FACULTY OF MATHEMATICS AND PHYSICS
Charles University

MASTER THESIS

Author's Name

TEXtured Manual

1.5.0

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Contents

Introduction

Already when I started writing my bachelor thesis [1], I tweaked a lot the original LaTeX template (which itself was slightly updated since then [2]) provided for students at MFF CUNI — Faculty of Mathematics and Physics, Charles University in Prague.

Some design choices originated already during this stage, particularly the significant use of theorem-like and remark-like environments with highly interlinked structure of the text.

I picked up right where I left off when I started writing my master thesis [3], and I have been refining the template ever since. Improved understanding of the coding backbone behind LaTeX and its package ecosystem enabled me to customize it even further to my liking, and add even more "bells and whistles".

Remark 1 (Template Purpose)**.** While primarily targeting theses, TeXtured can be used for other document types as well. ⌟

To make it user-friendly, I have restructured the preamble into several files, each of which is responsible for a specific aspect of the document. This way, the user can (and is encouraged to) easily find the relevant part of the code and modify it.

Numerous comments and explanations are provided throughout the code to further aid the user in understanding the template without always having to consult the documentation of packages (which is recommended for more advanced changes).

Remark 2 (How to Setup)**.** To set up TeXtured template for your document, you can use the `Overleaf` template or clone the repository on GitHub [4]. Then, you can start modifying the files to suit your needs.

Also make sure to check the `README.md` file for more detailed instructions, particularly on various software dependencies. If you encounter any issues, please see `jdujava/TeXtured #2` and `jdujava/TeXtured #5`. ⌟

Quick Summary

In **Chapter N** we exhibit an example of a *front matter* chapter.

In **Chapter 1** we present design *Principles* to which TEXtured adheres.

In **Chapter 2** we explain the file structure and the basics of using the template.

In **Chapter 3** we describe various implemented features, design choices, and LaTeX packages helping with the task of realizing goals sketched in Chapter 1.

In **Chapter 4** we give tips and tricks on how to fully utilize and even extend capabilities of TEXtured.

In **Appendix A** we show an example of an Appendix chapter.

> **Note** (WIP Disclaimer)**.** Both Chapter 3^{→p.4} and Chapter 4^{→p.14} are as of now Work-in-Progress. There is a lot of stuff yet to be exhibited and explained. All the colored TODO-like environments are to be resolved in the final version of this document.

Notation & Conventions

Remark N.1. This chapter is numbered (or perhaps more precisely "lettered"). This means that is appears in Table of Contents with its letter "**N**", which also prefixes all numbering of environments in this chapter.

On the other hand, and are unnumbered (or "unlettered") in this sense. ⌟

Example N.2 (Usage of Mathematical Fonts)**.** To make the text more readable and beautiful, we can use different types of mathematical fonts for different types of objects (striving to be at least somewhat consistent):

- ***Bold*** often for tensorial object (abstract index).

- Sans for groups, certain spaces, or some operations/maps.

- 𝔉𝔯𝔞𝔨𝔱𝔲𝔯 for algebras (and densities).

- $\mathcal{Calligraphic}$ (available are only capital letters, and ℓ)

- $\mathit{Calligraphic}$ (alternative font containing also lowercase letters)

- 𝔻ouble-𝕊truck for fields like $\mathbb{R}$, spaces like $\mathbb{S}^n$ and $\mathbb{CP}^n$.

- Typewriter for code functions, or other special objects. ⌟

Example N.3. You can use ⬚ as an argument placeholder. ⌟

1 Design Principles

It is not like I stated the *Principles* at the beginning and then tried to follow them. They emerged more naturally. So the causal structure is more like

$$
\begin{array}{ccc}
\text{made some} & & \text{implemented} \\
\text{design choices} & \text{and} & \text{certain features}
\end{array}
\quad \rightsquigarrow \quad
\begin{array}{c}
\text{recognized} \\
\text{at first subconscious} \\
\text{overarching principles}
\end{array}
\quad .
$$

Anyway, here they are.

> **Definition 1.1** (Design Principles). The main design *Principles* are:
>
> - **Elegance** — Aim for a classy, typographically elegant layout.
>
> - **Structure** — Create a smart, easy-to-reference, and skimmable structure.
>
> - **Clarity** — Eliminate distractions and strive for clear explanations.

Remark 1.2 (Common Goal, Alternative Definition via Antiprinciples)**.** There is also an alternative point of view. The common goal of $\boxed{\text{Design Principles}}$ is to minimize the following *Antiprinciples*:

- We should be concise, and that means fewer pages, the better. Long blocks of text without noticeable space between paragraphs are preferred (the reader should go on a walk to have some breathing spacetime).

- Avoid creating distinct anchor points for important concepts, since an attentive reader should be able to extract them from blocks of text.

- Do not waste time referencing earlier discussions and reflecting on them from the current context and point of view, as the reader is anyway making such connections all the time. ⌐

Each of these principles is somehow reflected in the design choices and features included (or omitted) in TEXtured, see $\boxed{\text{Chapter } 3^{\rightarrow\text{p.4}}}$ for more details.

