references like

```
see Problem ref{...}
```

works well in all formats (i.e., no double Problem Problem appears).

**Remark.** Examples are *not* typeset similarly to exercises unless one adds the command-line option `--examples_as_exercises`. That is, without this option, any heading and starting with `Example:` makes DocOnce treat the forthcoming text as ordinary text without any interpretation of exercise-style instructions. With the command-line option `--examples_as_exercises`, one can use the `!bsubex` and `!bsol` commands to indicate a subproblem and a solution. In this way, the typesetting of the example looks like an exercise equipped with a solution.

**List of Exercises, Problems, and Projects.** DocOnce also supports listing all exercises, problems, and projects with corresponding page numbers. By default, no such listing is enabled. When running `doconce format pdflatex` (or `latex`) there is a command-line option `--list_of_exercises` that can be set to

- `toc`: include exercises, problems, and projects as part of the table of contents
- `loe`: make a separate list of exercises, problems, and projects, which appears after the table of contents

There is a special  $\text{\LaTeX}$  environment for the exercises that one can use to further tailor the appearance of exercises (given that one edits the `.tex` file, preferably by a script after each `doconce format` command).

## 4.2 Blocks of Verbatim Computer Code

Blocks of computer code, to be typeset verbatim, must appear inside a “begin code” `!bc` keyword and an “end code” `!ec` keyword. Both keywords must be on a single line and *start at the beginning of the line*. Before such a code block there must be a plain sentence (at least if successful transformation to reST and ASCII-type formats is desired). For example, a code block cannot come directly after a section/paragraph heading or a table.

Here is a plain code block:

```
!bc
% Could be a comment line in some file
% And some data
1.003 1.025
2.204 1.730
3.001 1.198
!ec
```

which gets rendered as

```
% Could be a comment line in some file
% And some data
1.003 1.025
2.204 1.730
3.001 1.198
```

**Typesetting Styles.** There may be an argument after the `!bc` tag to specify a certain environment (for `ptex2tex`, `doconce ptex2tex`, or Sphinx) for typesetting the verbatim code. For instance, `!bc dat` corresponds to the data file environment and `!bc cod` is typically used for a code snippet. There are some pre-defined environments explained below. If there is no argument specifying the environment, one assumes some plain verbatim typesetting (for `ptex2tex` this means the `ccq` environment, which is defined in the config file `.ptex2tex.cfg`, while for Sphinx it defaults to the `python` environment).

By default, `pro` is used for complete programs in Python, `cod` is for a code snippet in Python, while `Xcod` and `Xpro` imply computer language specific typesetting where `X` can be `f` for Fortran, `c` for C, `cpp` for C++, `sh` for Unix shells, `pl` for Perl, `m` for Matlab, `cy` for Cython, `r` for Ruby, `js` for JavaScript, `latex` for  $\text{\LaTeX}$ , `html` for HTML, and `py` for Python. The argument `sys` means by default console for Sphinx and `CodeTerminal` (`ptex2tex` environment) for  $\text{\LaTeX}$ . Other specifications are `dat` for a data file or print out, `pyshell` for plain interactive Python shell sessions, and `ipy` for interactive IPython sessions (the latter does not introduce any environment in sphinx output, as interactive sessions are automatically recognized and handled in that format). (All these definitions of the arguments after `!bc` can be redefined in the `.ptex2tex.cfg` configuration file for `ptex2tex` and in the sphinx code-blocks comments for Sphinx, see below.)

Since the config file for `ptex2tex` and command-line arguments for the alternative `doconce ptex2tex` program can define what some environments map onto with respect to typesetting, a similar possibility is supported for Sphinx as well. The argument after `!bc` is in case of Sphinx output mapped onto a valid Pygments language for typesetting of the verbatim block by Pygments. This mapping takes place in an optional comment to be inserted in the DocOnce source file, e.g.,

```
# sphinx code-blocks: pycod=python cod=fortran cppcod=c++ sys=console
```

Here, three arguments are defined: `!bc pycod` maps on to the Pygments style `python` for Python code, `!bc cod` maps on to the Pygments style `fortran` for Fortran code, `!bc cppcod` maps on to the Pygments style `c++` for C++ code, and `!bc sys` maps on to the Pygments `console` style for terminal sessions. The same arguments would be defined in `.ptex2tex.cfg` or on the command line for `doconce ptex2tex` for how to typeset the blocks in  $\text{\LaTeX}$  using various verbatim styles (Pygments can also be used in a  $\text{\LaTeX}$  context).

#### Tip.

The enclosing `!ec` tag of verbatim computer code blocks must be followed by a newline. A common error in list environments is to forget to indent the plain text surrounding the code blocks. In general, we recommend to use

paragraph headings instead of list items in combination with code blocks (it usually looks better, and some common errors are naturally avoided).

Here is a verbatim code block with Python code (pycod style):

```
!bc pycod
def f(x, y):
    return x + y

# Main program
from math import pi
print 'Testing f:', f(pi, 0)
!ec
```

The typeset result of this block becomes

```
def f(x, y):
    return x + y

# Main program
from math import pi
print 'Testing f:', f(pi, 0)
```

And here is a C++ code snippet (cppcod style):

```
!bc cppcod
void myfunc(double* x, const double& myarr) {
    for (int i = 1; i < myarr.size(); i++) {
        myarr[i] = myarr[i] - x[i]*myarr[i-1]
    }
}
!ec
```

with the rendered result

```
void myfunc(double* x, const double& myarr) {
    for (int i = 1; i < myarr.size(); i++) {
        myarr[i] = myarr[i] - x[i]*myarr[i-1]
    }
}
```

**Copying Code from Source Files.** Computer code can be copied directly from a file, if desired. The syntax is then

```
@@@CODE myfile.f
@@@CODE myfile.f fromto: subroutine\s+test@^C\s{5}END1
```

The first line implies that all lines in the file `myfile.f` are copied into a verbatim block, typset in a `!bc Xpro` environment, where `X` is the extension of the file-name, here `f` (i.e., the environment becomes `!bc fpro` and will typically lead to some Fortran-style formatting). The second line has a `fromto:` directive, which implies copying code between two lines in the code, typset within a `!bc Xcod` environment (again, `X` is the filename extension, implying the type of file). Note that the `pro` and `cod` arguments are only used for  $\text{\LaTeX}$  and Sphinx output, all

other formats will have the code typeset within a plain !bc environment.) Two regular expressions, separated by the @ sign, define the “from” and “to” lines. The “from” line is included in the verbatim block, while the “to” line is not. In the example above, we copy code from the line matching subroutine test (with as many blanks as desired between the two words) and the line matching C END1 (C followed by 5 blanks and then the text END1). The final line with the “to” text is not included in the verbatim block.

One can also specify the code environment explicitly rather than relying on the file extension:

```
@@@CODE somefile.py envir=X fromto: def myfunc@def yourfunc
```

This is the same as writing !bc X and copying parts of the somefile.py text into the DocOnce source file, followed by !ec. For example, if the lines between the myfunc and yourfunc functions actually work as a complete Python program, one could specify envir=pypro to indicate that it is a complete program that can be run as is. By default, copying a part of a .py file will lead to !bc pycod, which indicates a code snippet that normally needs additional code to be run.

Let us demonstrate the result of copying a whole file, as specified in the first line above:

```
C      a comment

subroutine test()
integer i
real*8 r
r = 0
do i = 1, i
    r = r + i
end do
return
C      END1

program testme
call test()
return
```

Let us then copy just a piece in the middle as indicated by the fromto: directive above:

```
subroutine test()
integer i
real*8 r
r = 0
do i = 1, i
    r = r + i
end do
return
```

**The fromto and from-to directives.** Note that the “to” line is never copied into the DocOnce file, but the “from” line is. Sometimes it is convenient to

also neglect the “from” line, a feature that is allowed by replacing `fromto:` by `from-to` (“from with minus”). This allows for copying very similar code segments throughout a file, while still distinguishing between them. Copying the second set of parameters from the text

```
# --- Start Example 1 ---
c = -1
A = 2
p0 = 4
simulate_and_plot(c, A, p0)
# --- End Example 1 ---

# --- Start Example 2 ---
c = -1
A = 1
p0 = 0
simulate_and_plot(c, A, p0)
# --- End Example 2 ---
```

is easy with

```
from-to: Start Example 2@End Example 2
```

With only `fromto:` this would be impossible.

Remark for those familiar with `ptex2tex`: The `from-to` syntax is slightly different from that used in `ptex2tex`. When transforming `DocOnce` to  $\text{\LaTeX}$ , one first transforms the document to a `.p.tex` file to be treated by `ptex2tex` or `doconce ptex2tex`. However, note that the `@@@CODE` line is always interpreted by `DocOnce` first.

Remark for those familiar with the `listings` package in  $\text{\LaTeX}$ : the `listing` package can copy code from files, but snippets must be specified through exact line numbers. The `@@@CODE` directive above works with regular expressions which are much less sensitive to edits of the source code file than the line numbers. Moreover, copy of code from file works in `DocOnce` across formats (HTML, Sphinx, Markdown, etc.).

### 4.3 $\text{\LaTeX}$ Blocks of Mathematical Text

Blocks of mathematical text are like computer code blocks, but the opening tag is `!bt` (begin TeX) and the closing tag is `!et`. It is important that `!bt` and `!et` appear on the beginning of the line and followed by a newline.

```
!bt
\begin{align}
\{\partial u \over \partial t\} &= \nabla^2 u + f, \text{label\{myeq1\}} \\
\{\partial v \over \partial t\} &= \nabla \cdot (q(u) \nabla v) + g. \text{label\{myeq2\}}
\end{align}
!et
```

**Support of  $\text{\LaTeX}$  Math in Various Output Formats.** The support of  $\text{\LaTeX}$  mathematics varies among the formats:

- Output in  $\LaTeX$  (`latex` and `pdflatex` formats) has full support of all  $\LaTeX$  mathematics, of course.
- The `html` format supports single equations and multiple equations via the `align` environment, also with labels.
- Markdown (`pandoc` format) allows single equations and inline mathematics, but does not allow references to equations (the generated DocOnce code simulates such references, however).
- MediaWiki (`mwiki` format) does not enable labels in equations and hence equations cannot be referred to.

### Important!

The main conclusion is that for output beyond  $\LaTeX$  (`latex` and `pdflatex` formats), stick to simple `\[` and `\]` or `equation` and `align` or `align*` environments, and avoid referring to equations in MediaWikis.

Going from DocOnce to MS Word is most easily done by outputting in the `latex` format and then using the [Pandoc](#) or [latex2rtf](#) programs to translate from  $\LaTeX$  to MS Word. Note that only a subset of  $\LaTeX$  will be translated correctly, and mathematics is notoriously difficult and unpredictable.

Conversion to ePub format can go via HTML and the [Calibre](#) tools. Also Pandoc can generate ePub. The ePub3 format supports mathematics via MathML. Some discussions of this topic appear in <http://tex.stackexchange.com/questions/1551/use-latex-to-produce-epub>. The [LaTeXML](#) program can convert  $\LaTeX$  to XML and XHTML and can be a good starting point for further conversion to ePub, but the plain `latexml` fails miserably on  $\LaTeX$  documents generated from DocOnce (the present manual to be precise).

A converter to iBooks would be nice, but it is not feasible before iBooks documents get better support for  $\LaTeX$  mathematics. The `.iba` files of iBooks documents can be renamed to `.zip`, the file can be unzipped, and the XML code of iBooks documents are then available (see some [ideas](#)).

**Dealing with Mathematics in Formats without  $\LaTeX$  Math Support.** If the document targets formats with and without support of  $\LaTeX$  mathematics, one can use the preprocessor to typeset the mathematics in two versions. After `#if FORMAT in ("latex", "pdflatex", "html", "sphinx", "mwiki", "pandoc")` one places  $\LaTeX$  mathematics, and after `#else` one can write inline mathematics in a way that looks nice in plain text and wiki formats without support for mathematical typesetting. Such branching can be used with mako if-else statements alternatively:

```
% if FORMAT in ("latex", "pdflatex", "html", "sphinx", "mwiki", "pandoc"):
!bt
```

```

\[ \sin^2x + \cos^2x = 1,\]
!et
% else:
!bc
        sin^2(x) + cos^2(x) = 1,
!ec
% endif

```

**Mathematics for PowerPoint/OpenOffice.** If you have  $\text{\LaTeX}$  mathematics written in DocOnce, it is fairly easy to generate PNG images of all mathematical formulas and equations for use with PowerPoint or OpenOffice presentations.

1. Make a Sphinx version of the DocOnce file.
2. Go to the Sphinx directory and load the `conf.py` file into a browser.
3. Search for “math” and comment out the `'sphinx.ext.mathjax'` (enabled by default) and `'matplotlib.sphinxext.mathmpl'` (disabled by default) lines, and uncomment the `'sphinx.ext.pngmath'` package. This is the package that generates small PNG pictures of the mathematics.
4. Uncomment the line with `pngmath_dvipng_args =` and set the PNG resolution to `-D 200` when the purpose is to generate mathematics pictures for slides.
5. Run `make html`.
6. Look at the HTML source file in the `_build/html` directory: all mathematics are in `img` tags with `src=` pointing to a PNG file and `alt=` pointing to the  $\text{\LaTeX}$  source for the formula in question. This makes it very easy to find the PNG file that corresponding to a particular mathematical expression.

## 4.4 Macros (Newcommands)

DocOnce supports a type of macros via a LaTeX-style *newcommand* construction, but only inside mathematical expressions (inline  $\text{\LaTeX}$  math or  $\text{\LaTeX}$  math blocks, otherwise use Mako functions).

The newcommands must be defined in a file with name `newcommand_replace.tex` are expanded when DocOnce is filtered to other formats, except for  $\text{\LaTeX}$  (since  $\text{\LaTeX}$  performs the expansion itself). Newcommands in files with names `newcommands.tex` and `newcommands_keep.tex` are kept unaltered when DocOnce text is filtered to other formats, except for the Sphinx format. Since Sphinx understands  $\text{\LaTeX}$  math, but not newcommands if the Sphinx output is HTML, it makes most sense to expand all newcommands. Normally, a user will put all newcommands that appear in math blocks surrounded by `!bt` and `!et` in `newcommands_keep.tex` to keep them unchanged, at least if they contribute to make the raw  $\text{\LaTeX}$  math text easier to read in the formats that cannot render  $\text{\LaTeX}$ . Newcommands used



elsewhere throughout the text will usually be placed in `newcommands_replace.tex` and expanded by DocOnce. The definitions of newcommands in the `newcommands*.tex` files *must* appear on a single line (multi-line newcommands are too hard to parse with regular expressions).

**Notice.**

If you desire a newcommand for the running text, using a Mako function (written in plain Python) is much more flexible. See Section 9.

## 4.5 Guidelines for $\text{\LaTeX}$ Writers

Any  $\text{\LaTeX}$  syntax is accepted, but if output in the `sphinx`, `pandoc`, `mwiki`, `html`, or `ipynb` formats is also important, one should follow these rules:

- AMS  $\text{\LaTeX}$  mathematics is supported, also for the `html`, `sphinx`, and `ipynb` formats.
- Only five equation environments can be used: `\[ ... \]`, `equation*`, `equation`, `align*`, and `align`.
- Newcommands in mathematical formulas are allowed, but not in the running text. Newcommands must be defined in files with names `newcommands*.tex`.
- MediaWiki (`mwiki`) does not support references to equations.

(DocOnce performs extensions to `sphinx` and other formats such that labels in `align` environments work well.)

**Notice.**

$\text{\LaTeX}$  supports lots of fancy formatting, for example, multiple plots in the same figure (`subfigure` package), margin notes, multi-page tables, example and algorithm environments, code listings in figures, etc. Other output formats, such as `sphinx` and `html`, make it necessary for DocOnce to only utilize very standard LaTeX-style writing. Correspondingly, the writer must stick to simple constructs and avoid, for instance,

- newcommands outside inline math or  $\text{\LaTeX}$  blocks<sup>a</sup>
- more than one plot per figure (combine them into one using `doconce combine_images`),
- floating tables with captions (tables are inlined and explained in the text),
- example environments (use `subsection` or `subsubsection` instead),

- algorithms environments (see *Typesetting of Algorithms* in this manual),
- code listings in figures (use just inline blocks).

However, one can use preprocessor if-tests on the format (typically `#if FORMAT in ("latex", "pdf"` to include special code for `latex` and `pdflatex` output and more straightforward typesetting for other formats. In this way, one can also allow advanced  $\text{\LaTeX}$  features and fine tuning of the resulting PDF document. More tuning can be done by automatic editing of the `.tex` produced by DocOnce.

One can also use the Mako preprocessor to extend DocOnce functionality and implement, e.g., theorem or example environments (see Section 9.5) or tables with figures (see Section 9.4). Many other extensions are also possible.

<sup>a</sup>Mako functions written in plain Python or simple Mako variables constitute a much more flexible tool than the  $\text{\LaTeX}$  newcommand construction. Such functions can be used both for the running text and math environments.

## 4.6 Typesetting of Algorithms

DocOnce has no support for typesetting of algorithms, while  $\text{\LaTeX}$  has quite sophisticated support.  $\text{\LaTeX}$  writes need some strategy with dealing with algorithms in DocOnce: they should be sophisticated when the output is in  $\text{\LaTeX}$  and they should be readable when the output is in other formats that have no native support for algorithms.

