marky Documentation — pdf

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Abstract – marky is a preprocessor with an easy and intuitive syntax for execution of embedded pyhon code during rendering html and pdf documents from Markdown text. This document is created using marky, version 0.9. For more information please refer to the marky repository.

1 marky Dynamic Markdown

marky is a Markdown preprocessor which transforms a Markdown document using python. marky implements three statements with extremely easy and intuitive syntax, which are embedded directly in the Markdown text:

- 1. $\langle ? \dots ? \rangle$: Python code block.
- 2. {{...}}: f-string output into Markdown.
- 3. ___(): Function for output into Markdown.

Using <?...?> and $\{\{...\}\}$ python code and f-string output are embedded directly inside the Markdown text.

Example 1: Inline Formatted Ouput

```
<?
x = 123.45
LEG = lambda v, w: "lesser" if v < w else "equal or greater"
?>
This is an example with a value x=\{\{x:.3f\}\},
which is \{\{LEG(x, 100)\}\} than 100.
```

Run and Output

This is an example with a value x=123.450, which is equal or greater than 100.

Using the ___() function text is generated from python algorithms and dynamically inserted into the resulting Markdown.

Example 2: Dynamic Text from Code

```
<?
for i in range(3):
    ___(f"{i+1}. `i = {i}`", "abcdefghij"[0:(i+1)*3])
?>
```

Run and Output

```
    i = 0 abc
    i = 1 abcdef
    i = 2 abcdefghi
```

Python code, which is embedded in the Markdown text follows the Python indentation standard. Markdown text is integrated into the program flow when being inserted in python statements accordingly.

Example 3: Text in Condition

Run and Output

```
This is the first line.
This Line is shown.
This is the last line.
```

Example 4: Text in Program Flow

```
<?
for i in range(3):
     ?>{{i+1}}. `i = {{i}}` in this iteration.
```

```
<?
?>
```

Run and Output

```
    i = 0 in this iteration.
    i = 1 in this iteration.
    i = 2 in this iteration.
```

1.1 A First marky Example

marky combines python expressions with Markdown, for dynamic creation of text. In the following, two in-depth examples of marky are presented.

Example 1: marky Syntax

```
<?
x = 123
y = 45
def abc_fun(v, a, b, c):
    return a if v < 100 else b if v == 100 else c
LEG = lambda v: abc_fun(v, "lesser", "equal", "greater")
?>
This is an example with a value x={{x}}, which is
{{LEG(x)}} than 100. There is another value y={{y}},
which is {{LEG(y)}} than 100. Both values together
are x+y={{x+y}}.
```

Run and Output

This is an example with a value x=123, which is greater than 100. There is another value y=45, which is lesser than 100. Both values together are x+y=168.

The following example contains meta data in the front matter and can be rendered into pdf and html by just calling make pdf/file or make html/file.

Example 2: md/file.md

```
---
title: An Example
```

```
<?
def cap_first(i):
    return " ".join([i[0].upper() + i[1:] for i in i.split()])
for i in ["very", "not so"]:
**{{cap_first(i)}} Section**
To day is a {{i}} very nice day.
The sun is shining {{i}} bright and
the birds are singing {{i}} loud and
fly {{i}} high in the {{i}} blue sky.
    <?
?>
Output build/file.md
title: An Example
**Very Section**
To day is a very very nice day.
The sun is shining very bright and
the birds are singing very loud and
fly very high in the very blue sky.
**Not So Section**
To day is a not so very nice day.
The sun is shining not so bright and
the birds are singing not so loud and
fly not so high in the not so blue sky.
```

1.2 How does marky work internally?

marky uses an extremely simple mechanism for generating a python programm from the Markdown text. Using the <?...?> and $\{\{...\}\}$ state-

ment, Python code is embedded into the Markdown text and translated into a series of calls to the ___() function using f-strings as arguments, where python variables are referenced. This results into a python program which can generate Markdown text algorithmically.

Example: md/file.md

```
* This is {first}. <?
x = 1 # this is code
for i in range(3):
    if x:
        ?>
{{i+1}}. The value is {{{x}}}.
<?
    else:
        ?>{{i+1}}. The value is zero.
<?
    x = 0
?>* This is last.
```

The file produces the following Markdown output.

Output: Markdown

```
* This is {first}.

1. The value is {1}.

2. The value is zero.

3. The value is zero.

* This is last.
```

marky transforms the Markdown into Python source code. Execution of the Python source code yields the new Markdown text.