Remark 1.3 (Disclaimer)**.** The following is at places highly opinionated, and not applicable to all scenarios and use-cases. I tried to describe my reasons for specific design choices, with which you can certainly disagree. I hope that at least it can provoke more people *(especially you!)* to contemplate about document creation, ideally resulting in production of documents with overall better quality. ⌐

2 Usage of TEXtured

To quickly familiarize yourself with the TEXtured template, we will go through the basic structure of the template files and explain how to use them. First, take a look at Figure 2.1→p.2 for a visual representation of the file structure.

```
TEXtured Root Directory/
├── thesis.tex
├── LICENSE
├── README.md
├── chapters/...
├── figures/...
├── frontmatter/...
├── preamble/
│   ├── bibliography.bib
│   ├── data.tex
│   ├── main.tex
│   └── ...
├── .latexmkrc
├── .gitignore
├── .gitattributes
└── .github/...
```
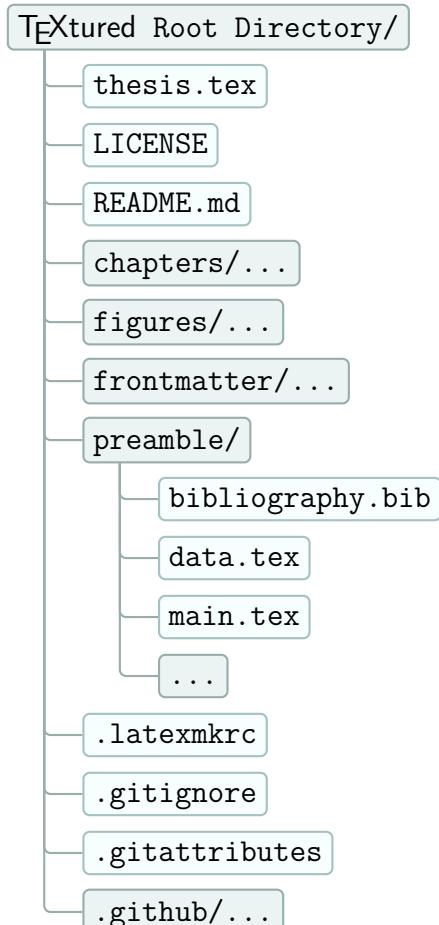
Figure 2.1 / TEXtured template file structure.

The main file is `thesis.tex`. It does not contain the actual content of the document, but instead `\include`s the chapters and *front matter* pages from the corresponding directories.

Make sure to fill all PDF (meta)data — like title, author, etc. — in the `preamble/data.tex` file. The bibliography/reference data is stored in the `preamble/bibliography.bib` file.

All of the TEXtured tweaks and settings located in files under `preamble/...` directories are loaded by the `preamble/main.tex` file, which is itself `\input`ed in the `thesis.tex` file.

The `.latexmkrc` file contains a configuration for the latexmk tool, which provides a convenient way to compile the document.

The usual workflow looks something like this:

- **Metadata**. Fill in the `preamble/data.tex` file with the necessary information about the document — title, author, and other *metadata*.

- **Content**. Write the content of the document in the `chapters/` directory. If you need more chapters, just create a new file, and `\include` it in the `thesis.tex` file at appropriate place.

- **Figures**. To include figures, you can put them in the `figures/` directory. Since this directory is by default included in `\graphicspath`, there is no need to specify full/relative path, and it is enough to use just the filename in the `\includegraphics` command.

- Citations. Using (for example) `\autocite` macro, you can cite in the text any entry added to the `preamble/bibliography.bib` file.

Remark 2.2 (Toggles)**.** There are a couple of *toggles* in the `thesis.tex` file that can be used to customize style/layout/creation of the document:

- Page Layout — you can choose between *Single-Side* or *Two-Sided* printing by uncommenting the appropriate `\documentclass` line.

- Fancy Style (default: `enabled`) — if the default style is not to your liking, you can disable some of the more "fancy" stylistic elements by using the `\FANCYfalse` line.

- Work-In-Progress Version (default: `disabled`) — if you want to mark the document as a *Draft*, leave the `\WIPtrue` line uncommented (comment out for the final version).

  - Extra Margin (default: `disabled`) — the *Draft* document will include extra right margin (for notes and corrections) when you enable it using `\EXTRAMARGINtrue`.

- Link Boxes (default: `enabled`) — drawing of link/reference boxes can be disabled by `\LINKBOXESfalse` command (improves compilation time).

- Censored Version (default: `disabled`) — if you want to censor chosen parts of the document, include the `\CENSORtrue` line.

- Include Only ... — if you want to compile only a subset of chapters, you can utilize the `\includeonlysmart` command.

Remark 2.3 (MFF CUNI Template Compatibility)**.** T_EXtured can be used out of the box for theses at the Faculty of Mathematics and Physics, Charles University in Prague. Just be sure to include all *front matter* pages and fill out necessary data:

- Title Page with the faculty logo (among other things),

- Declaration,

- Dedication (optional),

- Information Page including the Abstract.

This is done by uncommenting the relevant lines in the main `thesis.tex` file.

Layout of these front matter pages is adapted and modified from the original MFF CUNI template [2]. However, always make sure it is compliant with the faculty guidelines, otherwise please raise an issue on GitHub [4].