The simplest solution is to use the preprocessor (Preprocess or Mako) to allow different solutions for different formats. There are basically three typesetting styles available:  $\text{\LaTeX}$  algorithm environments, pseudo code in a verbatim block, and a nested list. A preprocessor variable, say `ALG` can be used to select the typesetting. With Mako we can write

```
% if ALG == 'latex':
# Write native LaTeX code for the algorithm
% elif ALG == 'code':
# Write pseudo code in (e.g.) a python-like style
!bc pycode
if feature in element:
...
!ec
% elif ALG == 'list':
# Use lists to express the algorithm
o if this element has the feature:
* ...
% endif
```

## 4.7 Admonitions

DocOnce offers strong support for admonition environments, such as warning boxes, notification boxes, question boxes, and summary boxes. The boxes normally have an icon, a heading, and may also have a background color. A special box, the block, has never any icon and can be used when an icon would be disturbing or misleading.

**Examples on Admonition Types.** The following admonition environments are available: block, warning, notice, question, and summary. The box is defined by begin and end tags such as `!bnotice` and `!enotice`. The title of the box is fully customizable.

Here are a few examples:

```
!bwarning
Here is a warning!
!ewarning

!bnotice
This is a notice box with default title.
!enotice

!bnotice Hint
A *Hint* or *Tip* box can use the 'notice' box.
!enotice

!bquestion
How many admonition types are there in DocOnce?
!equestion

!bblock This is a block.
A block has never any icon. A block has never any icon,
but may feature a title. It is often used in slides.
!eblock

!bnotice Going deeper
This is text meant to provide more details. The box has the
layout of the notice box, but a custom title, here *Going deeper*.
!enotice

Finally some summary:

!bsummary
The main message is to utilize the admonition styles for
marking different parts of the text
!esummary
```

The above DocOnce code is in the present format rendered as

**Warning.**

Here is a warning!

**Notice.**

This is a notice box with default title.

**Hint.**

A *Hint* or *Tip* box can, e.g., use the `notice` box.

**Question.**

How many admonition types are there in DocOnce?

**This is a block.**

A block has never any icon. A block has never any icon, but may feature a title. It is often used in slides.

**Going deeper.**

This is text meant to provide more details. The box has the layout of the notice box, but a custom title, here *Going deeper*.

Finally some summary:

**Summary.**

The main message is to utilize the admonition styles for marking different parts of the text

The layout of admonitions depend on the format. In the `rst` and `sphinx` formats one applies the native admonitions, but in `sphinx` the `automake_sphinx.py` script manipulates the HTML file to set a gray background for all admonitions. In `html`, `latex` and `pdflatex` there is quite some functionality to control the layout of admonitions.

**Layout of admonitions in HTML.** The command-line argument `--html_admon` sets the admonition style for the `html` format:

- `--html_admon=gray` for icons with gray background and small font,
- `--html_admon=yellow` and `--html_admon=apricot` are similar, but the icons and colors are different,
- `--html_admon=colors` has quite bright colors as backgrounds for the different admonitions,
- `--html_admon=lyx` gives a white background and small icons,
- `--html_admon=bootstrap_alert` gives the common colored admonition boxes associated with the Bootstrap HTML styles (only effective if `--html_style=boots*`),
- `--html_admon=bootstrap_panel` applies the panel construction in Bootstrap to make admonition boxes with (normally) white background but a colored background for the title (only effective if `--html_style=boots*`),
- `--html_admon=paragraph` results in a simple paragraph with the admon title as heading.

The options `--html_admon_bg_color=...` and `--html_admon_bd_color=...` can be used to override the default background and boundary frame colors of the admon styles (respectively). These options have only effect for the `apricot`, `yellow`, and `gray` styles.

Some recommended combinations for admonitions in HTML are

- `--html_style=bloodish, --html_admon=gray, --pygments_html_style=none`  
Or `--pygments_html_style=default`
- `--html_style=blueish2, --html_admon=yellow, --pygments_html_style=none`  
Or `--pygments_html_style=default`
- `--html_style=boots*, --html_admon=bootstrap_alert` Or `--html_admon=bootstrap_panel`

**Layout of admonitions in L<sup>A</sup>T<sub>E</sub>X.** In `latex` and `pdflatex`, the type of admonition style is set by the command-line option `--latex_admon=`. Several values are available:

- `paragraph` is the simplest type of admonition and typeset as plain text with an optional paragraph heading.
- `colors1` (inspired by the original NumPy User Guide in LaTeX/PDF) applies different colors for the different admons with an embedded icon.
- `colors2` is like `colors1` but the text is wrapped around the icon.

- `mdfbox` is the default and gives rounded white boxes with a potential title and no icon (using the very flexible `mdframed` packaged in  $\text{\LaTeX}$ ).
- `graybox2` has square corners, gray background, and is narrower than `mdfbox`. One special feature of `graybox2` is the summary admon, which has a different look with horizontal rules only, and for A4 format, the summary box is half of the text width and wrapped with running text around (if it does not contain verbatim text, in that case the standard `graybox2` style is used). This small summary box is effective in proposals to disperse small paragraphs of key points around.
- `grayicon` has icons and a light gray background.
- `yellowicon` has icons and a light yellow background.

There is also an option `--latex_admon_color=...` that can be used to override the default color. Values are either saturated colors like `gray!10` or an RGB tuple `0.95,0.91,0.97`. The chosen color replaces all default colors for all admon styles except paragraph. For example, an oval gray box is produced by `--latex_admon=mdfbox` and `'--latex_admon_color=gray!10'` (note the quotes: they are necessary to avoid a Bash error due to the exclamation mark in the color specification).

The `mdfbox` admonition styles has boxes with many possibilities for customization by editing the `.tex` file. For example, `linecolor` sets the color of the frame border and `frametitlebackgroundcolor` sets the background color of the title area. A dark blue frame and a light blue background for the title is produced by this automatic edit:

```
doconce replace 'linecolor=black,' 'linecolor=darkblue,'
mydoc.tex
doconce subst 'frametitlebackgroundcolor=.*?,'
'frametitlebackgroundcolor=blue!5 mydoc.tex
```

Admonition titles without a period, exclamation mark, or colon at the end will by default get a period at the end. For some  $\text{\LaTeX}$  admonitions (e.g., `mdfbox`), it may be natural to view the title with a heading *without* any period. The command-line option `--latex_admon_title_no_period` avoids appending a period.

**$\text{\LaTeX}$  code environments inside admonitions.** Sometimes one sets a special background color in the admonitions, and colored code blocks, which look fine in the running text, may then have inappropriate colors inside admonitions. The option `--latex_admon_envir_map=...` is used to map an environment (usually for code) to a new style inside admonitions. Specifying a number, say 2, as in `--latex_admon_envir_map=2`, appends the number to all environments inside admonitions, so `!bc pycod` becomes effectively `!bc pycod2`. One can then in `doconce ptex2tex` (or in the `ptex2tex` configuration file) specify the typesetting of the `pycod2` environment. Otherwise the specification must be a mapping for each `envir` that should be changed inside the admonitions:



```
publish import refs1.bib
publish import refs2.bib
```

During import, Publish may ask you for accepting the name of new institutions or journals. Publish already have a database of journals and institutions/departments, but when you add new, you also get a file `venues.list` (in the current working directory) which will be used for future imports in this directory. Make sure you store `publish.pub` and `venues.list` along with your DocOnce document files (e.g., add them to your version control system).

## 5.2 Requirements to input data

### Notice.

Note that Publish only accepts B<sub>I</sub>B<sub>T</sub>E<sub>X</sub> files where the keys (author, title, etc.) are in lower case and where the data are enclosed in curly braces. You may need to edit your B<sub>I</sub>B<sub>T</sub>E<sub>X</sub> files to meet this demand.

The utility `doconce fix_bibtex4publish file.bib` fixes several known issues with B<sub>I</sub>B<sub>T</sub>E<sub>X</sub> files such that Publish has a better chance of accepting the entries. Run this utility first, then run Publish, respond to any requirements that Publish spits out, remove `papers.pub` if it exists, and run the import statements again.

Although references are visible as numbers only in the output, it is recommended to have apply a nice, consistent typesetting of your keys. It is suggested to use the following scheme:

```
Langtangen_2003a      # single author
Langtangen_Pedersen_2002 # two authors
Langtangen_et_al_2002  # three or more authors
```

One can add a, b, c, and so forth if several keys feature the same authors and year.

## 5.3 Adding new references to the database

When you get some new B<sub>I</sub>B<sub>T</sub>E<sub>X</sub> references you simply put them in a file, say `refs3.pub` and run the `publish import refs3.pub` command to update the database. You may also consider editing the `papers.pub` file directly when adding new references.

## 5.4 Exporting the database

Export of everything in the database to B<sub>I</sub>B<sub>T</sub>E<sub>X</sub> is done by

```
publish export mybibtexfile.bib
```



You can easily export subsets of the database, e.g., only papers associated with a particular author (the Publish manual has details on how this is done). DocOnce will automatically export the database to  $\text{\LaTeX}$  if the output format is `latex` or `pdflatex`.

## 5.5 Referring to publications

We use the command

```
cite{key}
```

to refer to a publication with bibliographic key `key`. Here is an example: [6] discussed propagation of large destructive water waves, [5] gave an overview of numerical methods for solving the Navier-Stokes equations, while the use of Backward Kolmogorov equations for analyzing random vibrations was investigated in [4]. The book chapter [7] contains information on C++ software tools for programming multigrid methods. A real retro reference is [3] about a big FORTRAN package. Multiple references are also possible, e.g., see [6, 7].

A  $\text{\LaTeX}$ -style cite command with additional detailed reference is also possible,

```
cite[details]{key}
```

for example as in [5, Section 2] or [5, Equation (4.2)].

In  $\text{\LaTeX}$ , the `cite` command is directly translated to the corresponding  $\text{\LaTeX}$  version of the command with a backslash; in reST and Sphinx the citations becomes links, with the citation keys as names; in HTML the citations are numbered from 1, 2, and so forth according to their appearance, and the numbers appear as links; while in other formats the citations are simply the keys inside square brackets and the corresponding references are listed in the order they are cited.

## 5.6 Specifying the Publish database

The specification of the Publish database file in the DocOnce document is done one a line containing `BIBFILE: papers.pub` (you may give the database file another name and store it in another directory). The references will be inserted at the place where this command appears. Before the command you will often want to have a headline with “References”, “Bibliography”, or similar. Here is an example:

```
===== References =====
```

```
BIBFILE: papers.pub
```

In  $\text{\LaTeX}$  and  $\text{\PDF\LaTeX}$  the `papers.pub` file is exported to  $\text{\BibTeX}$  format and included in the document, while in all other formats, suitable text is produced from the database.

## 5.7 L<sup>A</sup>T<sub>E</sub>X Bibliography Style

The bibliography style is “plain” in L<sup>A</sup>T<sub>E</sub>X output. To change this, just edit the .p.tex file. For example,

```
doconce format latex mydoc
doconce replace 'bibliographystyle{plain}' 'bibliographystyle{abbrev}' mydoc.p.tex
```

## 6 Preprocessing and Postprocessing

DocOnce allows preprocessor commands for, e.g., including files, leaving out text, or inserting special text depending on the format. These commands are run prior to translation of the document. After translation, there are `doconce split_*` commands available for splitting HTML and Sphinx documents into smaller pieces (web pages) as a postprocess.

### 6.1 The Preprocess and Mako Preprocessors

Two preprocessors are supported: preprocess (<http://code.google.com/p/preprocess>) and mako (<http://www.makotemplates.org/>). The former allows include and if-else statements much like the well-known preprocessor in C and C++ (but it does not allow sophisticated macro substitutions). The latter preprocessor is a very powerful template system. With Mako you can automatically generate various type of text and steer the generation through Python code embedded in the DocOnce document. An arbitrary set of `name=value` command-line arguments (at the end of the command line) automatically define Mako variables that are substituted in the document.

DocOnce will detect if preprocess or Mako commands are used and run the relevant preprocessor prior to translating the DocOnce source to a specific format.

The preprocess and mako programs always have the variable `FORMAT` defined as the desired output format of DocOnce (`html`, `latex`, `plain`, `rst`, `sphinx`, `epypdoc`, `st`). It is then easy to test on the value of `FORMAT` and take different actions for different formats. Below is an example:

First some math:

```
!bt
\begin{align}
x &= 3 \\
\label{x:eq1} \\
y &= 5 \\
\label{y:eq1} \\
\end{align}
!et
Let us now reason about this.
```

# Sphinx cannot refer to labels in align environments

```

# #if FORMAT in ("latex", "pdflatex", "html")
From (\ref{x:eq})-(\ref{y:eq}) we get that
# #elif FORMAT == "sphinx"
From
!bt
\[ x = 3 \]
!et
and
!bt
\[ y = 5 \]
!et
it follows that
# #else
From the above equations it follows that
# #endif
$x+y$ is 8.

```

A variable `DEVICE` is also defined. It equals `screen` by default, but the command-line argument `--device=paper` can set `DEVICE` to `paper` (or another value). Testing on `DEVICE` inside the document makes it possible to test if the output is on paper media, a screen, or a particular device.

Other user-defined variables for the preprocessor can be set at the command line as explained in [Section 10](#).

More advanced use of mako can include Python code that may automate the writing of parts of the document.

#### On the type of a Mako variable from the command line.

You define Mako variables as in this example:

```
Terminal> doconce format html mydoc LANG=C NO=4 COMMENTS=False
```

The variable `LANG` gets the value `'C'` as a Python string inside the document. All values are treated as strings, except if the value is `True` or `False` or if it is an integer. Therefore, `NO` becomes the integer 4 and you can test like `% if NO > 4:`. The variable `COMMENTS` gets the boolean value `False` and `% if not COMMENT:` is a positive test. With Mako such variables set on the command-line you can easily leave out portions of the document or choose between different versions of the text in a very flexible and fine-tuned way.

#### Advanced setting of Mako variables.

Mako variables can also be run through `eval` before being sent to Mako. For example,

```
Terminal> doconce format latex mydoc \
          SOMEVAR="eval(['problem', 'data', 'results'])"
```

Now, SOMEVAR will be defined by

```
SOMEVAR = eval("[ 'problem', 'data', 'results' ]")
```

and result in the list ['problem', 'data', 'results']. In a DocOnce document, we can write

```
% for element in SOMEVAR:  
* "${element}.pdf": "http://some.net/pdf/${element}.pdf"  
% endfor
```

and produce the following  $\text{\LaTeX}$  code:

```
\begin{itemize}  
  \item  
    \href{{http://some.net/pdf/problem.pdf}}{\nolinkurl{problem.pdf}}  
  
  \item  
    \href{{http://some.net/pdf/data.pdf}}{\nolinkurl{data.pdf}}  
  
  \item  
    \href{{http://some.net/pdf/results.pdf}}{\nolinkurl{results.pdf}}  
\end{itemize}
```

Instead of giving the SOMEVAR list on the command line, we can hardcode it inside the document:

```
<%  
SOMEVAR = ['problem', 'data', 'results']  
%>
```

The flexibility enabled by Mako variables and statements is one of the major reasons to adopt DocOnce.

## 6.2 Splitting Documents into Smaller Pieces

Long documents are conveniently split into smaller DocOnce files. However, there must be a master document including all the pieces, otherwise references to sections and the index will not work properly. The master document is preferably a file just containing a set of preprocessor include statements of the form `#include "file.do.txt"`. The preprocessor will put together all the pieces so that DocOnce sees a long file with the complete text.

For web documents it is often desired to split long pages into shorter ones. This is done by the DocOnce command `!split` placed at the beginning of a line. The `!split` commands works with output in `html`, `rst`, `sphinx`, `latex`, and `pdflatex`. The `!split` command are normally placed before section headings. It is very actively used when writing slides with DocOnce. The `doonce` format command does not recognize `!split` instructions: one needs to run `doonce split_*` as a postprocess, where the `*` means `html`, `rst`, or `beamer`.

**HTML.** Splitting an HTML document is done by

```
Terminal> doconce format html mydoc
Terminal> doconce split_html mydoc
```

The `mydoc.html` document created by the first command is replaced by a new HTML file, representing the first part of the document, after the second command. The various files that constitute the parts of the document are listed after the `split_html` command. The files have names `mydoc.html`, `._mydoc000.html` (equal to `mydoc.html`), `._mydoc001.html`, `._mydoc002.html`, and so on. Recall that all the parts are needed if the HTML document is to be moved to another location (you can always check `.mydoc_html_file_collection` for a list of all the files that are needed to display this HTML document).

MathJax cannot refer to equations defined in other HTML files, but the `doconce split_html` fixes this problem. Note, however, that running `doconce split_html` leads to another equation numbering than in the original HTML document. In the latter, we use AMS equation numbering, which means that the standard  $\text{\LaTeX}$  conventions are followed, while in the splitted document only the subset of equations with labels are given numbers.

