



FACULTY  
OF INFORMATICS  
Masaryk University

# Using inside T<sub>E</sub>X Documents

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TUG@BachoT<sub>E</sub>X 2017

<https://github.com/witiko/markdown>

Vít Novotný

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# Section 1

## **Introduction**

# The Case for Lightweight Markup

## *T<sub>E</sub>X as a Content Creation Language*

### 1. High Markup to Text Ratio

- The *T<sub>E</sub>Xbook* (Knuth, 1986) is 22 % markup (plain T<sub>E</sub>X).
- *Think Java* (Downey et al., 2016) is 21 % markup (L<sup>A</sup>T<sub>E</sub>X).

### 2. Zero Sandboxing Support

- The document you are typesetting may not compile.

```
\texttt{innocent_looking_underscores.tex}
```

- The document you are typesetting may halt.

```
\def\whiletrue{\whiletrue} \whiletrue
```

- The document you are typesetting may access the system shell.

```
\immediate\write18{sudo rm -rf /}
```

### 3. Steep Learning Curve

# The Case for Lightweight Markup

## *Comparison of $\text{\LaTeX}$ and Markdown*

```
\section{This is a level one heading}
```

This is a text paragraph with `\emph{emphasis}`.

```
\begin{quotation}This paragraph will show as a quote.\end{quotation}
```

```
\begin{verbatim}
```

This is is a source code example.

```
\end{verbatim}
```

```
\begin{itemize}
```

```
  \item First item with \alert{strong emphasis}
```

```
  \item Second item with a link%
```

```
    \footnote{See \url{http://link.com} (Title)}
```

```
\end{itemize}
```

```
\begin{enumerate}
```

```
  \item First item with \verb`inline code`.
```

```
  \item Second item with an \includegraphics{image.png}
```

```
\end{enumerate}
```

# The Case for Lightweight Markup

## *Comparison of $\text{\LaTeX}$ and Markdown*

### # This is a level one heading

This is a text paragraph with emphasis.

> This paragraph will show as a quote.

```
~~~~~This is is a source code example.
```

\* First item with **strong emphasis**

\* Second item with a [link](http://link.com/ "Title")

1. First item with `inline code`.

2. Second item with an ![image](image.png "Title")

# The Case for Lightweight Markup

## *Markdown as a Content Creation Language*

### 1. Minimal Markup to Text Ratio

- Recall: Knuth (1986) and Downey et al. (2016) are ~22 % markup.
- *Efficient R programming* (Gillespie et al., 2016) is 5.5 % markup.
- *R for Data Science* (Grolemund et al., 2016) is 3.8 % markup.

### 2. Either Sandboxing Support ...

- A Markdown document converted to  $\text{\TeX}$  will always compile.
- The document may neither halt nor access the shell.

### 3. ... or Hybrid Markup Support

- Structurally simple sections can use pure Markdown, complex sections may combine Markdown and the host markup.

### 4. Mild Learning Curve

## Existing Solutions

### *The Swiss Army Knife of Pandoc*

*If you need to **convert files from one markup format into another**, Pandoc is your swiss-army knife.*

— MacFarlane ([2016b](#)), emphasis mine

- A multi-target publishing software.
- Supports tens of markup languages (Markdown,  $\text{\LaTeX}$ , HTML, XML Docbook) and output formats (ODF, OOXML, PDF).
- The use of Pandoc for the preparation of  $\text{\LaTeX}$  documents has been described in TUGBoat by Dominici ([2014](#)).



## Why Is Pandoc Not Ideal?

## # Heading {#link}

This is `\protect\hyperlink{link}{a link}`.

- Markdown documents cannot be directly edited at collaborative T<sub>E</sub>X platforms such as ShareL<sup>A</sup>T<sub>E</sub>X or Overleaf.

# Existing Solutions

## Why Is Pandoc Not Ideal?

### 3. Half-hybrid, Half-sandboxed

- The input is heuristically parsed and sanitized:

This `{will} 2^n \begin{get} s~nitized and \this{will}`  
not `\begin{equation}2^n\end{equation} $2^n$.`

↓↓

This `\{will\} 2^{n} \textbackslash\begin\{get\}`  
`s\textasciitilde\ nitized and \this{will} not`  
`\begin{equation}2^n\end{equation} \((2^n\)).`

- Malicious input such as

```
\def\shell{18} \immediate\write\shell{sudo rm -rf /}
```

is left alone by Pandoc.

## Section 2

# **The `markdown.tex` Package**

## Building a Parser

*Is T<sub>E</sub>X Up to the Task?*

There exist formal language parsers written solely in T<sub>E</sub>X. These parsers recognize regular (T<sub>E</sub>X3 Project, 2016) and context-free LL(1) languages (Carlisle, 2000). Markdown is not context-free:

```
`There is a literal backtick (`) here.`
```

and a parser needs to be able to backtrack over the entire input:

```
[this is not a link](http://link.com/ "Title"
```

Implementing such a parser in T<sub>E</sub>X is possible, but generally a bad idea due to the lack of efficient data structures.

## Building a Parser

*Can We Use Lua Instead of  $\text{\TeX}$ ?*

*Lua is a powerful, efficient, lightweight, embeddable scripting language. It supports procedural programming, object-oriented programming, functional programming, data-driven programming, and data description.*

— Lua Team (2016)

*Lua $\text{\TeX}$  is an extended version of pdf $\text{\TeX}$  using Lua as an embedded scripting language.*

— Lua $\text{\TeX}$  Team (2016)

# Building a Parser

*Can We Use Lua Instead of  $\text{T}_{\text{E}}\text{X}$ ?*

- With Lua $\text{T}_{\text{E}}\text{X}$ , we can directly execute Lua code:

```
1 + 2 = \directlua{ tex.sprint(1 + 2) }
```

- With pdf $\text{T}_{\text{E}}\text{X}$  and other modern  $\text{T}_{\text{E}}\text{X}$  engines, we can spawn a shell and execute the Lua code in a separate process:

```
1 + 2 = \newwrite\script
\immediate\openout\script=script.lua
\immediate\write\script{ print(1 + 2) }%
\immediate\closeout\script
\immediate\write18{texlua script.lua > output.tex}%
\input output.tex
```

# Building a Parser

## *The Lunamark Library*

- Lunamark (MacFarlane, [2016a](#)) is a Markdown parser in Lua.
- The language is specified using a Parsing Expression Grammar (PEG) via the LPeg C library (and a bit of cheating).
- The dependencies of Lunamark were all either compiled into Lua<sub>T</sub><sub>E</sub><sub>X</sub> (LPeg, Slnunicode), or unnecessary (Cosmo, Alt-getopt).
- The library has been released under the Expat (MIT) License.

# The High-Level Overview of the *markdown.tex* Package

## # Heading

This is `\markdownRendererLink{a link}{#link}{#link}{}`.

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# Using Markdown from Within $\text{\LaTeX}$

## *The Sandbox and Hybrid Modes*

```
\documentclass{article}
\usepackage{markdown}
\begin{document}
\begin{markdown}
  Foo bar \TeX{}  $2^n$ .
\end{markdown}
\begin{markdown*}{hybrid}
  Foo bar \TeX{}  $2^n$ .
\end{markdown*}
\end{document}
```

Foo bar  $\text{\TeX}$   $2^n$ . Foo bar  $\text{\TeX}$   $2^n$ .

# Using Markdown from Within $\text{\LaTeX}$

*Mapping Markdown Tokens to  $\text{\TeX}$  Macros*

```
\documentclass{article}
\usepackage{markdown}
\markdownSetup{renderers = {
  link = {#1\footnote{See \url{#3} (#4)}}},
}}
\begin{document}
\begin{markdown}
  Foo [bar](http://link.com "Link").
\end{markdown}
\end{document}
```

Foo bar<sup>1</sup>.

---

<sup>1</sup>See <http://link.com> (Link)

# Using Markdown from Within $\text{\LaTeX}$

## *Syntax Extensions*

- Some syntax extensions were already supported by Lunamark:
  - HTML,
  - footnotes,
  - definition lists,
- New syntax extensions were added as a part of the project:
  - citations,
  - fenced code blocks,
  - IA Writer content blocks.

## Using Markdown from Within $\text{\LaTeX}$

*Syntax Extensions – `\markdownSetup{html}`*

HTML `<b>tags</b>` such as `&lt;b&gt;` are recognized  
*<!-- and comments are just ignored-->.*

HTML tags such as `<b>` are recognized.

# Using Markdown from Within $\text{\LaTeX}$

*Syntax Extensions – `\markdownSetup{footnotes}`*

Here is a footnote reference, <sup>[^1]</sup> and another. <sup>[^long]</sup>

<sup>[^1]</sup>: Here is the footnote.

<sup>[^long]</sup>: Here's one with multiple blocks.

Subsequent paragraphs are indented to show that they belong to the footnote.

Here is a footnote reference,<sup>2</sup> and another.<sup>3</sup>

---

<sup>2</sup>Here is the footnote.

<sup>3</sup>Here's one with multiple paragraphs.

Subsequent paragraphs are indented to show that they belong to the footnote.

# Using Markdown from Within $\text{\LaTeX}$

*Syntax Extensions – `\markdownSetup{definitionLists}`*

Term 1

: Definition

Term 2

: Definition with

multiple paragraphs

**Term 1** Definition 1

**Term 2** Definition  
with multiple paragraphs

## Using Markdown from Within $\text{\LaTeX}$

*Syntax Extensions – `\markdownSetup{citations}`*

Here is a parenthetical citation [`@knuth86`] and a string of several [`see @knuth86`, pp. 33-35; also `@gruber04`, chap. 1].

Here is a text citation `@knuth86` and a string of several `@knuth86` [pp. 33-35; `@gruber04`, chap. 1].

Here is a parenthetical citation (Knuth, 1986) and a string of several (see Knuth, 1986, pp. 33-35; also Gruber, 2004, chap. 1).

Here is a text citation Knuth (1986) and a string of several Knuth (1986, pp. 33-35) and Gruber (2004, chap. 1).

# Using Markdown from Within $\text{\LaTeX}$

*Syntax Extensions – `\markdownSetup{fencedCode}`*