Remark 2.4 (License)**.** If you want to make your document publicly available (together with the source code), you should not forget to include an appropriate license of your choice — change the `LICENSE` file, specifying the `CC0 1.0 Universal` license of T_EXtured.

Features of TEXtured

In the following sections, we will describe the features of TEXtured template, implemented by utilizing various LaTeX packages and custom macros.

Remark 3.1 (Packages and Macros). We will refer to various LaTeX packages and macros using the following styles:

- `package`$^{\rightarrow\,\text{CTAN}}$ — a package (together with a link to its CTAN page),

- `\macro` — a command/macro, either built-in or provided by a package,

- `\custommacro` — a custom macro defined in the TEXtured template.

3.1 Code Organization

To avoid large and hard to navigate preamble files, the code is organized into multiple directories/files in the `preamble/` directory, each focusing on a particular function/feature, see Figure 3.2$^{\rightarrow\,\text{p.4}}$.

```
preamble/
    bibliography.bib
    data.tex
    toggles.tex
    main.tex
    debug/...
    environments/...
    general/...
    hacks/...
    layout/...
    math/...
    misc/...
    pdfA-compliance/...
    references/...
    user/...
```
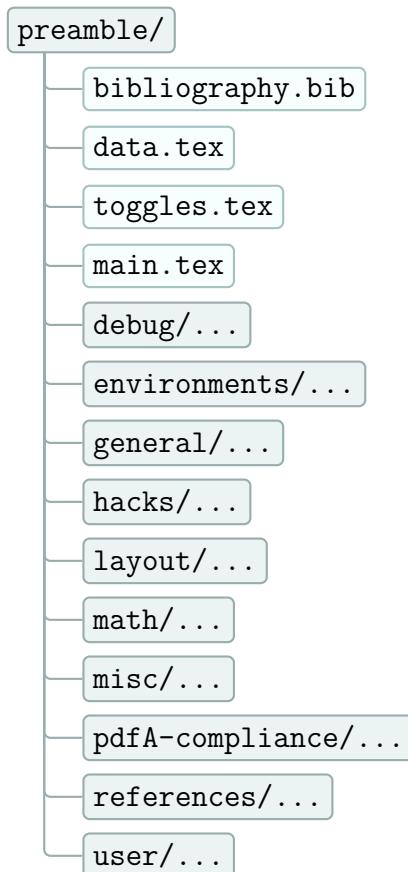
Figure 3.2 / Structure of the `preamble/` directory.

It is critical that the `preamble/pdfA-compliance/glyphtounicode.tex` file ensuring the PDF/A compliance is sourced before `\documentclass`.

The `preamble/toggles.tex` files defines various toggles, which should be appropriately set right after. Finally, the rest of (preamble) files are then loaded through the `preamble/main.tex` file.

When possible, add your own tweaks and macros to the `preamble/user/` directory reserved for this purpose. This way, you can easily update to newer versions of TEXtured (hopefully) without conflicts.

Remark 3.3 (Pointers to Directories/Files)**.** If you want to tweak some aspect of the template — or learn how a given feature is implemented — pointers to the relevant directories/files are provided next to the subsequent section/subsection titles to help you navigate the code. ⌟

Remark 3.4 (Custom User Macros)**.** Store your own macros in the `preamble/user/` directory, which is reserved precisely for this purpose. Then, if you would like to update to a newer version of TEXtured, you will be having easier time — less mixing of your code with the template code will result in fewer conflicts you must resolve manually. ⌟

Remark 3.5 (Auxiliary Files)**.** To avoid cluttering the directories with *auxiliary files* generated during the compilation, it is recommended to use the `aux_dir` setting in the `.latexmkrc` file (enabled by default, the `aux_dir` being `.aux/`). All auxiliary files are then stored in a separate directory, leaving the rest tidy. ⌟

Remark 3.6 (Suggestion: One Sentence Per Line)**.** It is a good practice to follow "one sentence per line" rule (or something similar), since it improves diffs for versioning systems like `git`. Tools like `latexindent` can help.

> **Note.** My config for `latexindent` mostly works, but some corner cases can surface. Will share someday.

If multiple sentences are on the same line, changing just one word results in the whole line being marked as changed, making it harder to see how much the text was actually changed in a given commit. ⌟

3.2 Page Layout and Style   `preamble/layout/`

We will first describe the page layout and style, which includes page dimensions, headers and footers, page numbering, and heading style.

Page Dimensions, Printing Layout `preamble/layout/geometry.tex`

Using `geometry`→CTAN package — set up the page layout (supported single/double-sided printing). Apply `\flushbottom` — try to make text body on all pages have the same height.

Page Headers and Footers   `preamble/layout/headers.tex`

Using `fancyhdr`→CTAN package — page headers and footers — consistent style also for initial page of a chapter (not totally different style with numbering in the bottom center . . .).

Page Numbering   `preamble/layout/numbering.tex`

Placing custom `\frontmatter`, `\mainmatter`, and `\backmatter` macros at appropriate places in `thesis.tex`, *Roman numbering* is set up for *front matter*, that is until the start of first numbered chapter, and then *Arabic numbering* for the rest of the document.

Heading Style   `preamble/layout/titles.tex`

Pretty chapter heading style — big calligraphic number/letter behind the title.