The HTML documents have by default very simple navigation buttons for the previous and next document. These buttons are customizable:

```
Terminal> doconce split_html mydoc.html --nav_buttons=X
```

where `X` can be text (pure text “Previous” and “Next”, no buttons), `gray1`, `gray2`, `bigblue`, `blue`, or `green` as shown here, respectively (from left to right):



However, if `--html_theme=` is set any theme starting with `bootstrap` or `bootswatch`, the navigation buttons are ignored, and Bootstrap-style buttons are used.

**reStructuredText and Sphinx.** Here is a typical split of a large Sphinx document `mydoc.rst` into smaller pieces:

```
Terminal> doconce sphinx_dir author="Some Author" \
           title="Short title" theme=fenics dirname=mydir mydoc
Terminal> doconce format sphinx mydoc
Terminal> doconce split_rst mydoc
Terminal> python automake_sphinx.py
```

The `doconce format sphinx mydoc` command is needed to produce `mydoc.rst`, which is the starting point for the `doconce split_rst` command. The various files that constitute the complete Sphinx document are `mydoc.rst`, `._mydoc000.rst`, `._mydoc001.rst`, `._mydoc002.rst`, and so on. The `automake_sphinx.py` script ensures that the Sphinx document is compiled correctly. If all links to local files are in a `_static` directory, the whole Sphinx document exists in a complete version in the compiled directory (usually `sphinx-rootdir/_build/html`) and can easily be moved around.

**Split and  $\LaTeX$ .**  $\LaTeX$  Beamer slides generated from DocOnce source also apply `!split` to indicate the start of individual slides. However, the split is performed by the `doconce slides_beamer` command and does not result in individual files like `split_rst` and `split_html` do.

## 7 Writing Slides

It is a potentially fast procedure to make slides from large amounts of DocOnce text, in particular for condensing running material for lectures or just providing the slide set as an overview or study guide. The slides can either be ordinary, separate slides - or just a document with much briefer text and emphasis on bullet lists, figures, mathematical formulas, admonitions, and little text.

Points to consider (just sketches...):

- Only some pygments style are suited for a particular reveal.js/deck.js theme
- Only some admon styles are appropriate
- Admon styles are erased in reveal
- Use `--keep_pygments_html_bg` to avoid big changes in background color for code
- Can use PowerPoint or Google Presenter to design a slide and then save as image (GP directly, PP via Save as Picture or Save As + choosing image type, and then all or present slide only), then import image in doconce.  $\LaTeX$  formulas in image are easiest created as PNGs using <http://www.codecogs.com/latex/eqneditor.php>.
- From doconce to PP or GP: use the `latexslides` script to convert to PDFs and odp format, convert odp to ppt interactively or with `unoconv`.
- Sections (7 =) are used to indicate sections in slides (gives a toc in beamer slides), while subsections (5 =) are used for slide headings. Remember `!split` before each slide (subsection). A comment `# Short title: title` after a section is interpreted in `latex` and `pdflatex` output as a short title for the section.

### 7.1 Overview

**Slide Types.** DocOnce can generate two types of slides: HTML5+CSS3 type of slides to be presented through a web browser, and classical  $\LaTeX$  Beamer slides. A [comprehensive demo](#) shows the range of possible layouts.

The following specific types of output is supported:

- $\text{\LaTeX}$ :
  - Beamer slides
- HTML5:
  - reveal.js
  - deck.js
  - CSSS
  - dzslides
- Markdown:
  - Remark

**Syntax.** Basically, DocOnce slides are ordinary DocOnce text with `!split` inserted before each slide. Nevertheless, contents of slide differ considerably from ordinary running text. Some guidelines on the elements within each slide are necessary to produce effective slide sets:

- Use a section heading (7 =) for dividing a presentation into parts. There can be text of figure(s) after the heading to illustrate the part.
- Use a subsection heading as slide heading (5 =).
- Limit the amount of running text (as always).
- Limit the amount of material so it fits within a slide (inspect slides visually to move or delete content - just an extra `!split` and a new heading is enough to make a new slide).
- Use the `pop` environment to pop up list items or blocks one by one.
- Use the `slidecell` environment (see below) to create a grid of slide cells (makes it easy to move figures and bullet lists or text around).
- Adjust the size of figures (`width` parameter for HTML, `frac` parameter for  $\text{\LaTeX}$  Beamer) so they become effective on the slide.

## 7.2 Slide Elements

**Title page.** Here is a typical title page:

```
TITLE: On Something Interesting
AUTHOR: O. Nordmann at Seg. Fault Ltd. & D. Bug Inc.
AUTHOR: John Doe Email: john.doe@mail.com at Progress Ltd.
AUTHOR: Chan Siu Ming at Progress Ltd & Moon University
DATE: today
```

```
FIGURE: [fig/logo, width=300 frac=0.3]
```

**Parts Page.** Parts of the presentation are divided by section headings. Here we also add some keywords in a bullet list on the left and a figure on the right. The `!bslidecell XY f` command starts the definition of a cell in a grid of cells in the slide. The `XY` part defines the coordinates of the cell, `00` is upper left, `01` is upper right. The `f` parameter specifies the fraction of the width occupied by this column of cells (can be left out, which results in columns of equal widths).

```
!split
===== Problem setting and methods =====
# Short title: Problem

!bslidecell 00 0.4

* Scope
* Focus
* Approach

!eslidecell

!bslidecell 01 0.6
FIGURE: [fig/method, width=600 frac=0.7]
!eslidecell
```

The `# Short title: ...` line can be used to define a short title for slide formats with navigation (where long titles are inappropriate), e.g., Beamer PDF slides.

**Standard bullet list page.** Bullet lists are typeset as usual in DocOnce:

```
!split
===== Methods =====

* Slow:
* Pick-and-choose
* Foxtrot
* Fast:
* Quickstep
* MMST
* PQR
```

Some prefer the bullet list or other contents of the slide to appear in a frame or Beamer block (potentially with shadows in some Beamer styles). This design is enabled by putting the contents inside the `block` environment:

```
!split
===== Methods =====

!bblock Methods are slow or fast:
* Slow:
* Pick-and-choose
* Foxtrot
* Fast:
* Quickstep
* MMST
* PQR
!eblock
```



The block title is optional.

One can easily pop up one item at a time using !bpop and !epop:

```
!split
===== Methods =====

!bblock Methods are slow or fast:
!bpop
* Slow:
  * Pick-and-choose
  * Foxtrot
* Fast:
  * Quickstep
  * MMST
  * PQR
!epop
!eblock
```

**Equations, movies, figures.** Standard DocOnce elements and formatting work in slides too:

```
!split
===== Key formulas =====

!bt
\[ a = b \]
!et

FIGURE: [fig/a_eq_b, width=500 frac=0.4]

MOVIE: [mov/animate_a_eq_b]
```

Here is another example on math and code:

```
!split
===== Example =====

!bblock Problem:
Solve  $ax+b=0$ .
!eblock

!bblock Solution:
 $x=-b/a$ 
!eblock

!bblock Implementation:
!bc pypro
import sys
a = float(sys.argv[1])
b = float(sys.argv[2])
x = -b/a
print x
!ec
!eblock
```

## 7.3 HTML5 Slides

Not yet written...

Just a very preliminary sketch of commands:

```
Terminal> doconce format html myslides \
--pygments_html_style=native --keep_pygments_html_bg
Terminal> doconce slides_html myslides reveal \
--html_slide_theme=darkgray
```

### Potential Problems.

- Some newer Firefox does not show rounded corners of the admonition boxes, e.g., notice and warning (tested on Ubuntu)
- DocOnce performs some adjustments of the spacing around equations. More edits (automate with `doconce subst`) might be needed.

## 7.4 L<sup>A</sup>T<sub>E</sub>X Beamer Slides

**Themes.** Four themes come with DocOnce:  $X_Y$ , where  $X$  is blue or red (the main color of the slides) and  $Y$  is `plain` for simple layout and `shadow` for shadowed boxes and more visual structure in the slides.

**Pop of list items and blocks.** The `!bpop` and `!epop` directives have the following effect in Beamer slides:

- If `!bpop` comes right before the beginning of a list, each list item is popped up, one at a time.
- Otherwise, the rest of the slide, or the text until the next `!bpop` pops up all at once.

**Compilation.** The cycle is

- `doconce format pdflatex mydoc` for producing `mydoc.p.tex`
- `doconce ptex2tex` or `ptex2tex` for translating `mydoc.p.tex` to `mydoc.tex`
- `doconce slides_beamer mydoc.tex` to produce a Beamer version `mydoc.tex`
- standard PDF $\text{\LaTeX}$  compilation of `mydoc.tex`

## 8 Misc

### 8.1 Missing Features

DocOnce does not aim to support sophisticated typesetting, simply because sophisticated typesetting usually depend quite strongly on the particular output format chosen. When a particular feature needed is not supported by DocOnce, it is recommended to hardcode that feature for a particular format and use the if-else construction of the preprocessor. For example, if a sophisticated table is desired in  $\LaTeX$  output, do something like

```
# #if FORMAT in ("latex", "pdflatex")
# insert native LaTeX code for fancy table
# #else
# insert a DocOnce-formatted "inline" table
# #endif
```

Similarly, if certain adjustments are needed, like pagebreaks in  $\LaTeX$ , hardcode that in the DocOnce format (and recall that this is really  $\LaTeX$  dependent - pagebreaks are not relevant HTML formats).

Instead of inserting special code in the DocOnce document, one can alternatively script editing of the output from DocOnce. That is, we develop a Python or Bash script that runs the translation of a DocOnce document to a ready document in another format. Inside this script, we may edit and fine-tune the output from DocOnce.

### 8.2 Emacs DocOnce Formatter

The file [.doconce-mode.el](#) in the DocOnce source distribution gives a "DocOnce Editing Mode" in Emacs.

Here is how to get the DocOnce Editing Mode in Emacs: Download [.doconce-mode.el](#) and save it in your home directory, then add these lines to `~/ .emacs`:

```
(load-file "~/ .doconce-mode.el")
```

Emacs will now recognize files with extension `.do.txt` and enter the DocOnce Editing Mode.

The major advantage with the DocOnce Editing Mode in Emacs is that many keyboard shortcuts are defined:

Emacs key	Action
Ctrl+c f	figure
Ctrl+c v	movie/video
Ctrl+c h1	heading level 1 (section/h1)
Ctrl+c h2	heading level 2 (subsection/h2)
Ctrl+c h3	heading level 2 (subsection/h3)
Ctrl+c hp	heading for paragraph
Ctrl+c me	math environment: !bt equation !et
Ctrl+c ma	math environment: !bt align !et
Ctrl+c ce	code environment: !bc code !ec
Ctrl+c cf	code from file: @@@CODE
Ctrl+c table2	table with 2 columns
Ctrl+c table3	table with 3 columns
Ctrl+c table4	table with 4 columns
Ctrl+c exer	exercise outline
Ctrl+c slide	slide outline
Ctrl+c help	print this table

Typing `Ctrl+c help` prints the above table in Emacs. Try out the different short-cuts and see how handy they are in learning DocOnce and saving much typing!

## 9 Mako Programming

The [Mako](#) templating engine is used as preprocessor for DocOnce documents, but the [Preprocess](#) is run prior to Mako and is recommended for including other files via `# #include "filename"`. Preprocess is also sufficient for if-else tests to steer which parts of the text that are to be compiled. For more demanding tasks, use Mako, which resembles a real programming language.

### Warning.

Unfortunately, the combination of Mako and  $\LaTeX$  mathematics may lead to problems because Mako applies syntax like `${var}` to extract variables or call functions, while  $\LaTeX$  mathematics sometimes applies the same syntax, e.g., `${\cal O}(\Delta x^2)` which looks like a Mako function call. This problem can give rise to strange error messages from Mako, usually that a variable is not defined. The solution is to avoid such Mako-style syntax when writing  $\LaTeX$  mathematics, e.g., by defining new commands if it is otherwise problematic.

### 9.1 The Basics of Mako

Just a preliminary sketch of some Mako code (next example is better!):

```

# Define variables
<%
mycounter = 1
mydict = {}
%>

# Assume MYVAR is given on the command line as MYVAR=mytext (e.g.)
% if MYVAR is not UNDEFINED:
The value of MYVAR is ${MYVAR}.
% endif

<%
## Manipulation of variables
mycounter += 1
%>

% if MYVAR in (2,4,6):
MYVAR is even integer in [2,6].
% elif MYVAR > 1000000:
MYVAR is big.
% else:
MYVAR=${MYVAR}, mycounter=${mycounter}.
% endif

# Function
<%
# Define Python function: FORMAT and DEVICE
# are always defined

def link(filename):
    url = "https://github.com/some/path/to/" + filename + '''
    if DEVICE == 'screen':
        # make link to url
        return '"filename":' + url
    elif DEVICE == 'paper':
        # write URL explicit on paper
        return 'URL:' + url
%>

<%doc>
This
is
a
block
comment in Mako.
<%doc/>

```

## 9.2 Debugging Python code in Mako

Although it is easy to put in Python code inside `<%` and `%>` directives, it may quickly become a nightmare to debug the Python code. If Mako reports a syntax error in the Python code, it is recommended to debug the Python code outside of Mako. That is, copy all Python code to a separate file and run it as standard Python code. This will give much more precise (and familiar) error messages.

A setup that is easy for developing and maintaining the Python code used in Mako goes as follows. Different pieces of Python code in Mako is placed in

separate files and included via the Preprocess preprocessor in the DocOnce document. For instance,

```
## Define Mako variables and basic functions
<%
# #include "variables.py"
# #include "basic_functions.py"
%>
```

Some DocOnce text ....

```
## Define more functions
<%
# #include "more_functions.py"
%>
```

Here, we have separated the Python code in Mako into three files: `variables.py`, `basic_functions.py`, and `more_functions.py`. With the `# #include` statements, Mako sees the `.py` files inserted as text inside the `<%` and `%>` directives (check the file `tmp_preprocess_mydoc.do.txt` for the result of running Preprocess and the complete DocOnce file that Mako sees).

To debug the `.py` files, collect all their text in one single `.py` file and run it. The recommended way is to use Preprocess to copy all the text in the `.py` files into a single file, named (say) `all_code.p.py`:

```
# ---- coding: utf-8 ---
# (Encoding info cannot be in mako code, but required here
# in Python code if we use non-ascii characters)

# #include "variables.py"
# #include "basic_functions.py"
# #include "more_functions.py"

# Test the code included above
print some_func(1, 'arg')
```

Note that after including the `.py` files one can insert calls to functions, print variables, etc., as desired to debug and experiment.

Run Preprocess on `all_code.p.py` to produce an ordinary Python file `all_code.py` and run that code to test and debug. A little shell script `all_code.sh` doing both these things is convenient:

```
#!/bin/sh
preprocess all_code.p.py > all_code.py
python all_code.py
```

Especially when the Python code in Mako grows and becomes non-trivial, this setup for having the code external to the DocOnce document is very effective.

#### Things to remember when programming Mako.

- Do not use continuation character (backslash) in Python code.

- When a Mako error refers to a line in the text, invoke the file that Mako sees: `tmp_preprocess__mydoc.do.txt` if the DocOnce file has name `mydoc.do.txt`.
- Use double `##` (Mako comment) to comment out Mako calls of the form `#{name...}`.

And to be repeated: keep the Python code in separate files!

One can use Mako to extend the DocOnce syntax. Three examples are given next.

### 9.3 Example: Executing Python and using SymPy Objects in $\text{\LaTeX}$

Here is an example where we want to illustrate how to calculate a double integral. All mathematics is to be done in SymPy, and results are supposed to be embedded in the document's text. We can include Python code to be executed, anywhere in the document, and a variable `var` in the Python code is reached by `#{var}`. Here, we run SymPy and use SymPy's  $\text{\LaTeX}$  converter to make  $\text{\LaTeX}$  code out of computed SymPy expressions:

```
# Execute Python code
<%
import sympy as sm
x, y, a = sm.symbols('x y a')
f = a*x + sm.sin(y)
step1 = sm.Integral(f, x, y)
step2 = sm.Integral(sm.Integral(f, x).doit(), y)
step3 = step2.doit()
%>

# Make use of results in the above block when writing LaTeX math
!bt
\begin{align*}
\#{sm.latex(step1)} \&= \#{sm.latex(step2)}\\
&= \#{sm.latex(step3)}
\end{align*}
!et
```

The result of the  $\text{\LaTeX}$  block above, after Mako is run, becomes

```
\begin{align*}
\iint a x + y^2 \sin\left(y\right) \, dx \, dy \&= \\
\int \frac{a y^2 x^2}{2} + x y^2 \sin\left(y\right) \, dy \& \\
&= \frac{a y^2 x^2}{2} + x \left(- y^2 \cos\left(y\right) \right. \\
&\quad \left. + 2 y \sin\left(y\right) + 2 \cos\left(y\right)\right) \\
\end{align*}
```

Debugging Python code in Mako is less convenient than debugging Python files directly, so one may prefer to just include the Python code that Mako is supposed to run by

```
<%
# #include "src/ex1.py"
%>
```

This is the recommended way to make use of SymPy to automate the mathematical derivations: first develop and test the SymPy code files, include the files in the document inside Mako's Python code environment.

**Remark.** Executing Python code inside the DocOnce document is closely related to *literate programming*. Tools supporting creating a document while running a Python programming cover [Pweave](#), [Python literate](#), [PyWebTool](#), [Antweb](#), [Literate Programming in Python](#), [Pyreport](#), and also IPython notebooks.