Output: build/file.py

```
___(rf"""* This is {{first}}. """, ___);
x = 1 # this is code
for i in range(3):
    if x:
        ___(rf"""
{i+1}. The value is {{{x}}}.
""", ___);
```

```
else:
    ___(rf"""{i+1}. The value is zero.
""", ___);
    x = 0
    ___(rf""* This is last.
""", ___);
```

2 Quick Start

2.1 marky Dependencies

marky depends on pandoc and pyyaml. pandoc is used for rendering the Markdown into html and pdf. marky uses pandoc for rendering html and pdf. pandoc>=2.10 releases can be found here. The other packages can be installed with pip.

```
pip install pandoc-fignos
pip install pandoc-eqnos
pip install pandoc-secnos
pip install pandoc-tablenos
pip install pandoc-xnos
pip install pyyaml
```

2.2 marky Workflow

Workflow for creating html or pdf using marky by invocation of make scan and make all.

| \overline{make} | 1. write | | 2. build | | 3. render |
|-------------------|------------|----|--------------------|----|----------------|
| pdf | md/file.md | | build/file.html.md | -> | html/file.html |
| hfml | ma/lite.ma | -/ | build/file.pdf.md | -> | pdf/file.pdf |

- 1. write: user writes a Markdown text file and places it in md/*.md directory with the extension .md.
- 2. **build**: marky transforms the files in md/*.md into regular Markdown text and places the transformed files in build/.
- 3. render: the regular Markdown text in the files build/*.md is rendered into html and pdf using pandoc.

The three steps are implemented in a Makefile.

2.3 Download and Initialize

marky is supplied as a single-file script which automatically sets up the project structure containing all scripts required for processing and rendering Markdown.

For example, download marky from github.

```
git clone https://lehmann7.github.com/marky.git
cd marky
```

After download, the marky environment is initialized using marky.

```
./marky.py --init

# mkdir build/

# mkdir data

# mkdir md/

# WRITE Makefile

# WRITE pandoc-run

# WRITE md/marky.md

# WRITE .gitignore

# USAGE

make help
```

2.4 marky Environment

During initialization, marky creates directories and files. After initialization, the following structure is auto-generated in the project directory. marky shows the project structure when invoking make tree.

PROJECT TREE

```
#############
<working_dir>
|- marky.py
                       - marky executable
|- Makefile
                  (*) - marky Makefile
- pandoc-run
                  (*) - pandoc wrapper
|- md/
                   (*) - user Markdown dir
| |- *.md
                       - user Markdown text
|- data/
                   (*) - user data dir
| |- *.*
                        user data files
|- build/
                  (*) - build Markdown dir
| |- *.py
                  (*) - marky Python code
| |- *.make
                  (*) - Makefile rules
```

```
| |- *.html.md (*) - Markdown for html format
| |- *.pdf.md (*) - Markdown for pdf format
|- html/*.html (*) - rendered html dir
|- pdf/*.pdf (*) - rendered pdf dir

(*) directories/files are auto-generated using
   `./marky.py --init; make scan; make all´
```

The script pandoc-run can be adjusted in case specific pandoc options are required for rendering the html and pdf documents.

2.5 Document Rendering

By invoking make all all files md/*.md are transformed into corresponding html/*.html and pdf/*.pdf files. By invoking make httpd a python web server is started in html/.

All user-generated Markdown content goes into md/* user-generated data files go into data/*.

ATTENTION: The files in the directories build/* are auto-generated. All user files have to be placed inside the directory md/*. Invoking make clean will delete all files in html/, build/ and pdf/.

2.6 marky Makefile Targets

marky manages all files using Makefile targets. Makefile targets are initialized using make scan and shown using make list.