3.3   Sane Typographical Defaults   `preamble/general/`

Now we will concern ourselves with more intricate and detailed typography, more at level of paragraphs, sentences, words, and even letters.

Paragraphs   `preamble/general/typesetting.tex`

No paragraph indentation, proper space between paragraphs — `parskip`→CTAN.

Floats, Captions   `preamble/general/floats.tex`

Caption styling includes a slight hang, `\footnotesize` font, and a bold sans label. See Appendix A →P·19 for a showcase of the different caption types.

Font and Related Stuff   `preamble/general/typesetting.tex`

The default choice are *Latin Modern* fonts — a classic really. Various families and shapes are typically used for different purposes:

- *Serif* family for the main text

- *Slanted* shape for emphasis using `\emph` macro (instead of the default *Italic* shape, which is reserved mainly for math formulas)

  Remark 3.7 (Nested Emphasis)**.** Nested emphasis is displayed in *Italic* shape. It is rather rare to nest an *additional emphasis inside an emphasis.*   ⌟

- *(Bold) Sans* family for headings and other structural elements

- *Typewriter* family for computer code and similar stuff

Example 3.8. Quick showcase of some font families and shapes:

This is Latin Modern Serif $\alpha = 2^2$
This is Latin Modern Serif Oblique $\alpha = 2^2$
This is Latin Modern Serif Bold $\alpha = 2^2$
This is Latin Modern Serif Bold Oblique $\alpha = 2^2$ ⌟

This is Latin Modern Sans $\alpha = 2^2$
This is Latin Modern Sans Oblique $\alpha = 2^2$
This is Latin Modern Sans Bold $\alpha = 2^2$
This is Latin Modern Sans Bold Oblique $\alpha = 2^2$

> **Note.** Sans math font has problems with showing properly all bold symbols (sub/superscripts don't work automatically).

For consistent quotation use `\enquote` macro provided by `csquotes →CTAN`.

Micro-Typography `preamble/general/typesetting.tex`

Enable micro-typographic extensions with package `microtype →CTAN`, most prominently character protrusion and font expansion.

Following quote from `microtype →CTAN` documentation nicely explains what it is about:

> Micro-typography is the art of enhancing the appearance and readability of a document while exhibiting a minimum degree of visual obtrusion. It is concerned with what happens between or at the margins of characters, words or lines. Whereas the macro-typographical aspects of a document (i.e., its layout) are clearly visible even to the untrained eye, micro-typographical refinements should ideally not even be recognizable. That is, you may think that a document looks beautiful, but you might not be able to tell exactly why: good micro-typographic practice tries to reduce all potential irritations that might disturb a reader.

3.4 Document Structure

It is important to have a clear and consistent structure of the document. This can be achieved by using various environments for different types of content, and by providing clear and informative titles for each part of the document, thus making it easier to navigate and understand.

Structure Environments `preamble/environments/*.tex`

Inspired by the structured mathematical texts, enclosing various parts of the document in the corresponding environments can help to make the document more structured and easier to read. Implemented mostly `tcolorbox →CTAN` package and `keytheorems →CTAN` (modern key–value interface for `amsthm →CTAN`).

Remark 3.9 (Default Environments)**.** There are predefined boxed "theorem-like" environments for Definition, Theorem, Lemma, Corollary, Proposition, and non-boxed "remark-like" environments for Remark, Proof, Example, Derivation, Calculation, Idea, and Tip (these have at least a mark indicating the end of the environment).

↳ Names of the corresponding environments are lowercase, for example `definition`, `remark`, and so on. They also accept an optional argument for a short description. ⌟

Some additional points about the *structure environments*:

- provide clear structure, enables high level of interlinking

- they make the text easy to skim through, quickly get an idea, and know roughly what to expect

- have shared numbering, together with tables, figures, equations — leads to a linear increase of the reference number, making them easier to locate

- not only for physics/math texts, can be generally used to highlight key ideas

  Tip 3.10 (Custom Structure Environments)**.** You can easily create additional "structure" environments, see Section 4.1 $^{→\text{P.14}}$. ⌟

- avoid using emphasis for the whole body of "theorem-like" environments, since we already have a whole box around it to make them stand out

Remark 3.11. There are also helper environments for Todo-like notes. By default, there are Todo, Note, Suggestion, and Question environments, but you can easily create your own.

To avoid conflicts with possible existing macros/environments, names of these environments are capitalized, for example `Todo`, `Note`, and so on. ⌟

> **Note.** No "code listing" setup yet. PRs welcome.

References and Links `preamble/hacks/custom-reference-boxes.tex`

Custom reference/link/citation styles using `tcolorbox`$^{→\text{CTAN}}$ package.

> **Note** (Slight Inconvenience — Line Breaks)**.** There is a slight inconvenience due to small flexibility around line breaks. It would be nice to have a proper workaround.

Remark 3.12 (Rationale)**.** I like to have clearly distinguished references, links, and citations. By default, `hyperref`$^{→\text{CTAN}}$ provides frames around links, but they are not that pretty, and the PDF viewer must support them. Using just colors can sometimes look better, but I still wasn't satisfied.