## 9.4 Example: Extending Tables to Handle Figures

DocOnce tables cannot contain figures, since figures must appear on a single line with the special syntax `FIGURE: [file, ...]`. What if you want a table of thumbnail figures with hyperlinks?

**Solution for  $\text{\LaTeX}$  and HTML.** We first restrict the attention to  $\text{\LaTeX}$  and HTML. In those cases we can create an ordinary table and insert a call to a Mako function in cells in the table to return the proper  $\text{\LaTeX}$  or HTML code for displaying a figure.

The Mako call syntax in a cell is decided to be ``${tfig('080')}``, which insert the figure `mov/wave_frames/frame_0080.png`. A 3x3 table of figures then look like


We do not want a heading, just a grid of figures, but a heading is required in DocOnce figures, so the solution is to provide empty column names in the heading. This solution gives acceptable results in HTML and  $\text{\LaTeX}$ .

The Mako function can be a plain Python function:

```
<%
def tfig(fileno):
    p = 'mov/wave_frames/frame_0' + fileno + '.png' # path
    if FORMAT in ("latex", "pdflatex"):
        text = r'\includegraphics[width=2cm]{%s}' % p
    elif FORMAT == "html":
        text = '<a href="%s"></a>' %
            (p, p)
    else:
```



```

text = '""%s': "%s"' % (fileno, p) # plain link
return text
%>

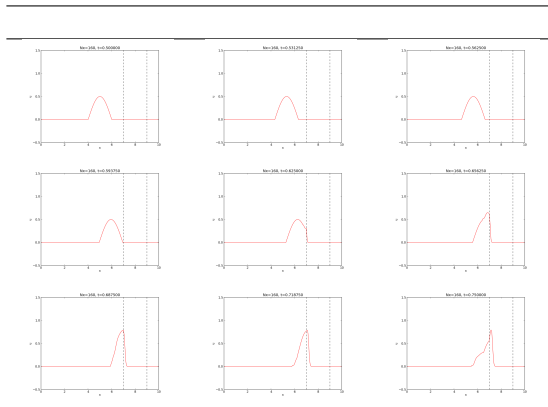
```

Note that for other formats than  $\text{\LaTeX}$  and HTML we just return a link to the figure.

#### Notice.

A corresponding solution for Sphinx will not work because inline figures in Sphinx has a syntax with pipe symbols ('|') that interfere with the column separator in tables in DocOnce. Returning the HTML code in case of Sphinx will just display that HTML code in the cells, not the rendered HTML code. A solution that includes Sphinx is provided later.

The resulting table is displayed below.



**Generating the Entire Table.** The specific structure of this table also suggest using Mako to generate the entire table:

```

<%
def generate_table(start, end, step, no_of_columns):
    # Heading
    text = ''
    horizontal_rule = '|----|\n'
    text += horizontal_rule
    text += '| '*no_of_columns + '\n'
    text += horizontal_rule
    fig_counter = 0
    for counter in range(start, end+1, step):
        fig_counter += 1
        text += '| ' + tfig('%03d' % counter) + ' '
        if fig_counter % no_of_columns == 0:
            text += '\n'
    text += horizontal_rule
    return text

```

```
<%>

${generate_table(80, 120, 5, 3)}
```

The result is a table like the one above, except that the horizontal rules and the heading are very short lines (but this is legal syntax - it just does not look appealing in the DocOnce source).

**Generating the Entire Table in a Native Format via Mako.** To allow Sphinx and other formats, it is best to generate the entire table. This can be done either by a Mako function or as a post process after DocOnce has created the output file. We show the Mako solution here.

#### Tip.

A pure Python function Mako is easiest to develop in a separate Python program file because Python has better error messages than Mako. Also, Python has debugging facilities that make the development of the code much more efficient than writing in Mako. When the Python function works, it can be inserted in the DocOnce file inside the Mako directives `<%` and `%>`.

The Mako function for generating the entire table in  $\text{\LaTeX}$ , HTML, and Sphinx format goes as follows.

```
<%
def generate_native_table(start, end, step, no_of_columns):
    text = ''
    # Heading
    if FORMAT in ("latex", "pdflatex"):
        text += r"""\begin{quote}\begin{tabular}{%s}

\hline
\\
\hline
"" % ('c'*no_of_columns)
    elif FORMAT in ("sphinx", "rst", "html"):
        text += '<p><table border="1">\n<tr>'
    fig_counter = 0
    latex_columns = []
    for counter in range(start, end+1, step):
        fig_counter += 1
        if FORMAT in ("latex", "pdflatex"):
            latex_columns.append(r'\includegraphics[width=2cm]{\
mov/wave_frames/frame_%04d.png}\n' %
counter)
        elif FORMAT in ("sphinx", "rst", "html"):
            text += '<td align="center"> '\
'<a href="mov/wave_frames/frame_%04d.png">'\
''\
'</a> </td>\n' % (counter, counter)
```

```

        if fig_counter % no_of_columns == 0: # new row
            if FORMAT in ("latex", "pdflatex"):
                text += ' ' + ' & '.join(latex_columns)
                if counter != end:
                    text += r'\ ' + '\n'
                latex_columns = []
            elif FORMAT in ("sphinx", "rst", "html"):
                text += '</tr>\n'
                if counter != end:
                    text += '<tr>\n' # begin new row

# Footer
if FORMAT in ("latex", "pdflatex"):
    text += r"""\hline
\end{tabular}\end{quote}
"""
elif FORMAT in ("sphinx", "rst", "html"):
    text += '</table>\n'
if FORMAT in ("sphinx", "rst"):
    # Wrap raw HTML code
    lines = text.splitlines()
    text = '\n.. raw:: html\n\n'
    for line in lines:
        text += ' ' + line + '\n'
    text += '\n'
return text
%>

## Example on call in DocOnce source
${generate_native_table(80, 120, 5, 3)}

```

One can easily add support for various other formats, such as pandoc, gwiki, mwiki, etc. The output in format the current format is as above.

**Generating the Entire Table in a Native Format as a Post Process.** Instead of using Mako as shown above, we can invent our own syntax line for the table with figures and apply a script to the DocOnce output file to replace the special line with proper native code. We use the same `generate_native_table` function as above, but this time in a Python script. In the DocOnce source we place a line

```
@@@FIGTABLE 80 120 5 3
```

which is meant to generate a table with figures where the numbers correspond to arguments in the `generative_native_table` function.

Suppose we have run

```
Terminal> doconce format sphinx mydoc
```

In the resulting `mydoc.rst` file we have the magic line `@@@FIGTABLE ...`. Such lines can now be processed in our Python script:

```

# read mydoc.rst into the string filestr
pattern = r'@@@FIGTABLE (.+)'

```

```
def replacement(m):
    # m is a MatchObject
    args = m.group(1)
    # Convert args to a tuple of words with right type
    args = [eval(arg) for arg in args.split()]
    text = generate_native_table(*args)

filestr = re.sub(pattern, filestr, replacement)
# write filestr back to manual.rst
```

This code makes use of a function for creating the replacement string for the `re.sub` command and demands a knowledge of regular expression syntax and the workings of `re.sub`. A more plain Python version goes like this:

```
# read mydoc.rst into the string filestr
lines = filestr.splitsplines()
for i in range(len(lines)):
    if lines[i].startswith('@@@FIGTABLE'):
        args = lines[i][10:].strip()
        # Convert args to a tuple of words with right type
        args = [eval(arg) for arg in args.split()]
        text = generate_native_table(*args)
        lines[i] = text
filestr = '\n'.join(lines) # make one string from all separate
                           lines
# write filestr back to manual.rst
```

#### Recommendation.

This latter way of inserting specialized native text after DocOnce has generated the output file is easier than using Mako and usually also safer.

#### Lesson Learned.

The above examples show different techniques for extending the DocOnce capabilities. The ideas are not restricted to DocOnce: using Mako as a preprocessing step or inserting “magic” lines that you can later substitute by a script is possible in all types of ASCII-based documents, e.g.,  $\text{\LaTeX}$ , Sphinx, and Markdown.

## 9.5 Example: Defining a Theorem Environment

DocOnce supports only basic formatting elements (headings, paragraphs, lists, etc.), while  $\text{\LaTeX}$  users are used to fancy environments for, e.g., theorems. A flexible strategy is to typeset theorems using paragraph headings, which will look satisfactorily in all formats, but add comment lines that can be replaced by

$\LaTeX$  environments via `doconce` replace. Theorems can be numbered using a variable in Mako. Here is an example on raw DocOnce code:

```
<%
theorem_counter = 4
%>

# begin theorem
label{theorem:fundamental1}
<%
theorem_counter += 1
theorem_fundamental1 = theorem_counter
%>

__Theorem ${theorem_counter}.__
Let $a=1$ and $b=2$. Then $c=3$.
# end theorem

# begin proof
__Proof.__
Since $c=a+b$, the result follows from straightforward addition.
$\Diamond$END$
# end proof

As we see, the proof of Theorem ${theorem_counter} is a modest
achievement.
```

The `.p.tex` output file now reads

```
% begin theorem
label{theorem:fundamental1}

\paragraph{Theorem 5.}
Let $a=1$ and $b=2$. Then $c=3$.
% end theorem

% begin proof
\paragraph{Proof.}
Since $c=a+b$, the result follows from straightforward addition.
$\Diamond$
% end proof

As we see, the proof of Theorem 5 is a modest
achievement.
```

Note that with Mako variables we can easily create our own counters, and this works in any format. In  $\LaTeX$  we can use both the generated numbers from Mako variables or we can use the labels.

The next step is to replace the `% begin ...` and `% end ...` lines with the proper  $\LaTeX$  expressions in the `.p.tex` file. Moreover, we need to remove the paragraphs with *Theorem*. The following Bash script does the job:

```
file=mydoc.p.tex
thpack='\\usepackage{theorem}\\n\\newtheorem{theorem}{Theorem}[section]'
doconce subst '% insert custom LaTeX commands\\.\\.\\.' $thpack
    $file
doconce subst '\\paragraph{Theorem \\d+\\.\\.}' '' $file
doconce replace '% begin theorem' '\\begin{theorem}' $file
doconce replace '% end theorem' '\\end{theorem}' $file
```

More heavy editing is better done in a Python script that reads the `mydoc.p.tex` file and performs string substitutions and regex substitutions as needed.

The resulting `mydoc.tex` file now becomes

```
\usepackage{theorem}
\newtheorem{theorem}{Theorem}[section]
```

...

```
\begin{theorem}
\label{theorem:fundamental1}
```

```
Let  $a=1$  and  $b=2$ . Then  $c=3$ .
\end{theorem}
```

```
% begin proof
\paragraph{Proof.}
Since  $c=a+b$ , the result follows from straightforward addition.
 $\Diamond$ 
% end proof
```

As we see, the proof of Theorem 5 is a modest achievement.

Even better, HTML output looks nice as well.

Note that DocOnce supports fancy environments for verbatim code via the `ptex2tex` program with all its flexibility for choosing environments. Also `doconce ptex2tex` has quite some flexibility for typesetting computer code.

## 9.6 Tools for Writing DocOnce Documents

- Emacs (with the modest DocOnce syntax highlighting), Vim, Gedit, etc.
- [TeXMaker](#) and [Kile](#) can in theory be adapted to handle DocOnce compilation and maybe even DocOnce constructs.

## 9.7 Debugging

Given a problem, extract a small portion of text surrounding the problematic area and debug that small piece of text. DocOnce does a series of transformations of the text. The effect of each of these transformation steps are dumped to a logfile, named `_doconce_debugging.log`, if the `to doconce` format after the filename is `debug`. The logfile is intended for the developers of DocOnce, but may still give some idea of what is wrong. The section “Basic Parsing Ideas” explains how the DocOnce text is transformed into a specific format, and you need to know these steps to make use of the logfile.

## 10 From DocOnce to Other Formats

Transformation of a DocOnce document `mydoc.do.txt` to various other formats is done with the script `doconce format`:

```
Terminal> doconce format formatname mydoc.do.txt
```

or just drop the extension:

```
Terminal> doconce format formatname mydoc
```

### 10.1 Generating a makefile

Producing HTML, Sphinx, and in particular  $\text{\LaTeX}$  documents from DocOnce sources requires a few commands. Often you want to produce several different formats. The relevant commands should then be placed in a script that acts as a “makefile”.

The `doconce makefile` can be used to automatically generate such a makefile, more precisely a Python script `make.py`, which carries out the commands explained below. If our DocOnce source is in `main_myproj.do.txt`, we run

```
doconce makefile main_myproj html pdflatex sphinx
```

to produce the necessary output for generating HTML, PDF $\text{\LaTeX}$ , and Sphinx. Usually, you need to edit `make.py` to really fit your needs. Some examples lines are inserted as comments to show various options that can be added to the basic commands. A handy feature of the generated `make.py` script is that it inserts checks for successful runs of the many `doconce` commands, and if something goes wrong, the script aborts.

### 10.2 Preprocessing

The `preprocess` and `mako` programs are used to preprocess the file. The DocOnce program detects whether `preprocess` and/or `mako` statements are present and runs the corresponding programs, first `preprocess` and then `mako`.

Variables to `preprocess` and/or `mako` can be added after the filename with the syntax `-DMYVAR`, `-DMYVAR=val` or `MYVAR=val`.

- The form `-DMYVAR` defines the variable `MYVAR` for `preprocess` (like the same syntax for the C preprocessor - `MYVAR` is defined, but has not specific value). When running `mako`, `-DMYVAR` means that `MYVAR` has the (Python) value `True`.
- The expressions `-DMYVAR=val` and `MYVAR=val` are equivalent. When running `preprocess`, `MYVAR` is defined and has the value `val` (`# ifdef MYVAR` and `# if MYVAR == "val"` are both true tests), while for `mako`, `MYVAR` exists as variable and has the value `val` (`% if MYVAR == "val"` is true).

Note that `MYVAR=False` defines `MYVAR` in `preprocess` and any test `# ifdef MYVAR` is always true, regardless of the value one has set `MYVAR` to, so a better test is `# if MYVAR == True`. In general, it is recommended to go with `preprocess` directives if the tests are very simple, as in `# ifdef MYVAR` or `# if FORMAT == "latex"`, otherwise use only `mako` syntax like `% if MYVAR` or `YOURVAR:` to incorporate `if` tests in the preprocessor phases.

Two examples on defining preprocessor variables are

```
Terminal> doconce format sphinx mydoc -Dextra_sections -DVAR1=5
Terminal> doconce format sphinx mydoc extra_sections=True VAR1=5
```

The variable `FORMAT` is always defined as the current format when running `preprocess` or `mako`. That is, in the above examples, `FORMAT` is defined as `sphinx`. Inside the DocOnce document one can then perform format specific actions through tests like `#if FORMAT == "sphinx"` (for `preprocess`) or `% if FORMAT == "sphinx":` (for `mako`).

The result of running `preprocess` on a DocOnce file `mydoc.do.txt` is available in a file `tmp_preprocess__mydoc.do.txt`. Similarly, the result of running `mako` is available in `tmp_mako__mydoc.do.txt`. By examining these files one can see exactly what the preprocessors have done.

### 10.3 Removal of inline comments

The command-line arguments `--no_preprocess` and `--no_mako` turn off running `preprocess` and `mako`, respectively.

Inline comments in the text are removed from the output by

```
Terminal> doconce format latex mydoc --skip_inline_comments
```

One can also remove all such comments from the original DocOnce file by running:

```
Terminal> doconce remove_inline_comments mydoc
```

This action is convenient when a DocOnce document reaches its final form and comments by different authors should be removed.

### 10.4 Notes

DocOnce does not have a tag for longer notes, because implementation of a "notes feature" is so easy using the `preprocess` or `mako` programs. Just introduce some variable, say `NOTES`, that you define through `-DNOTES` (or not) when running `doconce format ...`. Inside the document you place your notes between `# ifdef NOTES` and `# endif` `preprocess` tags. Alternatively you use `% if NOTES:` and `% endif` that `mako` will recognize. In the same way you may encapsulate unfinished material, extra material to be removed for readers but still nice to archive as part of the document for future revisions.



## 10.5 Demo of different formats

A simple scientific report is available in [a lot of different formats](#). How to create the different formats is explained in more depth in the coming sections.

## 10.6 HTML

**Basics.** Making an HTML version of a DocOnce file `mydoc.do.txt` is performed by

```
Terminal> doconce format html mydoc
```

The resulting file `mydoc.html` can be loaded into any web browser for viewing.

**Typesetting of Code.** If the Pygments package (including the `pygmentize` program) is installed, code blocks are typeset with aid of this package. The command-line argument `--no_pygments_html` turns off the use of Pygments and makes code blocks appear with plain (`pre`) HTML tags. The option `--pygments_html_linenos` turns on line numbers in Pygments-formatted code blocks. A specific Pygments style is set by `--pygments_html_style=style`, where `style` can be `default`, `emacs`, `perldoc`, and other valid names for Pygments styles.