```
~~~ js
if (a > b)
  return c + 4;
else
  return d + 5;
~~~~~
```

```
if (a > b)
  return c + 4;
else
  return d + 5;
```



# Using Markdown from Within $\text{\LaTeX}$

Syntax Extensions – `\markdownSetup{contentBlocks} I`

/Flowchart.png "Engineering Flowchart"

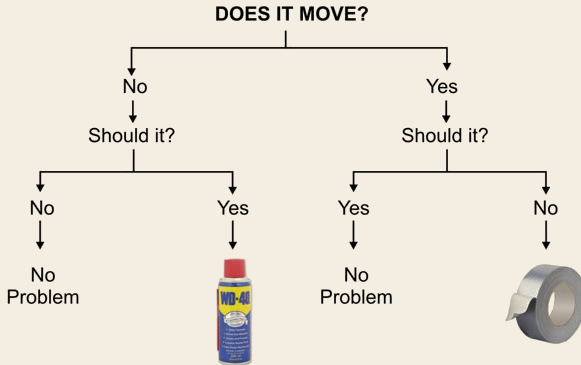


Figure: Engineering Flowchart

## Using Markdown from Within $\text{\LaTeX}$

*Syntax Extensions – `\markdownSetup{contentBlocks}` II*

`/Scientists.csv` (Great Minds of the 19th Century)

name	surname	age
Albert	Einstein	133
Marie	Curie	145
Thomas	Edison	165

Table: Great Minds of the 19th Century

# Using Markdown from Within L<sup>A</sup>T<sub>E</sub>X

*Syntax Extensions – \markdownSetup{contentBlocks} III*

/chapters/01.txt

/chapters/02.txt

## Chapter 1

This is the first chapter.

## Chapter 2

And this is the second chapter.

## Using Markdown from Within $\text{\TeX}$

*Syntax Extensions – `\markdownSetup{contentBlocks}` IV*

<https://tug.org/tugboat/noword.jpg>

(The Communications of the  $\text{\TeX}$  Users Group)

The logo for TUGBOAT, featuring the word "TUGBOAT" in a large, bold, black serif font. The letters are closely spaced, and the overall style is classic and professional.

Figure: The Communications of the  $\text{\TeX}$  Users Group

## Section 3

# Conclusion

# Conclusion

## *The Missing Pieces of the Puzzle*

The `markdown.tex` package

- enables the use of Markdown in environments where tools from outside T<sub>E</sub>X distributions are unavailable,
- gives the authors full control over how individual Markdown elements are rendered and how much access to T<sub>E</sub>X markup the Markdown documents have,
- exposes Lua, plain T<sub>E</sub>X, L<sup>A</sup>T<sub>E</sub>X, and ConT<sub>E</sub>Xt interfaces.
- was released under the L<sup>A</sup>T<sub>E</sub>X Project Public License (LPPL) 1.3 on the Comprehensive T<sub>E</sub>X Archive Network (CTAN) and on GitHub (<https://github.com/witiko/markdown>).

# Conclusion

## *The Missing Pieces of the Puzzle*

- The syntax extensions were backported to Lunamark and merged by MacFarlane, resulting in a new minor version release of the library (0.5.0). (Novotný, [2016a](#))
- The package was featured on the twitter profile and the blog of Overleaf – a major online service for preparing  $\text{\LaTeX}$  documents – along with original example documents. (Lim, [2017](#))

## Section 4

### **Q&A**



## Section 5

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