Sometimes it is nice to know the precise location of the reference, especially when the document is printed and you cannot simply click on them. Therefore, the page number is (by default) included with `\Cref`, see Remark 3.13 $^{→\text{P.8}}$. Use the starred variant `\Cref*` to omit it. ⌟

Remark 3.13 (Automatic Reference Type Detection)**.** Package `zref-clever`$^{→\text{CTAN}}$ provides `\zcref` command — similarly to the older, no longer maintained, `cleveref`$^{→\text{CTAN}}$ package — which automatically detects the type of reference, ⌟

and formats it accordingly. This behavior is adapted in TEXtured with the macro `\Cref`, which wraps the link in nice box, and also shows a corresponding page number of the target.

If you want the link to show the reference title, use `\Nref` — or the starred variant `\Nref*` to omit the page number — which utilizes `zref-titleref`→CTAN.

Table of Contents and Outline/Index `preamble/layout/toc.tex`

Clear and elegant Table of Contents, which includes all the important parts — also (unnumbered) subsections, but in a more compact style.

Similarly, automatically populate the PDF Outline/Index (digital Table of Contents in PDF viewer). It is very handy for navigating longer documents, and includes also other important pages other than just initial pages of main chapters: Title Page, Contents, Introduction, References, and so on.

Remark 3.14. I use `Zathura` as my PDF viewer, with the Outline/Index just one `Tab` away, allowing me to quickly jump to the desired part of the document.

Remark 3.15 (List of Figures, Tables, ...)**.** If you want/need to include a List of Figures, List of Tables, and so on, you can easily do so by uncommenting the relevant lines in the `\contentsandlists` macro.

3.5 Bibliography/References `preamble/references/`

Pretty and functional Bibliography/References, via `biblatex`→CTAN package.

Bibliography Style `preamble/references/*.tex`

Entries in `References`→p.22 have a clean consistent style, which builds on the `ext-numeric-verb` style from `biblatex-ext`→CTAN package.

Tip 3.16 (Bibliography Data)**.** Make sure to gather all the relevant data you need for every reference. If you later decide you want to reduce the amount of presented information, `biblatex`→CTAN can help you with that. For example, it is possible to automatically

- remove `url` field if `doi` field is present,
- ignore unwanted fields (`pages`, `number`, `volume`, `series`, `location`, ...).

Extra Fields `preamble/references/biblatex-extra-fields.dbx`

Support extra `github` field.

Custom External Links `preamble/references/doi-eprint-url.tex`

Have the external DOI/arXiv/URL/GitHub links displayed in custom boxes, and place them on the new line.

Backreferences `preamble/references/backref.tex`

Include *backreferences*, which point from the bibliography to the pages where the reference was cited.

Citation Style `preamble/references/cite.tex`

Include [and] characters around citation number inside the link (and wrap in `tcolorbox`→CTAN ...), for example [4].

3.6 PDF/A Compliance `preamble/pdfA-compliance/`

Proper metadata setup (via `hyperref`→CTAN and `\DocumentMetadata`).

Remark 3.17 (Document Data)**.** Various data about the work should be entered in `preamble/data.tex` file. When the relevant entries contain LaTeX commands (for example to obtain specific formatting of the title), it is necessary to provide "plaintext" variations, so that `hyperref`→CTAN can properly set up PDF metadata.⌟

Next we will describe various common violations of PDF/A standard, and how to fix them.

Glyph to Unicode Map `.../pdfA-compliance/glyphtounicode.tex`

To obtain PDF/A compliant PDF, we need to have Unicode mapping for all glyphs used in the document. It can happen — mainly when using fonts providing extra mathematical symbols — that certain glyphs are not covered by mappings loaded in `preamble/pdfA-compliance/glyphtounicode.tex`.

In the `preamble/pdfA-compliance/glyphtounicode.tex` file you can also find an example veraPDF output for a PDF with a problematic glyph. It also points to a guide located in `preamble/pdfA-compliance/LaTeX-find-glyph-name/` directory, which explains how to find out the glyph name, and how to provide the *glyph to Unicode* mapping with `\pdfglyphtounicode` command.

PDF `/Interpolation` Key

Some PDFs can have enabled the `/Interpolation` key, for example `Inkscape` generated PDFs with blur parts. However, PDF/A requires it to be disabled.

This is automatically fixed by `figures/Inkscape/inkscape-export-to-latex` shell script.

3.7 Miscellaneous

Math-Related Tweaks — $e^{i\pi}$
`preamble/math/`

Some of the math-related tweaks:

- Use `\boldmath` automatically for `\textbf` text (useful mainly in headings).

- Possible to use sans italic font for math via `\mathsfit`.

- Better extendable arrows with `TikZ`→CTAN.

- *(Optional, disabled by default)* Automatically change usage of `\textcolor` to `\mathcolor` in math mode, so that we get proper math spacing, for example

$$a \times b \text{ (right spacing)} \qquad \text{versus} \qquad a{\times}b \text{ (wrong spacing)}.$$

  However, it is recommended to explicitly use `\mathcolor` when appropriate, since it leads to easier maintenance of the code (copy-pasting to other projects will work without problems).

Following practice is highly recommended.

Tip 3.18 (Define Your Own Math Macros). Frequently define macros for notation used more than once. Advantages are for example:

- Code is easier to read/write, since it is more "semantic".