**Handling of Movies.** MP4, WebM, and Ogg movies are typeset with the HTML5 `video` tag and the HTML code tries to load as many versions among MP4, WebM, and Ogg as exist (and the files are loaded in the mentioned order). If just the specified file is to be loaded, use the `--no_mp4_webm_ogg_alternatives` command-line option. Other movie formats, e.g., `.flv`, `.mpeg` and `.avi`, are embedded via the older `embed` tag.

**HTML Styles.** The HTML style can be defined either in the header of the HTML file, using a named built-in style; in an external CSS file; or in a template file.

An external CSS file `filename` used by setting the command-line argument `--css=filename`. There available built-in styles are specified as `--html_style=name`, where `name` can be

- `solarized`: the famous `solarized` style (yellowish),
- `blueish`: a simple style with blue headings (default),
- `blueish2`: a variant of *blueish*,
- `bloodish`: as *blueish*, but dark read as color,
- `bootstrap*` or `bootswatch*` in a lot of variants, see `doconce format --help` for a list of all styles.

There is a [comprehensive demonstration](#) of almost all available styles!

Using `--css=filename` where `filename` is a non-existing file makes DocOnce write the built-in style to that file. Otherwise the HTML links to the CSS stylesheet in `filename`. Several stylesheets can be specified: `--css=file1.css,file2.css,file3.css`

**HTML templates.** Templates are HTML files with "slots" `%(main)s` for the main body of text, `%(title)s` for the title, and `%(date)s` for the date. DocOnce comes with a few templates. The usage of templates is described in a "separate document": `""`. That document describes how your DocOnce-generated HTML file can have any specified layout.

The HTML file can be embedded in a template with your own tailored design, see a [tutorial](#) on this topic. The template file must contain valid HTML code and can have three "slots": `%(title)s` for a title, `%(date)s` for a date, and `%(main)s` for the main body of text. The latter is the DocOnce document translated to HTML. The title becomes the first heading in the DocOnce document, or the title (but a title is not recommended when using templates). The date is extracted from the `DATE:` line. With the template feature one can easily embed the text in the look and feel of a website. DocOnce comes with two templates in `bundled/html_styles`. Just copy the directory containing the template and the CSS and JavaScript files to your document directory, edit the template as needed (also check that paths to the `css` and `js` subdirectories are correct - according to how you store the template files), and run

```
Terminal> doconce format html mydoc --html_template=mytemplate.html
```

The template in `style_vagrant` also needs an extra option `--html_style=vagrant`.

**The HTML File Collection.** There are usually a range of files needed for an HTML document arising from a DocOnce source. The needed files are listed in `.basename_html_file_collection`, where `basename` is the filestem of the DocOnce file (i.e., the DocOnce source is in `basename.do.txt`).

**Filenames.** An HTML version of a DocOnce document is often made in different styles, calling for a need to rename the HTML output file. This is conveniently done by the `--html_output=basename` option, where `basename` is the filestem of the associated HTML files. The `.basename_html_file_collection` file lists all the needed files for the HTML document. Here is an example on making three versions of the HTML document: `mydoc_bloodish.html`, `mydoc_solarized`, and `mydoc_vagrant`.

```
Terminal> doconce format html mydoc --html_style=bloodish \  
--html_output=mydoc_bloodish  
Terminal> doconce split_html mydoc_bloodish.html  
Terminal> doconce format html mydoc --html_style=solarized \  
--html_output=mydoc_solarized \  
--pygments_html_style=perldoc --html_admon=apricot  
Terminal> doconce format html mydoc --html_style=vagrant \  
--html_output=mydoc_vagrant --pygments_html_style=default \  

```

```
--html_template=templates/my_adapted_vagrant_template.html
Terminal> doconce split_html mydoc_vagrant.html
```

## 10.7 Blog Posts

DocOnce can be used for writing blog posts provided the blog site accepts raw HTML code. Google's Blogger service ([blogger.com](http://blogger.com) or [blogname.blogspot.com](http://blogname.blogspot.com)) is particularly well suited since it also allows extensive  $\text{\LaTeX}$  mathematics via MathJax.

1. Write the text of the blog post as a DocOnce document without any title, author, and date.
2. Generate HTML as described above.
3. Copy the text and paste it into the text area in the blog post (just delete the HTML code that initially pops up in the text area). Make sure the input format is HTML.

See a [simple blog example](#) and a [scientific report](#) for demonstrations of blog posts at [blogspot.no](http://blogspot.no).

### Warning.

The comment field after the blog post does not recognize MathJax ( $\text{\LaTeX}$ ) mathematics or code with indentation. However, using a MathJax bookmarklet, e.g., at <http://checkmyworking.com/misc/mathjax-bookmarklet/>, one can get the mathematics properly rendered. The comment fields are not suitable for computer code, though, as HTML tags are not allowed.

### Notice.

Figure files must be uploaded to some web site and the local filenames name must be replaced by the relevant URL. This is usually done by using the `--figure_prefix=http://project.github.io/...` option to give some URL as prefix to all figure names (a similar `--movie_prefix=` option exists as well).

Changing figure names in a blog post can also be done “manually” by some editing code in the script that compiles the DocOnce document to HTML format:

```
cp mydoc.do.txt mydoc2.do.txt
url="https://raw.githubusercontent.com/someuser/someuser.github.com"
dir="master/project/dir1/dir2"
for figname in fig1 fig2 fig3; do
  doconce replace "$figname," "$site/$dir/$figname.png," \
```

```

mydoc2.do.txt
done
doconce format html mydoc2
# Paste mydoc2.html into a new blog post page

```

Blog posts at Google can also be published [automatically through email](#). A Python program can send the contents of the HTML file to the blog site's email address using the packages `smtplib` and `email`.

WordPress ([wordpress.com](http://wordpress.com)) allows raw HTML code in blogs, but has very limited  $\text{\LaTeX}$  support, basically only formulas. The `--wordpress` option to `doconce` modifies the HTML code such that all equations are typeset in a way that is acceptable to WordPress. Look at a [simple doconce example](#) and a [scientific report](#) to see blog posts with mathematics and code on WordPress.

Speaking of WordPress, the related project <http://pressbooks.com> can take raw HTML code (from DocOnce, for instance) and produce very nice-looking books. There is no support for mathematics in the text, though.

## 10.8 Pandoc and Markdown

Output in Pandoc's extended Markdown format results from

```
Terminal> doconce format pandoc mydoc
```

or (equivalent)

```
Terminal> doconce format markdown mydoc
```

The name of the output file is `mydoc.md`. From this format one can go to numerous other formats:

```
Terminal> pandoc -R -t mediawiki -o mydoc.mwk --toc mydoc.md
```

Pandoc supports `latex`, `html`, `odt` (OpenOffice), `docx` (Microsoft Word), `rtf`, `texinfo`, to mention some. The `-R` option makes Pandoc pass raw HTML or  $\text{\LaTeX}$  to the output format instead of ignoring it, while the `--toc` option generates a table of contents. See the [Pandoc documentation](#) for the many features of the `pandoc` program.

**Markdown to HTML conversion.** The HTML output from `pandoc` needs adjustments to provide full support for MathJax  $\text{\LaTeX}$  mathematics, and for this purpose one should use `doconce md2html`:

```
Terminal> doconce format pandoc mydoc
Terminal> doconce m2html mydoc
```

The result `mydoc.html` can be viewed in a browser.

**Strict Markdown.** The option `--strict_markdown_output` generates plain or strict Markdown without the many extension that Pandoc accepts in Markdown syntax.

**GitHub-flavored Markdown.** Adding the command-line option `github-md` turns on the [GitHub-flavored Markdown dialect](#), which is used for the issue tracker on [GitHub](#). A special feature is the support of task lists: unnumbered lists with `[x]` (task done) or `[ ]` (task not done). (Tables get typeset directly as HTML and the syntax for code highlighting is different from Pandoc extended Markdown.) Below is a typical response in a GitHub issue tracker where one first quotes the issue and then provides an answer:

```
!bquote
===== Problems with a function =====

There is a problem with the 'f(x)' function

!bc pycod
def f(x):
    return 1 + x
!ec
This function should be quadratic.
!equote

OK, this is fixed:

!bc pycod
def f(x, a=1, b=1, c=1):
    return a*x**2 + b*x + c
!ec

===== Updated task list =====

* [x] Offer an 'f(x)' function
* [ ] Extension to cubic functions
* [x] Allowing general coefficient in the quadratic function

=== Remaining functionality ===

|-----|
| function | purpose | state |
|-----|-----|-----|
| 'g(x)' | Compute the Gaussian function. | Formula ready. |
| 'h(x)' | Heaviside function. | Formula ready. |
| 'I(x)' | Indicator function. | Nothing done yet. |
|-----|
```

Say this text is stored in a file `mycomments.do.txt`. Running

```
Terminal> doconce format pandoc mycomments --github_md
```

produces the Markdown file `mycomments.md`, which can be pasted into the Write field of the GitHub issue tracker. Turning on Preview shows the typesetting of the quote, compute code, inline verbatim, headings, the task list, and the table.

**MultiMarkdown.** The option `--multimarkdown_output` generates the Multi-Markdown version of Markdown (as opposed to Pandoc-extended Markdown (default), strict Markdown, or GitHub-flavored Markdown).

**Strapdown rendering of Markdown text.** [Strapdown](#) is a tool that can render Markdown text nicely in a web browser by just inserting an HTML header and footer in the Markdown file and load the file into a browser. The option `--strapdown` outputs the relevant header and footer. The output file must be renamed such that it gets the extension `.html`:

```
Terminal> doconce format pandoc mydoc --strict_markdown_output \
--strapdown --bootstrap_bootstrap_theme=slate
Terminal> mv mydoc.md mydoc.html
```

The `--bootstrap_bootstrap_theme=theme` option is used to choose a [Bootstrap](#) theme whose names are found on the [Strapdown](#) page.

**Using Pandoc to go from  $\text{\LaTeX}$  to MS Word or HTML.** Pandoc is useful to go from  $\text{\LaTeX}$  mathematics to, e.g., HTML or MS Word. There are two ways (experiment to find the best one for your document): `doconce format pandoc` and then translating using `doconce md2latex` (which runs `pandoc`), or `doconce format latex`, and then going from  $\text{\LaTeX}$  to the desired format using `pandoc`. Here is an example on the latter strategy:

```
Terminal> doconce format latex mydoc
Terminal> doconce ptex2tex mydoc
Terminal> doconce replace '\Verb!' '\verb!' mydoc.tex
Terminal> pandoc -f latex -t docx -o mydoc.docx mydoc.tex
```

When we go through `pandoc`, only single equations, `align`, or `align*` environments are well understood for output to HTML.

Note that DocOnce applies the `Verb` macro from the `fancyvrb` package while `pandoc` only supports the standard `verb` construction for inline verbatim text. Moreover, quite some additional `doconce replace` and `doconce subst` edits might be needed on the `.mkd` or `.tex` files to successfully have mathematics that is well translated to MS Word. Also when going to `reStructuredText` using `Pandoc`, it can be advantageous to go via  $\text{\LaTeX}$ .

## 10.9 $\text{\LaTeX}$

### Notice.

XeLaTeX and PDF $\text{\LaTeX}$  are used very much in the same way as standard  $\text{\LaTeX}$ . The minor differences are described in separate sections of the documentation of the DocOnce to  $\text{\LaTeX}$  translation.

Making a  $\text{\LaTeX}$  file `mydoc.tex` from `mydoc.do.txt` is done in two steps: 1) compile the DocOnce source to the `ptex2tex` format, and 2) compile the `ptex2tex` format to standard  $\text{\LaTeX}$ . The `ptex2tex` format can be viewed as an extended  $\text{\LaTeX}$ . For DocOnce users, the `ptex2tex` format essentially means that the file consists of

1. `if-else` statements for the preprocess processor such that  $\text{\LaTeX}$  constructions can be activated or deactivated, and
2. all code environments can be typeset according to a `.ptex2tex.cfg` configuration file.

Point 2 is only of interest if you aim to use a special computer code formatting that requires you to use a configuration file and the `ptex2tex` program.

The reason for generating `ptex2tex` and not standard  $\text{\LaTeX}$  directly from DocOnce was that the `ptex2tex` format shows a range of possible  $\text{\LaTeX}$  constructions for controlling the layout. It can be instructive for  $\text{\LaTeX}$  users to look at this code before choosing specific parts for some desired layout. Experts may also want to edit this code (which should be automated by a script such that the edits can be repeated when the DocOnce source is modified, see Step 2b below). (Direct control of the  $\text{\LaTeX}$  layout in the `doonce` format program would not spit out alternative  $\text{\LaTeX}$  constructs as is now done through the `ptex2tex` step.)

Going from `ptex2tex` format to standard  $\text{\LaTeX}$  format is enabled by either the `ptex2tex` program or DocOnce's (simplified) version of it: `doonce ptex2tex`. Details are given below.

#### Information on typesetting of inline verbatim.

The `ptex2tex` and the `doonce ptex2tex` programs take inline verbatim code, typeset with backticks in DocOnce, and translate this to

```
\Verb!text!
```

Thereafter, if `text` does not contain illegal characters for the `\texttt` command, the latter is used instead since then  $\text{\LaTeX}$  can insert linebreaks in the inline verbatim text and hence avoid overfull hboxes.

**Step 1.** Filter the `doonce` text to the `ptex2tex` "pre- $\text{\LaTeX}$  form" `mydoc.p.tex`:

```
Terminal> doonce format latex mydoc
```

$\text{\LaTeX}$ -specific commands ("newcommands") in math formulas and similar can be placed in files `newcommands.tex`, `newcommands_keep.tex`, or `newcommands_replace.tex` (see Section 4.4). If these files are present, they are included in the  $\text{\LaTeX}$  document so that your commands are defined.

An option `--device=paper` makes some adjustments for documents aimed at being printed. For example, links to web resources are associated with a footnote listing the complete web address (URL). (Very long URLs in footnotes can be shortened using services such as <http://goo.gl/>, <http://tinyurl.com/>, and <https://bitly.com/>.) The default, `--device=screen`, creates a PDF file for reading on a screen where links are just clickable.

There are many additional options (run `doconce format --help` and look for options starting with `--latex` to get a more verbose description):

- `--latex_font=helvetica,palatino`
- `--latex_papersize=a4,a6`
- `--latex_bibstyle=plain`
- `--latex_title_layout=titlepage,std,beamer,doconce_heading`
- `--latex_style=std,Springer_lncse,Springer_llncs,Springer_T2,...`
- `--latex_list_of_exercises=loe,toc,none`
- `--latex_fancy_header`
- `--latex_section_headings=std,blue,strongblue,gray,gray-wide`
- `--latex_colored_table_rows=blue,gray,no`
- `--latex_todonotes`
- `--latex_double_spacing`
- `--latex_preamble=filename`
- `--latex_admon=mdfbox,graybox2,grayicon,yellowicon,paragraph,colors1,colors2`
- `--latex_admon_color=0.34,0.02,0.8`
- `--latex_admon_envir_map=2`
- `--latex_exercise_numbering=absolute,chapter`
- `--latex_movie=media9,href,multimedia,movie15`
- `--latex_movie_controls=on`
- `--latex_external_movie_viewer` (for `movie15` package)
- `--xelatex`



**Step 2.** Run `ptex2tex` (if you have installed the Python `ptex2tex` package) to make a standard  $\LaTeX$  file,

```
Terminal> ptex2tex mydoc
```

In case you do not have `ptex2tex`, you may run the (simplified) version that comes with DocOnce:

```
Terminal> doconce ptex2tex mydoc
```

The `ptex2tex` command can set two preprocessor variables:

- `PREAMBLE` to turn the  $\LaTeX$  preamble on or off (i.e., complete document or document to be included elsewhere - and note that the preamble is only included if the document has a title, author, and date)
- `MINTED` for inclusion of the `minted` package for typesetting of code with the `Pygments` tool (which requires `latex` or `pdflatex` to be run with the `-shell-escape` option); not used for `doconce ptex2tex` only in the `ptex2tex` program

If you are not satisfied with the generated DocOnce preamble, you can provide your own preamble by adding the command-line option `--latex_preamble=myfile`. In case `myfile` contains a documentclass definition, DocOnce assumes that the file contains the *complete* preamble you want (not that all the packages listed in the default preamble are required and must be present in `myfile`). Otherwise, `myfile` is assumed to contain *additional*  $\LaTeX$  code to be added to the DocOnce default preamble.

The `ptex2tex` tool makes it possible to easily switch between many different fancy formatings of computer code in  $\LaTeX$  documents. After any `!bc` command in the DocOnce source you can insert verbatim block styles as defined in your `.ptex2tex.cfg` file, e.g., `!bc sys` for a terminal session, where `sys` is set to a certain environment in `.ptex2tex.cfg` (e.g., `CodeTerminal`). There are about 40 styles to choose from, and you can easily add new ones.

The `doconce ptex2tex` allows specifications of code environments as well. Here is an example:

```
Terminal> doconce ptex2tex mydoc \  
"sys=\begin{quote}\begin{verbatim}@end{verbatim}\end{quote}" \  
fpro=minted fcod=minted shcod=Verbatim envir=ans:nt
```

Note that `@` must be used to separate the begin and end  $\LaTeX$  commands, unless only the environment name is given (such as `minted` above, which implies `\begin{minted}{fortran}` and `\end{minted}` as begin and end for blocks inside `!bc fpro` and `!ec`). Specifying `envir=ans:nt` means that all other environments are typeset with the `anslistings.sty` package, e.g., `!bc cppcod` will then result in `\begin{c++}`. A predefined shortcut as in `shcod=Verbatim-0.85` results in denser vertical spacing (`baselinestretch 0.85` in  $\LaTeX$  terminology), and `shcod=Verbatim-indent` implies indentation of the verbatim text. Alternatively, one can provide all desired parameters `\begin{Verbatim}` instruction using the syntax illustrated for the `sys` environments above.