marky TARGETS

#########

fmtplot marky

2.7 Integrated Documentation

marky has an integrated environment. Using make help displays a short info about the marky dependencies, make targets and examples.

```
marky DEPENDENCIES
####################
* pandoc >= 2.10
* pip install pandoc-fignos
* pip install pandoc-eqnos
* pip install pandoc-secnos
* pip install pandoc-tablenos
* pip install pandoc-xnos
* pip install pyyaml
ATTENTION
##########
All files in `build/*.md` and `html/*.html` are auto-generated!
User files `*.md` have to be placed in `md/*.md`!
`make clean` deletes all files in `build/`, `html/` and `pdf/`.
marky UTILS
############
                    - show this *Help Message*
* make help
* make tree
                     - show the *Project Tree*
                     - run python -m httpd.server in `html/`
* make httpd
* make clean
                      - delete: `build/*`, `html/*`, `pdf/*`
* make quiet [...] - build with `./marky --quiet [...]`
* make scan
                      - build make deps: `build/*.make`
* make list
                      - list all scanned files and targets
marky BUILD ALL
################
* make build
                     -> `build/*.{html,pdf}.md`
* make tex
                     -> `build/*.tex`
                     -> `html/*.html`
* make html
```

```
-> `pdf/*.pdf`
* make pdf
                      -> `html/*.html`, `pdf/*.pdf`
* make all
marky BUILD FILE
#################
* make build/file
                   -> `build/file.{html,pdf}.md`
* make build/file.tex -> `build/file.tex`
                      -> `html/file.html`
* make html/file
* make pdf/file -> `pdf/pdf.html`
EXAMPLE
########
1. run `make scan; make html/file.html httpd`:
   * generate `build/file.make`
   * transform `md/file.md` -> `html/file.html`
   * start a python httpd server in `html`
2. run `make scan; make pdf/file.pdf`
   * generate `build/file.make`
   * transform `md/file.md` -> `pdf/file.pdf`
```

3 marky Features

In order to quick start a new Markdown project, just link the marky.py executable in the project dir or clone the git as described above, and initialize the environment using --init.

```
mkdir my_project
cd my_project
ln -s ~/marky/marky.py .
# ... or git clone ...
./marky.py --init
```

Now marky is ready for operation. Place a new file in md/file.md and run the following commands.

```
touch md/file.md
make scan
# WRITE build/file.make
```

marky discovers the new document when invoking make scan. marky also renders html and pdf using make targets.

```
make html/file
make pdf/file
```

3.1 Meta Data in Front Matter

If document starts with ---, yaml is used to parse the front matter block delimited by ---. All meta data keys will be exposed into the python scope as a local variable, unless the variable already exists.

Example

```
title: "`marky` Documentation "
author: ...
date: 2022-01-01
---
The title of this document is {{title}}.
```

Output

```
title: "`marky` Documentation "
author: ...
date: 2022-01-01
```

The title of this document is `marky` Documentation .

3.2 Inline Formatted Output

Python local variables and variables from meta data in front matter can be accessed diretly from the markdown text. The {{...}} statement uses syntax similar to python f-strings for formatted output of variables and results of expressions into Markdown text. The marky operator {{<expression>[:<format>]}} uses the syntax of f-strings.

Example 1

```
Title of this document is {{title}} and font size is {{fontsize}}. `x` is {{x}} and {{",".join([str(i) for i in range(x-10,x)])}}.
```

Output

Title of this document is marky Documentation and font size is 11pt. x is 0 and -10,-9,-8,-7,-6,-5,-4,-3,-2,-1.

Example 2

```
x = int(1)

y = float(2.3)

z = 0

a = [1, 2, 3]

b = (4, 5)

This is a paragraph and x is \{\{x:03d\}\} and y is \{\{y:.2f\}\}.

Other content is: a = \{\{a\}\}, b = \{\{b\}\}.
```

Output

This is a paragraph and x is 001 and y is 2.30. Other content is: a = [1, 2, 3], b = (4, 5).

3.3 Embedding Python Code

Python code blocks are embedded into Markdown using <?...?> and {{...}}. All code blocks span one large scope sharing functions and local variables. Meta data is imported from Markdown front matter as local variables in the python scope. The import statement can be used in python code in order to access installed python packages as usual.

3.3.1 Visible Code

Using <?!...?> code is executed and stored. The text of the last <?!...?> block can be accessed and placed via {{___(code=True)}}.

Example

```
<?!
x = 42 # visible code
print("Hello console!")
?>
{{___(code=True)}}
```

Run and Output

```
x = 42 # visible code
print("Hello console!")
```

ATTENTION: Using the print() function the text will be printed to the console and **not** inside the resulting Markdown text.

3.3.2 Hidden Code

Using <?...?> code is executed but not shown in Markdown.

Example

```
<?
x = 41 \# hidden code
___(f"Output to Markdown. x = \{x\}!")
```

Run and Output

```
Output to Markdown. x = 41!
```

ATTENTION: Using the ___() function the text will be printed inside the resulting Markdown text **and not** on the console.

3.3.3 Error Messages

marky shows error messages directly inside the Markdown text.