- To tweak notation, you only need to change it in one place.

- Easier to find all occurrences of a certain notion.

GitHub Actions
`.github/workflows/`

Describe implemented GitHub Actions:

- Automatic `latexmk` build of the latest PDF version.

- PDF/A verification via veraPDF.

- Deploy to `gh-pages` branch. One can furthermore enable (in repo settings) GitHub Pages for `gh-pages` branch, which will automatically upload latest PDF to `https://username.github.io/reponame/thesis.pdf`. This enables convenient sharing of your (even continuously evolving) work without needing to commit the PDF (resulting in large repository size) or compiling the PDF on the receiving side.

  Remark 3.19 (Private Repositories). Even for private repositories such link is publicly accessible. This is why GitHub Pages setup is not done automatically for you. If you want to share the work more "privately", there are other solutions, for example GitHub Action which uploads PDF to Google Drive, and sharing via a private link. Also look at Section 3.7 →P.12.

Censoring `preamble/debug/censor.tex`

Censoring/redaction using `censor→CTAN` package. Use `\censor`, `\blackout`, or `\censorbox`. For example, ███████████████████████.

Inkscape Integration `preamble/misc/inkscape.tex`

Put your `Inkscape` figures into `figures/Inkscape/` directory, and include them using `\includeInkscapeSVG` macro (in place of `\includegraphics`), which has the following features:

- Automatic export after changing the `svg` (need to enable `--shell-escape` for pdfTEX or LuaTEX, done via `.latexmkrc`).

- Watermark via a `PostScript` injection.

  Remark 3.20 (Watermark String). By default, the watermark string is composed as "©⟨*year*⟩ ⟨*author's name*⟩", where the author's name is extracted from `\ThesisAuthorPlaintext`. You can customize it in the shell script `figures/Inkscape/inkscape-export-to-latex` to your liking. ⌐

- Automatic fix of `/Interpolation` key problem.

- All text is processed by LaTeX, ensuring consistent typesetting experience. In particular, you can enter math as usual through `$...$`.

3.8 Non-Features

These features were deemed unnecessary, or even counterproductive, and thus were not implemented/not customized. This does not mean that it is hard or not compatible to use them with TEXtured.

Footnotes

- they break the flow of reading, can be distracting

- either it is important and you want it there — no need to use footnotes — or it is not so important (maybe just a reminder/remark), but then there are in my opinion better ways to handle such situation

  - grayed out/smaller text, sidenotes are better alternative, if the page layout enables them

  - it is not bad to remind reader of something in the main text...

Index, Glossary

- since the text is primarily intended for electronic use, finding usage of certain terms is easy

- text should be ideally structured in such a way, that finding definitions of important terms is straightforward — interlinking/referencing in proper places to indicate where the notion to be used was defined/discussed

Tips & Tricks

In this chapter we will see how to utilize and even extend capabilities of TEXtured. Additionally, there will be sprinkled miscellaneous tips on how to improve the quality of your document.

4.1 Structure

Headings

- numbered and "lettered" chapters

  > **Todo.** Describe `\chapternotnumbered`, and "lettered" chapters in front matter.

- Use nicely named subsections — much easier to navigate, since it leads to better ToC and Index

  > **Todo.** Describe `\texorpdfstring`.

Structure Environments

- Utilize structure (remark, definition, ...) environments to make the document more structured and easier to read. Including a brief description as an optional argument can help to foreshadow the content of the environment. Important concepts will then stick out more and will be remembered better.

  Remark 4.1 (Spacing at the End of Structure Environments)**.** Structure environments ending with displayed math or a list may need a bit of tweaking to ensure proper spacing at their end.

  This is most easily achieved using the `\qedhere` macro on the line, which should be the last one in the environment. This uses the mechanism of the `\qedhere` macro from `amsthm →CTAN` package, but now has also a starred variant for extra vertical space (for equations containing big operators), or even an optional argument for a completely custom vertical shift.

  > **Todo.** Describe creation of new "structure" environments.

- Try to motivate every definition/theorem with "normal" text, do not let the document degenerate just into a listing of definitions/theorems/proofs/...

- Use references to other remarks/definitions/sections to make the document more interconnected, which can help the reader to look at a bigger picture, recollect necessary information to proceed further, or to understand the context better.

> **Todo.** Show using `\autocite{TODO}` in the text **[●]**. Helps to not forget to add the citation later.

4.2 Typography

- use `~` to enter a non-breakable space, or also after a dot in the initials or after academic titles (otherwise one gets bigger space than is proper), for example `M.Sc.~Name Surname`

- proper usage of hyphens/dashes — learn when to use hyphen - (`-`), when en-dash – (`--`), and when em-dash — (`---`)

- use *emphasis* with `\emph` for the names of new and important concepts

- for quotation marks use `\enquote` from `csquotes`→CTAN package

- sometimes using gray text instead of parentheses may result in a cleaner look, for example instead of "(pseudo-)Riemannian" just gray out "pseudo-" like "pseudo-Riemannian"

- choose capitalization style of titles, and stick with it — I chose "titlecase"