If no environments like `sys`, `fpro`, or the common `envir` are defined on the command line, the plain `\begin{Verbatim}` and `\end{Verbatim}` instructions are used.

**Step 2b (optional).** Edit the `mydoc.tex` file to your needs. For example, you may want to substitute `section` by `section*` to avoid numbering of sections, you may want to insert linebreaks (and perhaps space) in the title, etc. This can be automatically edited with the aid of the `doconce replace` and `doconce subst` commands. The former works with substituting text directly, while the latter performs substitutions using regular expressions. You will use `doconce replace` to edit `section{` to `section*{`:

```
Terminal> doconce replace 'section{' 'section*{' mydoc.tex
```

For fixing the line break of a title, you may pick a word in the title, say "Using", and insert a break after than word. With `doconce subst` this is easy employing regular expressions with a group before "Using" and a group after:

```
Terminal> doconce subst 'title\{(.+)Using (.+)\}' \
'title{\g<1> \\\ [1.5mm] Using \g<2>}' mydoc.tex
```

A lot of tailored fixes to the  $\LaTeX$  document can be done by an appropriate set of text replacements and regular expression substitutions. You are anyway encouraged to make a script for generating PDF from the  $\LaTeX$  file so the `doconce subst` or `doconce replace` commands can be put inside the script.

**Step 3.** Compile `mydoc.tex` and create the PDF file:

```
Terminal> latex mydoc
Terminal> latex mydoc
Terminal> makeindex mydoc # if index
Terminal> bibitem mydoc   # if bibliography
Terminal> latex mydoc
Terminal> dvipdf mydoc
```

See the next two sections for compilation with XeLaTeX or PDF $\LaTeX$ .

If one wishes to use the minted  $\LaTeX$  package for typesetting code blocks (Minted\_Python, Minted\_Cpp, etc., in `ptex2tex` specified through the `*pro` and `*cod` variables in `.ptex2tex.cfg` or `$HOME/.ptex2tex.cfg`), the minted  $\LaTeX$  package is needed. This package is automatically included by `doconce ptex2tex` if the minted style is used, while you have to include the `-DMINTED` preprocessor option when running the `ptex2tex` program:

```
Terminal> ptex2tex -DMINTED mydoc
```

If the minted style is used, `latex` (or `pdflatex` or `xelatex`) *must* be run with the `-shell-escape` option:

```
Terminal> latex -shell-escape mydoc
Terminal> latex -shell-escape mydoc
Terminal> makeindex mydoc # if index
Terminal> bibitem mydoc   # if bibliography
Terminal> latex -shell-escape mydoc
Terminal> dvipdf mydoc
```

## 10.10 PDFLaTeX

Running `pdflatex` instead of `latex` follows almost the same steps, but the start is

```
Terminal> doconce format latex mydoc
```

Then `ptex2tex` is run as explained above, and finally

```
Terminal> pdflatex -shell-escape mydoc
Terminal> makeindex mydoc      # if index
Terminal> bibitem mydoc        # if bibliography
Terminal> pdflatex -shell-escape mydoc
```

## 10.11 XeLaTeX

XeLaTeX is an alternative to PDF $\text{\LaTeX}$  and is run in almost the same way, except for the `--xelatex` flag to `doconce format`:

```
Terminal> doconce format pdflatex mydoc --xelatex
Terminal> doconce ptex2tex mydoc
Terminal> xelatex mydoc
```

## 10.12 From PDF to e-book formats

PDF (as generated from  $\text{\LaTeX}$  above) can be read on most devices today. However, for Kindle and other devices specialized for e-books you need to convert to their format. The [Calibre](#) program can produce epub, mobi, and other e-book formats from PDF, see a [description](#).

## 10.13 Microsoft Word or LibreOffice

Transforming DocOnce files to Word format is best done with the aid of `pandoc`. A standard way is to first generate the Markdown format (`doconce format pandoc`) and then use `pandoc` to generate a `.docx` file:

```
Terminal> doconce format pandoc mydoc
Terminal> pandoc -t docx -o mydoc.docx mydoc.md
```

The transformation works well for simple text files, but  $\text{\LaTeX}$  mathematics does not work.

## 10.14 Plain ASCII Text

We can go from DocOnce "back to" plain untagged text suitable for viewing in terminal windows, inclusion in email text, or for insertion in computer source code:

```
Terminal> doconce format plain mydoc.do.txt # results in mydoc.txt
```

## 10.15 reStructuredText

Going from DocOnce to reStructuredText gives a lot of possibilities to go to other formats. First we filter the DocOnce text to a reStructuredText file `mydoc.rst`:

```
Terminal> doconce format rst mydoc.do.txt
```

We may now produce various other formats:

```
Terminal> rst2html.py mydoc.rst > mydoc.html # html
Terminal> rst2latex.py mydoc.rst > mydoc.tex # latex
Terminal> rst2xml.py mydoc.rst > mydoc.xml # XML
Terminal> rst2odt.py mydoc.rst > mydoc.odt # OpenOffice
```

The OpenOffice file `mydoc.odt` can be loaded into OpenOffice and saved in, among other things, the RTF format or the Microsoft Word format. However, it is more convenient to use the program `unoconv` to convert between the many formats OpenOffice supports *on the command line*. Run

```
Terminal> unoconv --show
```

to see all the formats that are supported. For example, the following commands take `mydoc.odt` to Microsoft Office Open XML format, classic MS Word format, and PDF:

```
Terminal> unoconv -f ooxml mydoc.odt
Terminal> unoconv -f doc mydoc.odt
Terminal> unoconv -f pdf mydoc.odt
```

**Remark about Mathematical Typesetting.** At the time of this writing, there is no easy way to go from DocOnce and  $\text{\LaTeX}$  mathematics to reST and further to OpenOffice and the "MS Word world". Mathematics is only fully supported by `latex` as output and to a wide extent also supported by the `sphinx` output format. Some links for going from  $\text{\LaTeX}$  to Word are listed below.

- <http://ubuntuforums.org/showthread.php?t=1033441>
- <http://tug.org/utilities/texconv/textopc.html>
- <http://nileshbansal.blogspot.com/2007/12/latex-to-openofficeworld.html>

## 10.16 Sphinx

Sphinx documents demand quite some steps in their creation. We have automated most of the steps through the `doconce sphinx_dir` command:

```
Terminal> doconce sphinx_dir author="authors' names" \
          title="some title" version=1.0 dirname=sphinxdir \
          theme=mytheme mydoc
```

The keywords `author`, `title`, and `version` are used in the headings of the Sphinx document. By default, `version` is 1.0 and the script will try to deduce authors and title from the doconce file `mydoc.do.txt`. The default value of `dirname` is `sphinx-rootdir`. The `theme` keyword is used to set the theme for design of HTML output from Sphinx (the default theme is `'default'`).

One often just runs the simple command

```
Terminal> doconce sphinx_dir mydoc
```

which creates the Sphinx directory `sphinx-rootdir` with relevant files.

The `doconce sphinx_dir` command generates a script `automake_sphinx.py` for compiling the Sphinx document into an HTML document. Run

```
Terminal> python automake_sphinx.py
```

As the output also tells, you can see the Sphinx HTML version of the document by running

```
Terminal> google-chrome sphinx-rootdir/_build/html/index.html
```

or loading the `index.html` file manually into your favorite web browser.

If you cycle through editing the DocOnce file and watching the HTML output, you should observe that `automake_sphinx.py` does not recompile the DocOnce file if the Sphinx `.rst` version already exists. In each edit-and-watch cycle do

```
Terminal> rm mydoc.rst; python automake_sphinx.py
```

#### Tip.

If you are new to Sphinx and end up producing quite some Sphinx documents, you are encouraged to read the Sphinx documentation and study the `automake_sphinx.py` file. Maybe you want to do things differently.

The following paragraphs describes the many possibilities for steering the Sphinx output.

**Links.** The `automake_sphinx.py` script copies directories named `fig*` over to the Sphinx directory so that figures are accessible in the Sphinx compilation. It also examines `MOVIE:` and `FIGURE:` commands in the DocOnce file to find other image files and copies these too. I strongly recommend to put files to which there are local links (not `http:` or `file:` URLs) in a directory named `_static`. The `automake_sphinx.py` copies `_static*` to the Sphinx directory, which guarantees that the links to the local files will work in the Sphinx document.

There is a utility `doconce sphinxfix_localURLs` for checking links to local files and moving the files to `_static` and changing the links accordingly. For

example, a link to `dir1/dir2/myfile.txt` is changed to `_static/myfile.txt` and `myfile.txt` is copied to `_static`. However, I recommend instead that you manually copy files to `_static` when you want to link to them, or let your script which compiles the DocOnce document do it automatically.

**Themes.** DocOnce comes with a rich collection of HTML themes for Sphinx documents, much larger than what is found in the standard Sphinx distribution. Additional themes include `agni`, `basicstrap`, `bootstrap`, `cloud`, `fenics`, `fenics_minimal`, `flask`, `haiku`, `impressjs`, `jal`, `pylons`, `redcloud`, `scipy_lectures`, `slim-agogo`, and `vlinux-theme`.

All the themes are packed out in the Sphinx directory, and the `doconce sphinx_dir` insert lots of extra code in the `conf.py` file to enable easy specification and customization of themes. For example, modules are loaded for the additional themes that come with DocOnce, code is inserted to allow customization of the look and feel of themes, etc. The `conf.py` file is a good starting point for fine-tuning your favorite team, and your own `conf.py` file can later be supplied and used when running `doconce sphinx_dir`: simply add the command-line option `conf.py=conf.py`.

A script `make-themes.sh` can make HTML documents with one or more themes. For example, to realize the themes `fenics`, `pyramid`, and `pylon` one writes

```
Terminal> ./make-themes.sh fenics pyramid pylon
```

The resulting directories with HTML documents are `_build/html_fenics` and `_build/html_pyramid`, respectively. Without arguments, `make-themes.sh` makes all available themes (!). With `make-themes.sh` it is easy to check out various themes to find the one that is most attractive for your document.

You may supply your own theme and avoid copying all the themes that come with DocOnce into the Sphinx directory. Just specify `theme_dir=path` on the command line, where `path` is the relative path to the directory containing the Sphinx theme. You must also specify a configure file by `conf.py=path`, where `path` is the relative path to your `conf.py` file.

**Example.** Say you like the `scipy_lectures` theme, but you want a table of contents to appear *to the right*, much in the same style as in the default theme (where the table of contents is to the left). You can then run `doconce sphinx_dir`, invoke a text editor with the `conf.py` file, find the line `html_theme == 'scipy_lectures'`, edit the following `nosidebar` to `false` and `rightsidebar` to `true`. Alternatively, you may write a little script using `doconce replace` to replace a portion of text in `conf.py` by a new one:

```
doconce replace "elif html_theme == 'scipy_lectures':
    html_theme_options = {
        'nosidebar': 'true',
        'rightsidebar': 'false',
        'sidebarbgcolor': '#f2f2f2',
        'sidebartextcolor': '#20435c',
```

```

        'sidebarlinkcolor': '#20435c',
        'footerbgcolor': '#000000',
        'relbarbgcolor': '#000000',
    }" "elif html_theme == 'scipy_lectures':
    html_theme_options = {
        'nosidebar': 'false',
        'rightsidebar': 'true',
        'sidebarbgcolor': '#f2f2f2',
        'sidebartextcolor': '#20435c',
        'sidebarlinkcolor': '#20435c',
        'footerbgcolor': '#000000',
        'relbarbgcolor': '#000000',
    }" conf.py

```

Obviously, we could also have changed colors in the edit above. The final alternative is to save the edited `conf.py` file somewhere and reuse it the next time `doconce sphinx_dir` is run

```
doconce sphinx_dir theme=scipy_lectures \
        conf.py=../some/path/conf.py mydoc
```

**The manual Sphinx procedure.** If it is not desirable to use the autogenerated scripts explained above, here is the complete manual procedure of generating a Sphinx document from a file `mydoc.do.txt`.

**Step 1.** Translate DocOnce into the Sphinx format:

```
Terminal> doconce format sphinx mydoc
```

**Step 2.** Create a Sphinx root directory either manually or by using the interactive `sphinx-quickstart` program. Here is a scripted version of the steps with the latter:

```
mkdir sphinx-rootdir
sphinx-quickstart <<EOF
sphinx-rootdir
n
_
Name of My Sphinx Document
Author
version
version
.rst
index
n
y
n
n
n
n
y
n
n
y
y
```

```
y
EOF
```

The autogenerated `conf.py` file may need some edits if you want to specific layout (Sphinx themes) of HTML pages. The `doconce sphinx_dir` generator makes an extended `conv.py` file where, among other things, several useful Sphinx extensions are included.

**Step 3.** Copy the `mydoc.rst` file to the Sphinx root directory:

```
Terminal> cp mydoc.rst sphinx-rootdir
```

If you have figures in your document, the relative paths to those will be invalid when you work with `mydoc.rst` in the `sphinx-rootdir` directory. Either edit `mydoc.rst` so that figure file paths are correct, or simply copy your figure directories to `sphinx-rootdir`. Links to local files in `mydoc.rst` must be modified to links to files in the `_static` directory, see comment above.

**Step 4.** Edit the generated `index.rst` file so that `mydoc.rst` is included, i.e., add `mydoc` to the `toctree` section so that it becomes

```
.. toctree::
   :maxdepth: 2

   mydoc
```

(The spaces before `mydoc` are important!)

**Step 5.** Generate, for instance, an HTML version of the Sphinx source:

```
make clean    # remove old versions
make html
```

Sphinx can generate a range of different formats: standalone HTML, HTML in separate directories with `index.html` files, a large single HTML file, JSON files, various help files (the `qthelp`, `HTML`, and `Devhelp` projects), `epub`,  $\text{\LaTeX}$ , PDF (via  $\text{\LaTeX}$ ), pure text, man pages, and Texinfo files.

**Step 6.** View the result:

```
Terminal> firefox _build/html/index.html
```

Note that verbatim code blocks can be typeset in a variety of ways depending the argument that follows `!bc`: `cod` gives Python (`code-block:: python` in Sphinx syntax) and `cppcod` gives C++, but all such arguments can be customized both for Sphinx and  $\text{\LaTeX}$  output.



## 10.17 Wiki Formats

There are many different wiki formats, but DocOnce only supports three: [Google-code wiki](#), [MediaWiki](#), and [Creole Wiki](#). These formats are called `gwiki`, `mwiki`, and `cwiki`, respectively. Transformation from DocOnce to these formats is done by

```
Terminal> doconce format gwiki mydoc.do.txt
Terminal> doconce format mwiki mydoc.do.txt
Terminal> doconce format cwiki mydoc.do.txt
```

The produced MediaWiki can be tested in the [sandbox of wikibooks.org](#). The format works well with Wikipedia, Wikibooks, and [ShoutWiki](#), but not always well elsewhere (see [this example](#)).

Large MediaWiki documents can be made with the [Book creator](#). From the MediaWiki format one can go to other formats with aid of [mwlib](#). This means that one can easily use DocOnce to write [Wikibooks](#) and publish these in PDF and MediaWiki format, while at the same time, the book can also be published as a standard  $\text{\LaTeX}$  book, a Sphinx web document, or a collection of HTML files.

The Googlecode wiki document, `mydoc.gwiki`, is most conveniently stored in a directory which is a clone of the wiki part of the Googlecode project. This is far easier than copying and pasting the entire text into the wiki editor in a web browser.

When the DocOnce file contains figures, each figure filename must in the `.gwiki` file be replaced by a URL where the figure is available. There are instructions in the file for doing this. Usually, one performs this substitution automatically (see next section).

## 10.18 Google Docs

Google Docs are normally made online in the interactive editor. However, you may upload a DocOnce document to Google Docs. This requires transforming the DocOnce document to one of the accepted formats for Google Docs:

- OpenOffice: `doconce format rst` and then run `rst2odt` (or `rst2odt.py`). Upload the `.odt` file, click *Open...* in Google Drive and choose *Google Docs* as viewer.
- MS Word: `doconce format pandoc` and then run `pandoc` to produce a `.docx` file that can be uploaded to Google Drive and opened in Google Docs.
- RTF: `doconce format pandoc` and then run `pandoc` to produce a `.rtf` file that can be uploaded to Google Drive and opened. Another possibility is to run `doconce format latex` and then [latex2rtf](#) (the support of mathematics has gotten worse).

- Plain text: `doconce format plain`. Upload the `.txt` file to Google Drive and open in Google Docs.
- HTML: `doconce format html`. Upload the `.html` file and open in Google Docs. Complicated HTML files can be misinterpreted by Google Docs.