Example: md/file.md

```
1 ---
2 title: "My Document"
3 ---
4 <?
5 x = 1
6 ?>
7 The value x is {{y}}.
```

Run and Output: make build/file

```
<!-- run md/file.md --!>
<!-- run build/file.py --!>
<!-- PYTHON ERROR
File "md/file.md", line 7, in <module>
    The value x is {{y}}.
Error <class 'NameError'> : name 'y' is not defined
--!>
```

3.4 The ___() Function

Using the print() statement the text will be printed to the console. When using the ___() statement new Markdown text is inserted dynamically into the document during preprocessing.

Example: Line Break

```
<?
x = 40 # hidden code
___("Output in ", ___)
___("single line! ", ___)
___(f"x = {x}")
?>
```

Run and Output

```
Output in single line! x = 40
```

Example: Shift, Crop, Return

Run and Output

```
####### * text is cropped and shifted
####### * shift and crop
######## * can be combined
######## * returning the result
```

3.5 Algorithmic Table Example

Table 1 is generated using the following python clode block.

Table 1: Table is generated using code and the ___() statement.

| X | X | X | X | X |
|------------|--------------|----------------|--------------|---|
| 0 | 0 | \overline{A} | 0 | 0 |
| 0 | 0 | ${f C}$ | \mathbf{F} | 0 |
| 0 | \mathbf{E} | Н | \times^K | 0 |
| 0 | G | \times^J | ∞_M | P |
| \times^I | ∞_L | O | \mathbf{R} | Ų |

3.6 Format Link Extension

When writing multiple documents, often documents are referenced between each other using links. In order to refer to external html and pdf documents the Markdown link statement is used.

```
[Link Caption] (path/to/file.html)
[Link Caption] (path/to/file.pdf)
```

One link statement cannot be used for rendering html and pdf with consistent paths. Using the marky format link .??? file extension results in

consistent links for html and pdf documents.

Example

```
[Link to this Document] (marky.???)
```

Output

Link to this Document

3.7 Format Codes

Often when writing markdown for html and pdf documents, the output needs to be tweaked accordingly. marky supports format specific tweaking by injecting raw html or tex code into Markdown using format codes.

In order to inject format specific code the fmtcode class is used. The fmtcode class manages injection of html and tex code depending on the output format.

ATTENTION: tex packages have to be included for pdf as well as JavaScript and style sheets for html using the meta data fields header-includes--pdf and header-includes--html respectively.

Example: fmtcode

```
F = fmtcode(html="H<sup>T</sup><sub>M</sub>L", pdf=r"\LaTeX") \\ Invocation of format code results in: {{F()}}.
```

Output

Invocation of format code results in: LATEX.

Example: Color

```
C = lambda color: fmtcode(
    html="<span style='color:%s;'>{0}</span>" % color,
    pdf=r"\textcolor{{%s}}{{{0}}}" % color
)
B = C("blue")
R = C("red")
Text with {{B("blue")}} and {{R("RED")}}.
```

Output

Text with blue and RED.

Example: Classes

```
class color:
    def __init__(self, color):
        self.color = color
    def upper(self, x):
        return self.text(x.upper())
    def lower(self, x):
        return self.text(x.lower())
class html(color):
    def text(self, x):
        return f"<span style='color:{self.color};'>{x}</span>"
class pdf(color):
    def text(self, x):
        return rf"\textcolor{{{self.color}}}{{{x}}}"
CC = lambda x: fmtcode(html=html(x), pdf=pdf(x))
BB = CC("blue")
RR = CC("red")
Text with {{BB.upper("blue")}} and {{RR.lower("RED")}}.
```

Output

Text with **BLUE** and red.

3.8 Markdown Include

The marky include statement ___(file) For inclusion of text from other files can be used to include text into html and pdf documents.

```
<?
___(file="include.md", __marky__=False, raw=False, aux=False)
?>
___(file) supports following options.
```

- __marky__: controls whether the include file is processed as marky script (True) or as a marky module (False, default).
- raw: controls whether the include file is included as-is (True) or processed via marky (False, default).
- aux: disables processing of the file if True, (default: False).

When script mode is activated (__marky__=True) then the *module code* as well as the *script code* are executed. However, if module mode is activated (__marky__=False), only the *module code* is processed.

```
title: Test
---
<?
# marky module code
?>
`marky` module output
<?
if __marky__:
    # marky script code
    ?>`marky` script output<?
?>
```

4 Meta Data in Front Matter

Meta data is annotated in the front matter of a Markdown text document. The front matter must start in the first line with --- and precedes all other text being fenced by ---. The meta data is in yaml format. The yaml block is parsed using python-pyyaml. All meta data is imported into the preprocessed document.