4.3 Mathematics & Physics

Math Typesetting

Learn stuff in `amsmath`→CTAN/`eqnlines`→CTAN and `mathtools`→CTAN packages. Then it is possible to write pretty multi-line equations like the following inclusion map

$$\iota \colon (\mathbb{S}^1, \mathbb{R}_{\geq 0}, \mathbb{S}^{d-1}) \longrightarrow \mathsf{AdS}_{d+1}/\mathbb{Z} \qquad \begin{cases} X^{-1} = \sqrt{\ell^2 + r^2}\cos(t/\ell), \\ X^0 = \sqrt{\ell^2 + r^2}\sin(t/\ell), \\ X^i = r\omega^i \quad \text{for } i \in \{1, \ldots, d\}. \end{cases}$$
$$(\, t \, , \ r \ , \ \omega^\bullet \,) \longmapsto X = \iota(t, r, \omega^\bullet) \equiv$$

Remark 4.2 (Math Ending Punctuation)**.** Make sure to use `\eqend` or `\eqcomma` macro (when appropriate) to properly end a math environment with a period or a comma, respectively. They add a small space before the punctuation to make the formula look better.

> **Todo.** Maybe show diagrams with `TikZ`→CTAN package.

Numbers and Units

Use `siunitx`→CTAN package for convenient typesetting numbers and units. Examples are shown in `Table 4.3`→P.16.

> **Note.** The `siunitx`→CTAN package is very powerful and flexible. It can be even used to nicely align numbers in tables. As of now, this feature is not customized in any way in TEXtured. Suggestions for improvements are welcome.

Command	Output	Usage
`\num{123.45 e-8}`	$123.45 \cdot 10^{-8}$	numbers
`\si{\meter\per\second\squared}`	$\mathrm{m/s^2}$	units
`\SI{123.45}{m/s^2}`	$123.45\,\mathrm{m/s^2}$	numbers with units
`\SIrange{1}{10}{\kilo\meter}`	$1\text{–}10\,\mathrm{km}$	ranges
`\SIlist{1;3;5}{A}`	$1\,\mathrm{A},\, 3\,\mathrm{A}$ and $5\,\mathrm{A}$	lists
`\SI{1.23 +- 0.45}{\celsius}`	$(1.23 \pm 0.45)\,^\circ\mathrm{C}$	uncertainties

Table 4.3 / Examples of `siunitx`→CTAN package usage.

4.4 LATEX Coding

> **Todo.** Describe how to create custom macros with `\NewDocumentCommand`, `\RenewDocumentCommand`, `\NewCommandCopy`, …

> **Question.** Difference between "macro" and "function" in LATEX? Which nomenclature is appropriate?

Remark 4.4 (Macro Space Handling)**.** Using macro inside text in the form `\foo` can swallow the following whitespace. When this is not the desired behavior, call the macro like `\foo{}`. In this way an empty argument is passed to the macro, leaving the following whitespace intact.

> **Todo.** Describe `\makeatletter` and `\makeatother`.

> **Todo.** Describe `\ensuremath`. When math macro is used often outside math mode (alone as `...\(\foo\)...`), defining it wrapped in `\ensuremath` can lead to perhaps easier use (as just `...\foo{}...`).

> **Todo.** Describe `\includeonlysmart`.

> **Note.** Be careful about implicit end of line spaces in function definitions, sometimes necessary to use `%` after last command on the line. TODO: Describe this in more detail.

> **Todo.** Describe WIP mode (particularly with LuaLATEX).

Note. Some comments in source code refer to files from TEXLive installation on Arch Linux. On other distributions or operating systems the paths might be different.

Summary and Outlook

Summary and Outlook.
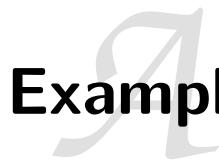
Example of Appendix Chapter

Example A.1 (Figure Caption Tweaking)**.** Now we will show off some figures with tweaked position/extent of the captions. Figure A.2→ᴾ·¹⁹ has a side-caption, while Figure A.3→ᴾ·¹⁹ has a caption that spans just the width of the figure. This utilizes the `floatrow`→ᶜᵀᴬᴺ package and is inspired by the ITT LaTeX template [6]. ⌐
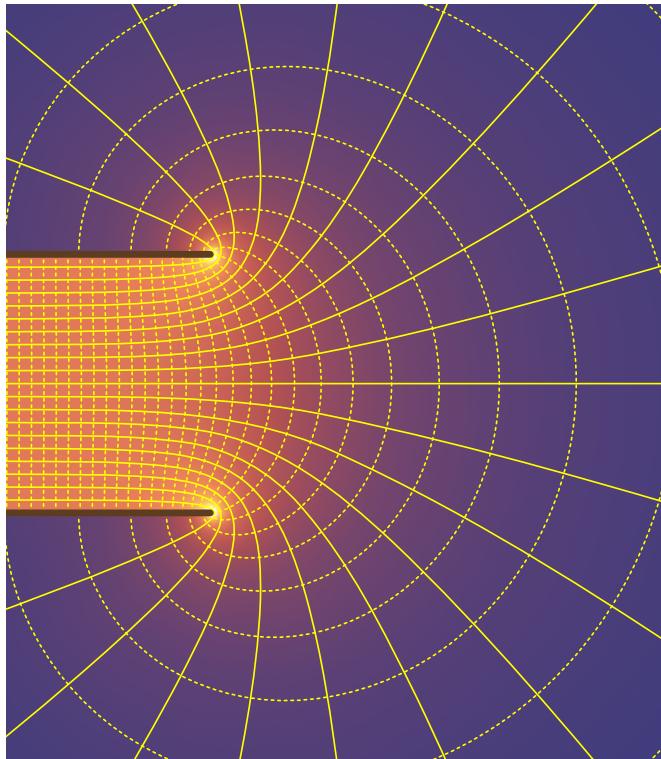
Figure A.2 / Example of a figure with a side-caption.