This is not yet much tested. It remains to see how code becomes in Google Docs. Support for mathematics is probably impossible until Google Docs can import  $\text{\LaTeX}$  files, but  $\text{\LaTeX}$  mathematics can be embedded in Google Docs and the [googledoc2latex](#) script can convert a Google document to  $\text{\LaTeX}$ .

## 10.19 Tweaking the DocOnce Output

Occasionally, one would like to tweak the output in a certain format from DocOnce. One example is figure filenames when transforming DocOnce to reStructuredText. Since DocOnce does not know if the `.rst` file is going to be filtered to  $\text{\LaTeX}$  or HTML, it cannot know if `.eps` or `.png` is the most appropriate image filename. The solution is to use a text substitution command or code with, e.g., `sed`, `perl`, `python`, or `scitools subst`, to automatically edit the output file from DocOnce. It is then wise to run DocOnce and the editing commands from a script to automate all steps in going from DocOnce to the final format(s). The `make.sh` files in `docs/manual` and `docs/tutorial` constitute comprehensive examples on how such scripts can be made.

## 11 Options for the doconce commands

### 11.1 doconce format command-line options

The transformation of a DocOnce source to various format is done with the `doconce format` command, which has *a lot* of command-line options. These are printed out by `doconce format --help`. The output is listed here for convenience.

```
Terminal> doconce format --help

doconce format X doconcefile

where X can be any of the formats
html, latex, pdflatex, rst, sphinx, plain, gwiki, mwiki, cwiki,
pandoc, epytext.

--help
Print all options to the doconce program.

--debug
Write a debugging file _doconce_debugging.log with lots
of intermediate results
```

`--no_abort`

Do not abort the execution if syntax errors are found.

`--verbose=...`

Write progress of intermediate steps if they take longer than X seconds.

0: X=15

1: X=5

2: 0.5

`--syntax_check=...`

Values: on/off. Turns on/off fix of illegal constructions and the syntax check (may be time consuming for large books).

`--skip_inline_comments`

Remove all inline comments of the form [ID: comment].

`--encoding=...`

Specify encoding (e.g., latin1 or utf-8).

`--no_mako`

Do not run the Mako preprocessor program.

`--no_preprocess`

Do not run the Preprocess preprocessor program.

`--mako_strict_undefined`

Make Mako report on undefined variables.

`--no_header_footer`

Do not include header and footer in (LaTeX and HTML) documents.

`--no_emoji`

Remove all emojis.

`--runestone`

Make a RunestoneInteractive version of a Sphinx document.

`--max_bc_linelength=...`

Strip lines in !bc environments that are longer than specified

(to prevent too long lines). Default: None (no length restriction).

`--keep_pygments_html_bg`

Do not allow change of background in code blocks in HTML.

`--minted_latex_style=...`

Specify the minted style to be used for typesetting code in LaTeX.

`--pygments_html_style=...`

Specify the minted/pygments style to be used for typesetting code in HTML.

Default: default (other values: monokai, manni, rrt, perldoc, borland, colorful, murphy, trac, tango, fruity, autumn, emacs, vim, pastie, friendly, native).

none, no, off: turn off pygments to typeset computer code in HTML, use plain `<pre>` tags.

highlight.js: use highlight.js syntax highlighting, not pygments.

`--pygments_html_linenos`

Turn on line numbers in pygmentized computer code in HTML.

(In LaTeX line numbers can be added via `doconce subst` or `doconce replace` such that the verbatim environments get the `linenos=true` parameter.)

`--html_output=...`

Alternative basename of files associated with the HTML format.

`--html_style=...`

Name of theme for HTML style:

plain, blueish, blueish2, bloodish,  
solarized, solarized2\_light, solarized2\_dark,  
bootstrap, bootswatch,  
bootstrap\_X, X=bloodish, blue, bluegray, brown, cbc, FlatUI, red,  
bootswatch\_X, X=cerulean, cosmo, flatly, journal, lumen, readable,  
simplex, spacelab, united, yeti  
(dark:) amelia, cyborg, darkly, slate, spruce,  
superhero (demos at bootswatch.com)

`--html_code_style=...`

on, off, inherit, transparent: enable normal inline verbatim font where foreground and background color is inherited from the surroundings (e.g., to avoid the red Bootstrap color).  
Default: on.

`--html_pre_style=...`

on, off, inherit, transparent: let code blocks inside `<pre>` tags have foreground and background color inherited from the surroundings.  
Default: on.

`--html_template=...`

Specify an HTML template with header/footer in which the doconce document is embedded. (Often preferred to run with `--no_title`)

`--no_title`

Comment out TITLE, AUTHOR, DATE.  
Often used with HTML templates.

`--html_toc_depth=...`

No of levels in the table of contents in HTML output for Bootstrap-based styles. Default: 2.

`--html_toc_indent=...`

No of spaces for indentation of subsections in the table of contents in HTML output. Default: 3 (0 gives toc as nested list in Bootstrap-based styles).

`--html_body_font=...`

Specify HTML font for text body. `=?` lists available fonts.

`--html_heading_font=...`

Specify HTML font for headings. `=?` lists available fonts.

`--html_video_autoplay=...`

True for autoplay when HTML is loaded, otherwise False (default).

`--html_admon=...`

Type of admonition and color:  
colors, gray, yellow, apricot, lyx, paragraph.  
For `html_style=bootstrap*,bootswatch*`,  
the two legal values are `bootstrap_panel`, `bootstrap_alert`.

`--html_admon_shadow`

Add a shadow effect to HTML admon boxes (gray, yellow, apricot).

`--html_admon_bg_color=...`

Background color of admon in HTML.

`--html_admon_bd_color=...`

Boundary color of admon in HTML.

--css=...

Specify a .css style file for HTML output.  
If the file does not exist, the default or specified style  
(--html\_style=) is written to it.

--html\_box\_shadow

Add a shadow effect in HTML box environments.

--html\_exercise\_icon=...

Specify a question icon in bundled/html\_images for being  
inserted to the right in exercises - "default" and "none" are allowed  
("none" if no option).

--html\_exercise\_icon\_width=...

Width of the icon image specified as --html\_exercise\_icon.

--html\_links\_in\_new\_window

Open HTML links in a new window.

--html\_quiz\_button\_text=...

Text on buttons for collapsing/expanding answers and  
explanations  
in quizzes (with bootstrap styles).  
Default: Empty (just pencil glyphion).

--html\_bootstrap\_navbar=...

Turns the Bootstrap navigation bar on/off. Default: on.

--html\_bootstrap\_jumbotron=...

Turns the Bootstrap jumbotron intro on/off and governs the  
size of the heading. Default: on. Other values: h2, off  
(h2 gives h2 heading instead of h1, off gives no jumbotron).

--device=...

Set device to paper, screen, or other (paper impacts LaTeX output).

--latex\_style=...

LaTeX style package used for the document.  
std: standard LaTeX article or book style,  
Springer\_lncse: Springer's Lecture Notes in Computational Science and  
Engineering (LNCSE) style,  
Springer\_llncs: Springer's Lecture Notes in Computer Science style,  
Springer\_T2: Springer's T2 book style,  
Springer\_collection: Springer's style for chapters in LNCSE proceedings,

Korma\_Script: Korma Script style,  
siamltex: SIAM's standard LaTeX style for papers,  
siamltexmm: SIAM's extended (blue) multimedia style for papers.

--latex\_font=...

LaTeX font choice: helvetica, palatino, std (Computer Modern, default).

--latex\_bibstyle=...

LaTeX bibliography style. Default: plain.

--section\_numbering=...

Turn section numbering on/off. Default: off for all formats except latex and pdflatex (on for those).

--latex\_table\_format=...

Default: quote. Other values: left, center, footnotesize, tiny.

--latex\_title\_layout=...

Layout of the title, authors, and date:  
std: traditional LaTeX layout,  
titlepage: separate page,  
doconce\_heading (default): authors with "footnotes" for institutions,  
beamer: layout for beamer slides.

--latex\_papersize=...

Geometry of page size: a6, a4, std (default).

--latex\_list\_of\_exercises=...

LaTeX typesetting of list of exercises:  
loe: special, separate list of exercises,  
toc: exercises included as part of the table of contents,  
none (default): no list of exercises.

--latex\_movie=...

Specify package for handling movie/video content.  
Default: href (hyperlink to movie file).  
Other options: media9, movie15, multimedia (Beamer's \movie command).

--latex\_movie\_controls=...

Specify control panel for movies. Default: on. Other options: off.

--latex\_external\_movie\_viewer

Allow external movie viewer for movie15 package.

`--latex_fancy_header`

Typesetting of headers on each page:

If article: section name to the left and page number to the right  
on even page numbers, the other way around on odd page numbers.  
If book: section name to the left and page number to the right  
on even page numbers, chapter name to the right and page number to  
the left on odd page numbers.

`--latex_section_headings=...`

Typesetting of title/section/subsection headings:

std (default): standard LaTeX,  
blue: gray blue color,  
strongblue: stronger blue color,  
gray: white text on gray background, fit to heading width,  
gray-wide: white text on gray background, wide as the textwidth.

`--latex_colored_table_rows=...`

Colors on every two line in tables: no (default), gray, blue.

`--latex_line_numbers`

Include line numbers for the running text (only active if there  
are inline comments).

`--latex_todonotes`

Use the todonotes package to typeset inline comments.

Gives colored bubbles in the margin for small inline comments and  
in the text for larger comments.

`--latex_double_spacing`

Sets the LaTeX linespacing to 1.5 (only active if there are  
inline comments).

`--latex_labels_in_margin`

Print equation, section and other LaTeX labels in the margin.

`--latex_index_in_margin`

Place entries in the index also in the margin.

`--latex_preamble=...`

User-provided LaTeX preamble file, either complete or additions  
to the doconce-generated preamble.

`--latex_no_program_footnotelink`

If `--device=paper`, this option removes footnotes with links to  
computer programs.



`--latex_admon=...`

Type of admonition in LaTeX:

`colors1:`  
(inspired by the NumPy User Guide) applies different colors for the different admons with an embedded icon,

`colors2:`  
like 'colors1' but the text is wrapped around the icon,

`mdfbox:`  
rounded boxes with a optional title and no icon (default),

`graybox2:`  
box with square corners, gray background, and narrower than mdfbox, if code it reduces to something like mdfbox (mdframed based); the summary admon is in case of A4 format only half of the text width with text wrapped around (effective for proposals and articles),

`grayicon:`  
box with gray icons and a default light gray background,

`yellowicon:`  
box yellow icons and a default light yellow background,

`paragraph:` plain paragraph with boldface heading.

Note: the colors in mdfbox and other boxes can customized.

`--latex_admon_color=...`

The color to be used as background in admonitions.  
Either rgb tuple or saturated color a la yellow!5:

`--latex_admon_color=0.1,0.1,0.4`

`'--latex_admon_color=yellow!5'`

Note the quotes, needed for bash, in the latter example.

If `--latex_admon=mdfbox`, the background of the title and the color of the border of box can also be customized by direct editing. For example, a dark blue border and light blue title background is obtained by editing the .tex file as

doconce replace 'linecolor=black,' 'linecolor=darkblue,' mydoc.tex

doconce subst 'frametitlebackgroundcolor=.\*?,' 'frametitlebackgroundcolor=blue!5,' mydoc.tex

`--latex_admon_title_no_period`

By default, a period is added to title admons that do not have a period, question mark, or similar. This option

`--latex_admon_envir_map=...`

Mapping of code envirs to new envir names inside admons, e.g., to get a different code typesetting inside admons. This is useful if admons have a special color and the color background of code blocks does not fit well with the color background inside admons. Then it is natural to use a different verbatim code style inside

admons.  
 If specifying a number, say 2, as in `--latex_admon_envir_map=2`,  
 an `envir` like `pycod` gets the number appended: `pycod2`. One can  
 then in `doconce` `ptex2tex` (or `ptex2tex`) specify the typesetting  
 of `pycod2` environments.  
 Otherwise the specification must be a mapping for each `envir`  
 that should be changed inside the `admons`:  
`--latex_admon_envir_map=pycod-pycod_yellow,fpro-fpro2`  
 (from-to,from-to,... syntax).

`--latex_exercise_numbering=...`

absolute: exercises numbered as 1, 2, ...  
 chapter: exercises numbered as 1.1, 1.2, ... , 3.1, 3.2, etc.  
           with a chapter prefix.

`--latex_subex_header_postfix=...`

Default: ).  
 Gives headers a), b), etc. Can be set to period, colon, etc.

`--xelatex`

Use `xelatex` instead of `latex/pdflatex`.

`--latex_double_hyphen`

Replace single dash - by double dash -- in LaTeX output.  
 Somewhat intelligent, but may give unwanted edits. Use with great care!

`--ipynb_admon=...`

Typesetting of admonitions and quotes.  
 quote: as Markdown quote (default) with gray line on the left.  
 paragraph: just the content with the title as paragraph heading.

`--ipynb_figure=...`

How to typeset figures in ipynb:  
 md (plain Markdown syntax),  
 imgtag ( tag, default)  
 Image (python cell with Image object).

`--ipynb_movie=...`

How to typeset movies in ipynb:  
 md (plain Markdown syntax, default)  
 HTML (python cell with HTML object containing the code that is used  
 in the HTML format)  
 HTML-YouTubeVideo: If YouTube video, use YouTubeVideo object, otherwise  
 use the HTML object with appropriat HTML code.  
 local: local video files with encoding.

`--verbose`

Write out all OS commands run by `doconce`.

`--examples_as_exercises`

Treat examples of the form "==== Example: ..."  
as in exercise environments.

`--without_solutions`

Leave out solution environments from exercises.

`--without_answers`

Leave out answer environments from exercises.

`--without_hints`

Leave out hints from exercises.

`--wordpress`

Make HTML output for wordpress.com pages.

`--tables2csv`

Write each table to a CSV file table\_X.csv,  
where X is the table number (autonumbered in according to  
appearance in the DocOnce source file).

`--sections_up`

Upgrade all sections: sections to chapters, subsections  
to sections, etc.

`--sections_down`

Downgrade all sections: chapters to sections, sections  
to subsections, etc.

`--os_prompt=...`

Terminal prompt in output from running OS commands (the  
@@@OSCMD instruction). None or empty: no prompt, just the command;  
nocmd: no command, just the output. Default is "Terminal>".

`--code_prefix=...`

Prefix all @@@CODE imports with some path.

`--figure_prefix=...`

Prefix all figure filenames with, e.g., an URL.

`--movie_prefix=...`

Prefix all movie filenames with, e.g., an URL.

`--no_mp4_webm_ogg_alternatives`

Use just the specified (.mp4, .webm, .ogg) movie file;  
do not allow alternatives in HTML5 video tag.  
Used if the just the specified movie format should be played.

`--handout`

Makes slides output suited for printing.

`--urlcheck`

Check that all URLs referred to in the document are valid.

`--short_title=...`

Short version of the document's title.

`--markdown`

Allow Markdown (and some Extended Markdown) syntax as input.

`--md2do_output=...`

Dump to file the DocOnce code arising from converting from  
Markdown. Default value is None (no dump).  
Any filename can be specified: `--md2do_output=myfile.do.txt`

`--github_md`

Turn on github-flavored-markdown dialect of the pandoc translator

`--strapdown`

Wrap Markdown output in HTML header/footer such that the  
output file (renamed as .html) can automatically be rendered as  
an HTML via strapdownjs.com technology. Combine with `--github_md`  
for richer output. Styles are set with `--bootswatch_theme=cyborg`  
(for instance).

`--bootswatch_theme=...`

Bootswatch theme for use with `--strapdown` option.

`--strict_markdown_output`

Ensure strict/basic Markdown as output.

`--multimarkdown_output`

Allow MultiMarkdown as output.

--quiz\_question\_prefix=...

Prefix/title before question in quizzes. Default: "Question:".  
Can also be set in square brackets for each individual question.  
("Q: [] What is 1+1?"  
results in no prefix/title before the "What is 1+1?".

--quiz\_choice\_prefix=...

Prefix/title before choices in quizzes.  
Default for HTML: "Choice", resulting in numbered choices  
"Choice 1:", "Choice 2:", etc.  
A value with colon, period, or question mark (e.g., "Answer:")  
leaves out the numbering.  
Default for latex/pdflatex: letter or letter+checkbox.  
Other values: number, number+checkbox, number+circle, letter+circle,  
letter.  
The checkbox or circle is always omitted if answers or solutions are  
included (i.e., if none of the --without\_answers and  
--without\_solutions is set).  
The choice prefix can also be set in square brackets for each  
individual choice.  
("Cr: [] Two"  
results in no prefix/title before the the answer "Two".

--quiz\_horizontal\_rule=...

on (default): <hr> before and after quiz in HTML. off: no <hr>.

--rst\_uio

Univ. of Oslo version of rst files for their Vortex system.

--rst\_mathjax

Use raw HTML with MathJax for LaTeX mathematics in rst files.

--sphinx\_keep\_splits

Respect user's !split commands. Default: Override user's !split  
and insert new !split before all topmost sections. This is what  
makes sense in a Sphinx Table of Contents if one wants to split  
the document into multiple parts.

--online\_paragraphs

Combine paragraphs to one line (does not work well).

## 12 Installation of DocOnce and its Dependencies

Below, we explain the manual installation of all software that may be needed when working with DocOnce documents. The impatient way to install what is needed on a Debian-based Linux computer (running, e.g., Ubuntu) is to run the `install_donce.sh` (or `install_donce.py`) script.