4.1 Pandoc Front Matter

Example

title: My Document
date: 2022-01-01
author: ...
link-citations: true
bibliography: data/marky.bib

```
header-includes: >
    \hypersetup{colorlinks=false,
    allbordercolors={0 0 0},
    pdfborderstyle={/S/U/W 1}}
xnos-cleveref: true
xnos-capitalise: true
fontsize: 11pt
```

The meta data fields title, date, author, link-citations, bibliography and header-includes are processed by pandoc during document rendering. fontsize adjusts the font size in html and pdf documents. The xnos-cleveref and xnos-capitalise fields are used by the pandoc-xnos extensions for referencing figures, tables, sections and equations.

4.2 marky Format Fields

Example: md/file.md

header-includes--pdf: >
 \hypersetup{
 colorlinks=false,
 allbordercolors={0 0 0},
 pdfborderstyle={/S/U/W 1}}
header-includes--html: >
 <style>* { box-sizing: border-box; }</style>

The pandoc header-includes field is used for pdf and html documents, therefore it must contain corresponding tex and html code.

The field header-includes ending with --pdf or --html specifies corresponding options for the generation of pdf and html documents. During make, marky scans all meta data fields, and fields which end with --pdf and --html are selected and forwarded to pandoc based on the format to be rendered.

After build make build/file the meta data field header-includes is present in the files build/file.html.md andbuild/file.pdf.md accordingly.

5 Scientific Writing in Markdown

Markdown is a markup language for technical writing, with emphasis on readability. Markdown can be rendered in many formats including html and pdf by using pandoc for example.

Using various Markdown extensions of pandoc a sufficient structure for writing scientific documents is reflected using Markdown syntax. marky by default uses the following pandoc Markdown extensions.

- parsing extensions
 - all symbols escapable
 - intraword underscores
 - escaped_line_breaks
 - space_in_atx_header
 - lists_without_preceding_blankline
- styling extensions
 - inline_code_attributes
 - strikeout
- structuring extensions
 - yaml_metadata_block
 - pipe_tables
 - line blocks
 - implicit_figures

- abbreviations
- inline notes
- code injection
 - raw_html
 - raw_tex

pandoc supports equations rendered inline and single-line in tex-style using \$...\$ and \$\$...\$\$, bibliography using the --citeproc option, section numbering using the --number-sections option and table of contents using the --table-of-contents option.

pandoc supports xnos filters for referencing document content like figures, equations, tables, sections by using the --filter pandoc-xnos option. xnos integrates clever references, which means "Fig.", "Sec.", "Eq." and "Tab." are added automatically to the corresponding element. If the prefix is to be omitted, the reference is written as \!@ref:label.

Example

```
## Referenced Section {#sec:label}
```

This is a reference to @sec:label.

! [This is the caption] ( UhEUgAAAAUAAAAFCAYAAACNbyblAAAAHElEQVQI12P4//8/w38GIAXDIBKEODH xgljNBAAO9TXLOY4OHwAAAABJRU5ErkJggg==) {#fig:label}

This is a reference to @fig:label.

```
A |B |C |D ---|---| 000 | 111 | 444 | 555 | 222 | 333 | 666 | 777
```

Table: This is the caption {#tbl:label}

This is a reference to @tbl:label.

\$\$\mbox{e}^{\mbox{i}\pi}+1=0\$\${#eq:label}

This is a reference to @eq:label.

This is a citation [@Muller1993].

The file marky.bib is specified in the meta data in the front matter of the Markdown text.

5.1 Referenced Section

This is a reference to Section 5.1.

Figure 1: This is the caption

This is a reference to Fig. 1.

Table 2: This is the caption.

| A | В | \mathbf{C} | D |
|-----|-----|--------------|-----|
| 000 | 111 | 444 | 555 |
| 222 | 333 | 666 | 777 |

This is a reference to Table 2.

$$e^{i\pi} + 1 = 0 \tag{1}$$

This is a reference to Eq. 1.

This is a citation (Muller 1993).

Thanks for reading, please try marky.

References

Muller, Peter. 1993. "The Title of the Work." The Name of the Journal 4 (2): 201-13.