It displays the two-dimensional electric field near one end of a parallel plate capacitor.

Legend:

equipotentials	
field lines	
capacitor plate	

You can also optionally use a footnote for the figure caption.
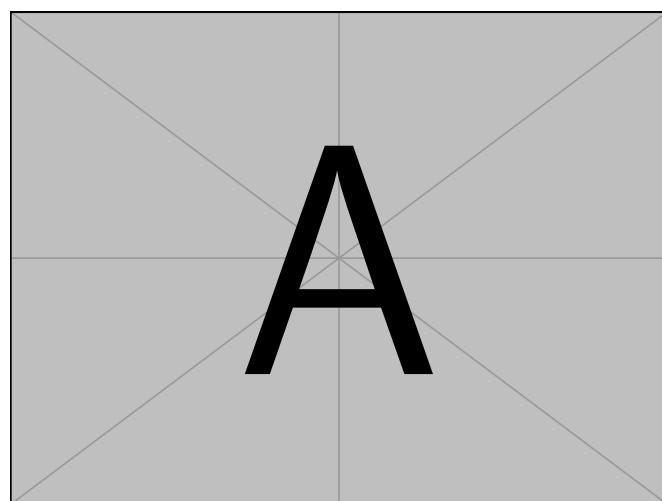
Figure A.3 / Example of a figure with a caption spanning just the width of the figure.

Example A.4 (Multi-Paragraph Figure Caption with Verbatim Text)**.** It is possible to have multi-paragraph captions for figures. One must remember to provide a short description as `\caption[This is a Short Description]{...}`, or else LaTeX will complain.

See `Figure A.5`[→p.20] for an example, demonstrating also a workaround for type-setting verbatim text in contexts where "fragile" commands are not allowed. ⌐
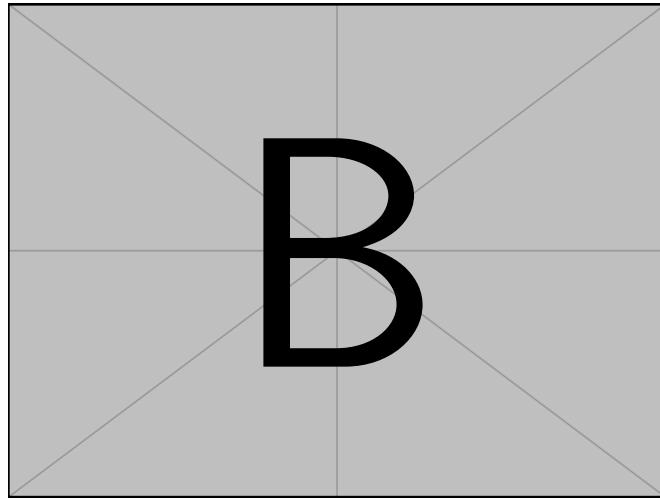

Figure A.5 / Example of a figure with a multi-paragraph caption.

Notice the spacing between the paragraphs. It was customized using the `parskip` key in `\captionsetup` provided by the `caption`[→CTAN] package.

To typeset verbatim text in the caption, use the `\fakeverb{...}` command instead of the usual `\verb|...|`, which is not allowed in captions.

A.1 Appendix Section

Note the numbering of various environments in the appendix.

> **Definition A.6** (Math in the Description — $\sin(\alpha) \approx \alpha$)**.** This is an example definition in an Appendix. Note the automatic switch to the alternative sans math font in the Definition description.

Remark A.7. The page header reflects that this is an appendix page. ⌐

Example A.8 (Equation Numbering and Referencing)**.** As was mentioned already in `Section 3.4`[→p.7], equations share numbering with *structure environments*. For example, the equation

$$\phi^* \boldsymbol{g}' \overset{!}{=} \Omega^2 \boldsymbol{g} \equiv \mathrm{e}^{2\omega} \boldsymbol{g} \tag{A.9}$$

is numbered as (A.9) in the appendix.

We can reference this equation using `\Cref` as `Equation (A.9)`[→p.20]. Starred variant `\Cref*` results in `Equation (A.9)`. If you desire less verbose output, you can use `\eqref`, which gives (A.9). ⌐

Theorem A.10 (Example with Math at the End)**.** Theorem ending with math, with proper spacing by utilizing `\qedhere` (can even use an optional argument to finetune the spacing)
$$a^2 + b^2 = c^2 \,.$$

References

Back-references to the pages where the publication was cited are given by ⬤.

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[6] Vasco Alexander Wild and Alex Povel. Template of the Institute of Engineering Thermodynamics (M-21). **2024**.
url: `https://collaborating.tuhh.de/m21/public/theses/itt-latex-template`
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