### 12.1 DocOnce

DocOnce itself is pure Python code hosted at <https://github.com/hplgit/donce>. Installation can be done via

```
sudo pip install -e git+https://github.com/hplgit/donce#egg=donce
# or if donce is already installed
sudo pip install -e git+https://github.com/hplgit/donce#egg=donce --upgrade
```

Alternatively, one can run the standard procedure

```
git clone git@github.com:hplgit/donce.git
cd donce
sudo python setup.py install
cd ..
```

Since DocOnce is frequently updated, it is recommended to use the above procedure and whenever a problem occurs, make sure to update to the most recent version:

```
cd donce
git pull origin master
sudo python setup.py install
```

### 12.2 Dependencies

Producing HTML documents, plain text, pandoc-extended Markdown, and wikis can be done without installing any other software. However, if you want other formats as output ( $\text{\LaTeX}$ , Sphinx, reStructuredText) and assisting utilities such as preprocessors, spellcheck, file differences, bibliographies, and so on, the software below must be installed.

To install all needed packages on a GNU/Linux Debian system, such as Ubuntu, you can jump to the script in Section 12.3.

**Preprocessors.** If you make use of the [Preprocess](#) preprocessor, this program must be installed:

```
svn checkout http://preprocess.googlecode.com/svn/trunk/ preprocess
cd preprocess
cd donce
sudo python setup.py install
cd ..
```

A much more advanced alternative to Preprocess is [Mako](#). Its installation is most conveniently done by `pip`,

```
pip install Mako
```

This command requires `pip` to be installed. On Debian Linux systems, such as Ubuntu, the installation is simply done by

```
sudo apt-get install python-pip
```

Alternatively, one can install from the `pip` [source code](#).

Mako can also be installed directly from [source](#): download the tarball, pack it out, go to the directory and run the usual `sudo python setup.py install`.

**Image file handling.** Different output formats require different formats of image files. For example, PostScript or Encapsulated PostScript is required for `latex` output, while HTML needs JPEG, GIF, or PNG formats. DocOnce calls up programs from the ImageMagick suite for converting image files to a proper format if needed. The [ImageMagick suite](#) can be installed on all major platforms. On Debian Linux (including Ubuntu) systems one can simply write

```
sudo apt-get install imagemagick
```

The convenience program `doconce combine_images`, for combining several images into one, will use `montage` and `convert` from ImageMagick and the `pdftk`, `pdfnup`, and `pdfcrop` programs from the `texlive-extra-utils` Debian package. The latter gets installed by

```
sudo apt-get install texlive-extra-utils
```

Automatic image conversion from EPS to PDF calls up `epstopdf`, which can be installed by

```
sudo apt-get install texlive-font-utils
```

**Spellcheck.** The utility `doconce spellcheck` applies the `ispell` program for spellcheck. On Debian (including Ubuntu) it is installed by

```
sudo apt-get install ispell
```

**Bibliography.** The Python package [Publish](#) is needed if you use a bibliography in your document. On the website, click on *Clone*, copy the command and run it:

```
hg clone https://bitbucket.org/logg/publish
```

Thereafter go to the `publish` directory and run the `setup.py` script for installing Publish:

```
cd publish
sudo python setup.py
```

**Ptex2tex for L<sup>A</sup>T<sub>E</sub>X Output.** To make L<sup>A</sup>T<sub>E</sub>X documents with very flexible choice of typesetting of verbatim code blocks you need [ptex2tex](#), which is installed by

```
svn checkout http://ptex2tex.googlecode.com/svn/trunk/ ptex2tex
cd ptex2tex
sudo python setup.py install
```

It may happen that you need additional style files, you can run a script, `cp2texmf.sh`:

```
cd latex
sh cp2texmf.sh # copy stylefiles to ~/texmf directory
cd ../..
```

This script copies some special stylefiles that that `ptex2tex` potentially makes use of. Some more standard stylefiles are also needed. These are installed by

```
sudo apt-get install texlive
```

on Debian Linux (including Ubuntu) systems. TeXShop on Mac comes with the necessary stylefiles (if not, they can be found by googling and installed manually in the `~/texmf/tex/latex/misc` directory).

Note that the `doconce ptex2tex` command, which needs no installation beyond DocOnce itself, can be used as a simpler alternative to the `ptex2tex` program.

The *minted* L<sup>A</sup>T<sub>E</sub>X style is offered by `ptex2tex` and `doconce ptext2tex` and popular among many users. This style requires the package [Pygments](#) to be installed. On Debian Linux,

```
sudo apt-get install python-pygments
```

Alternatively, the package can be installed manually:

```
hg clone ssh://hg@bitbucket.org/birkenfeld/pygments-main pygments
cd pygments
sudo python setup.py install
```

One can also do the simple

```
pip install sphinx
```

which also installs pygments.

If you use the *minted* style together with `ptex2tex`, you have to enable it by the `-DMINTED` command-line argument to `ptex2tex`. This is not necessary if you run the alternative `doconce ptex2tex` program.

All use of the *minted* style requires the `-shell-escape` command-line argument when running L<sup>A</sup>T<sub>E</sub>X, i.e., `latex -shell-escape` or `pdflatex -shell-escape`.

Inline comments apply the `todonotes` L<sup>A</sup>T<sub>E</sub>X package if the option `--latex_todonotes` is given. The `todonotes` package requires several other packages: `xcolor`, `ifthen`, `xkeyval`, `tikz`, `calc`, `graphicx`, and `setspace`. The relevant Debian packages for installing all this are listed below.



**L<sup>A</sup>T<sub>E</sub>X packages.** Many L<sup>A</sup>T<sub>E</sub>X packages are potentially needed (depending on various preprocessor variables given to ptex2tex or doconce ptex2tex). The standard packages always included are relsize, epsfig, makeidx, setspace, color, amsmath, amsfontr, xcolor, bm, microtype, titlesec, and hyperref. The ptex2tex package (from [ptex2tex](#)) is also included, but removed again if doconce ptex2tex is run instead of the ptex2tex program, meaning that if you do not use ptex2tex, you do not need ptex2tex.sty. Optional packages that might be included are minted, fontspec, xunicode, inputenc, helvet, mathpazo, wrapfig, calc, ifthen, xkeyval, tikz, graphicx, setspace, shadow, disable, todonotes, lineno, xr, framed, mdframe, movie15, a4paper, and a6paper.

Relevant Debian packages that gives you all of these L<sup>A</sup>T<sub>E</sub>X packages are

```
texlive
texlive-extra-utils
texlive-latex-extra
texlive-font-utils
```

On old Ubuntu 12.04 one has to do `sudo add-apt-repository ppa:texlive-backports/ppa` and `sudo apt-get update` first, or alternatively install these as well:

```
texlive-math-extra
texlive-bibtex-extra
texlive-xetex
texlive-humanities
texlive-pictures
```

Alternatively, one may pull in `texlive-full` to get all available style files.

If you want to use the *anslistings* code environment with ptex2tex (`.ptex2tex.cfg` styles `Python_ANS`, `Python_ANSt`, `Cpp_ANS`, etc.) or doconce ptex2tex (`envir=ans` or `envir=ans:nt`), you need the `anslistings.sty` file. It can be obtained from the [ptex2tex source](#). It should get installed by the `cp2texmf.sh` script executed above.

**reStructuredText (reST) Output.** The `rst` output from DocOnce allows further transformation to L<sup>A</sup>T<sub>E</sub>X, HTML, XML, OpenOffice, and so on, through the [docutils](#) package. The installation of the most recent version can be done by

```
svn checkout \
  http://docutils.svn.sourceforge.net/svnroot/docutils/trunk/docutils
cd docutils
sudo python setup.py install
cd ..
```

The command

```
pip install sphinx
```

installs Docutils along with Sphinx and Pygments.

To use the OpenOffice suite you will typically on Debian systems install

```
sudo apt-get install unovonv libreoffice libreoffice-dmaths
```

There is a possibility to create PDF files from reST documents using ReportLab instead of  $\text{\LaTeX}$ . The enabling software is [rst2pdf](#). Either download the tarball or clone the svn repository, go to the `rst2pdf` directory and run the usual `sudo python setup.py install`.

**Sphinx Output.** Output to sphinx requires of course the [Sphinx software](#), installed by

```
hg clone https://bitbucket.org/birkenfeld/sphinx
cd sphinx
sudo python setup.py install
cd ..
```

An alternative is

```
pip install sphinx
```

DocOnce comes with many Sphinx themes that are not part of the standard Sphinx source distribution. Some of these themes require additional Python/Sphinx modules to be installed:

- cloud and redcloud: [https://bitbucket.org/ecollins/cloud\\_sptheme](https://bitbucket.org/ecollins/cloud_sptheme)
- bootstrap: <https://github.com/ryan-roemer/sphinx-bootstrap-theme>
- solarized: <https://bitbucket.org/miiton/sphinxjp.themes.solarized>
- impressjs: <https://github.com/shkumagai/sphinxjp.themes.impressjs>
- sagecellserver: <https://github.com/kriskda/sphinx-sagecell>

These must be downloaded or cloned, and `setup.py` must be run as shown above.

**Markdown and Pandoc Output.** The DocOnce format `pandoc` outputs the document in the Pandoc extended Markdown format, which via the `pandoc` program can be translated to a range of other formats. Installation of [Pandoc](#), written in Haskell, is most easily done by

```
sudo apt-get install pandoc
```

on Debian (Ubuntu) systems.

**Epydoc Output.** When the output format is `epyd` one needs that program too, installed by

```
svn co https://epydoc.svn.sourceforge.net/svnroot/epyd/trunk/epyd epydoc
cd epydoc
sudo make install
cd ..
```

**Remark.** Several of the packages above installed from source code are also available in Debian-based system through the `apt-get install` command. However, we recommend installation directly from the version control system repository as there might be important updates and bug fixes. For `svn` directories, go to the directory, run `svn update`, and then `sudo python setup.py install`. For Mercurial (`hg`) directories, go to the directory, run `hg pull`; `hg update`, and then `sudo python setup.py install`.

**Analyzing file differences.** The `doconce diff file1 file2` command for illustrating differences between two files `file1` and `file2` using the program `prog` requires `prog` to be installed. By default, `prog` is `diff` which comes with Python and is always present if you have DocOnce installed. Another choice, `diff`, should be available on all Unix/Linux systems. Other choices, their URL, and their `sudo apt-get install` command on Debian (Ubuntu) systems appear in the table below.

Program	URL	Debian/Ubuntu install
<code>pdiff</code>	<a href="#">a2ps wdiff</a>	<code>sudo apt-get install a2ps wdiff texlive-latex-extra texlive-latex-re</code>
<code>latexdiff</code>	<a href="#">latexdiff</a>	<code>sudo apt-get install latexdiff</code>
<code>kdifff3</code>	<a href="#">kdifff3</a>	<code>sudo apt-get install kdifff3</code>
<code>diffuse</code>	<a href="#">diffuse</a>	<code>sudo apt-get install diffuse</code>
<code>xxdiff</code>	<a href="#">xxdiff</a>	<code>sudo apt-get install xxdiff</code>
<code>meld</code>	<a href="#">meld</a>	<code>sudo apt-get install meld</code>
<code>tkdiff.tcl</code>	<a href="#">tkdiff</a>	not in Debian

## 12.3 Quick Debian/Ubuntu Install

On Debian (including Ubuntu) systems, it is straightforward to install the long series of DocOnce dependencies:

```
# Version control systems
sudo apt-get install -y mercurial git subversion

# Python
sudo apt-get install -y idle ipython python-pip python-pdftools texinfo

# LaTeX
sudo apt-get install -y texlive texlive-extra-utils texlive-latex-extra texlive-math-extra texlive-font-uti
# or sudo apt-get install -y texlive-full # get everything
sudo apt-get install -y latexdiff auctex

# Image and movie tools
sudo apt-get install -y imagemagick netpbm mjpegtools pdftk giftrans gv libav-tools libavcodec-extra-53 lib

# Misc
sudo apt-get install -y ispell pandoc libreoffice unoconv libreoffice-dmaths curl a2ps wdiff meld xxdiff di

# More Python software
sudo pip install sphinx # install pygments and docutils too
sudo pip install mako
sudo pip install -e svn+http://preprocess.googlecode.com/svn/trunk#egg=preprocess
```

```

sudo pip install -e hg+https://bitbucket.org/logg/publish#egg=publish

sudo pip install -e hg+https://bitbucket.org/ecollins/cloud_sptheme#egg=cloud_sptheme
sudo pip install -e git+https://github.com/ryan-roemer/sphinx-bootstrap-theme#egg=sphinx-bootstrap-theme
sudo pip install -e hg+https://bitbucket.org/miiton/sphinxjp.themes.solarized#egg=sphinxjp.themes.solarized
sudo pip install -e git+https://github.com/shkumagai/sphinxjp.themes.impressjs#egg=sphinxjp.themes.impressjs
sudo pip install -e git+https://github.com/kriskda/sphinx-sagecell#egg=sphinx-sagecell
sudo pip install -e svn+https://epydock.svn.sourceforge.net/svnroot/epydock/trunk/epydock#egg=epydock

# DocOnce itself
rm -rf srclib # put downloaded software in srclib
mkdir srclib
cd srclib
git clone git@github.com:hplgit/doconce.git
cd doconce
sudo python setup.py install -y
cd ../..

# Ptex2tex
cd srclib
svn checkout http://ptex2tex.googlecode.com/svn/trunk/ ptex2tex
cd ptex2tex
sudo python setup.py install -y
cd latex
sh cp2texmf.sh # copy stylefiles to ~/texmf directory
cd ../../..

```

## 13 Basic Parsing Ideas

The (parts of) files with computer code to be directly included in the document are first copied into verbatim blocks.

All verbatim and TeX blocks are removed and stored elsewhere to ensure that no formatting rules are not applied to these blocks.

The text is examined line by line for typesetting of lists, as well as handling of blank lines and comment lines. List parsing needs some awareness of the context. Each line is interpreted by a regular expression

```
(?P<indent> *(?P<listtype>[*o-] )? *) (?P<keyword>[^:]+?:)? (?P<text>.*)\s?
```

That is, a possible indent (which we measure), an optional list item identifier, optional space, optional words ended by colon, and optional text. All lines are of this form. However, some ordinary (non-list) lines may contain a colon, and then the keyword and text group must be added to get the line contents. Otherwise, the text group will be the line.

When lists are typeset, the text is examined for sections, paragraphs, title, author, date, plus all the inline tags for emphasized, boldface, and verbatim text. Plain substitutions based on regular expressions are used for this purpose.

The final step is to insert the code and TeX blocks again (these should be untouched and are therefore left out of the previous parsing).

It is important to keep the DocOnce format and parsing simple. When a new format is needed and this format is not obtained by a simple edit of the definition of existing formats, it might be better to convert the document to reST and then to XML, parse the XML and write out in the new format. When the

DocOnce format is not sufficient to getting the layout you want, it is suggested to filter the document to another, more complex format, say reST or  $\text{\LaTeX}$ , and work further on the document in this format.

### 13.1 Typesetting of Function Arguments, Return Values, and Variables

#### Note.

This text is somewhat outdated. Now DocOnce supports NumPy-style docstrings. DocOnce can also do automatic references to Python documentation, say the 'math' module, but the link only works in case of Sphinx output. Typical syntax is

With `:mod:'numpy'` and the `:func:'scipy.io.loadmat'` function in the `:mod:'scipy.io'` module, we can ...

In case of ambiguous names, say a local `math` module, one can use `python`, `numpy`, `scipy`, and `mpl` (`matplotlib`) as prefix (as defined in `conf.py`, generated by the `doconce sphinx_dir`):

With `:func:'python:math.sin'` instead of `:func:'math.sin'` ...

(More info in the Sphinx API doc by the author - under development.)

A Mako function can provide greater flexibility such that other formats than Sphinx can take advantage of such references (full URL can be built into the function, depending on the format).

As part of comments (or doc strings) in computer code one often wishes to explain what a function takes of arguments and what the return values are. Similarly, it is desired to document class, instance, and module variables. Such arguments/variables can be typeset as description lists of the form listed below and *placed at the end of the doc string*. Note that `argument`, `keyword argument`, `return`, `instance variable`, `class variable`, and `module variable` are the only legal keywords (descriptions) for the description list in this context. If the output format is Epytext (Epydoc) or Sphinx, such lists of arguments and variables are nicely formatted.

- `argument x`: `x` value (float),  
which must be a positive number.
- `keyword argument tolerance`: `tolerance` (float) for stopping  
the iterations.
- `return`: the root of the equation (float), if found, otherwise `None`.
- `instance variable eta`: surface elevation (array).
- `class variable items`: the total number of `MyClass` objects (int).
- `module variable debug`: `True`: debug mode is on; `False`: no debugging  
(bool variable).

The result depends on the output format: all formats except Epytext and Sphinx just typeset the list as a list with keywords.

**module variable x:** x value (float), which must be a positive number.

**module variable tolerance:** tolerance (float) for stopping the iterations.

## 14 References

### Note.

The references below are just for illustrating and testing citation syntax and not references for explaining parts of the text.

## References

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