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Faculty of Engineering, Computer Science and Psychology
Institute of Measurement, Control and Microtechnology

mrmthesis user documentation v. 1.6

Student Research Project

by

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1 Introduction

1.1 Short introduction into (La)TEX

TEX was developed by Donald E. Knuth 1977 until 1986. In contrast to the general opinion, TEX is no text processing program. In fact, it is a typography system based on macros. LATEX in contrast is a mighty collection of useful TEX macros implemented by Leslie Lamport in the early 80s. The actual Version of LATEX is 2e and is used by *mrmthesis*.
This short documentation of using *mrmthesis* has no objections to explain TEX or rather LATEX 2_ε itself. It is strictly recommend to know how to use LATEX 2_ε. [SKPH03] or rather [OPHS10] give you a very good introduction. To minimize typically beginner faults, please take care of the tips [Tre07]. The user guides are available in all most spoken languages. As you know from school, a cheat sheet could also be helpful (see [Cha06]).

1.2 Short introduction into *mrmthesis*

mrmthesis is based on Komas scrbook. The main goal of *mrmthesis* is to handle the complete layout for your Student Research Project, Bachelor, Master or Diploma Thesis. Without thinking about the typography of the title page, affirmation and many other required stuff, your thesis will fulfill the specifications given by the Institute of Measurement, Control and Microtechnology at Ulm university. So take only five minutes to learn about some easy self-explanatory options explained in chapter Class options. Afterwards, use the template *my_mrmthesis.tex* and fill in some fields with personal declarations. Hence, you only have to think about the content of your thesis because the complete layoutstuff is already done. Please note that *mrmthesis* only produces a4-papers in the typically twoside style of books.

In principle, output could be generate in DVI, PS or PDF mode. For the last one, pdflatex is used, which supports micro-typographic extensions. In DVI and PS mode, this great feature will be missing. Depending on this, **using pdflatex is strongly recommended!**

Good luck and a good mark as well!

2 Using *mrmthesis*

2.1 TEX-file encoding

Regarding the compatibility for different platforms and LaTeX distributions, the mrmthesis class requires "'latin1"' (ISO 8859-1) encoding of all files. Especially UNIX user should ensure this encoding using the options of your preferred editor.

2.2 Class options

There are only the following few options to configurate *mrmthesis*.

language The document language could be switched between German (*language=de*) and English (*language=en*). German is the default language. A simple *en* as value switches the document language to English, *de* sets the document language to German. **Note:** The selected language has effect for the titlepage, project description, affirmation and some headings.

thesis There are four kinds of values for the option thesis:

option	*language=en*	*language=de* (default)
thesis=master **default**	Master Thesis	Masterarbeit
thesis=bachelor	Bachelor Thesis	Bachelorarbeit
thesis=stud	Student Research Project	Studienarbeit
thesis=diplom	Diploma Thesis	Diplomarbeit

logopath Option *logopath=???* defines the path to logos *uni_wort.eps/pdf* and *uni_bild.eps/pdf*. The default path is img/. The path can be given absolute or relative to the path of *my_mrmthesis.tex*. If pdflatex is used, the pdf logos will be essential, otherwise the eps logos. Please note that it is not allowed to use any braces and blank spaces in the path. Further more, the path has to end with the character / (use / instead of \).

Option *BCOR=???* can be used to manipulate the value of the correction for the binding. The **default** value is *BCOR=0.75cm*. **Don't touch this option if your thesis will be printed and binded as a book at the Communications and Information Center (kiz)!** BCOR

Option *confidential=true/false* can be used to label the thesis as confidential on the title page. The default setting is false. confid. . . l

Option *namebehindauthortitle=true/false* can be used to change the placement of author title and author name on the title page and the project description page. If set to true, the order is "Title Name" like usual for e. g. "Dipl.-Ing.", otherwise "Name, Title" like usual for e. g. "B. Sc.". The default setting is false. name. . . e

Option *backendbibtex=true/false* is only available for compatibility reasons with old LaTeXdistributions. If the default backend *biber* is not available on your platform, you can get it from [CK13]. Please make sure to use the right Biber version for your Biblatex package version, see version matrix in [bib]. If this is not possible for some reason, this option can be changed from its default value *false* to *true*, and BibTeX8 can be used instead. Please note that BibTeXis not longer supported by this class, and usage is at your own risk. bac . . . x

An example for setting *mrmthesis* options is shown in Listing 2.1. Please note that due to the default values, Listing 2.1 and Listing 2.2 have exactly the same effect.

```
\documentclass[language=de,thesis=master]{mrmthesis}
```

Listing 2.1: Example: setting *mrmthesis* options

```
\documentclass{mrmthesis}
```

Listing 2.2: Using *mrmthesis* without options

Hint: *mrmthesis* ignores all unknown options, also typos, and use the defaults instead.

2.3 Fill in required informations first

```
%please fill out the following needed informations
\title{}
\descriptiontitle{}
\affirmationtitle{}
\author[m]{}
%\authortitle{} %default: None
\supervisor[m]{}
\examiner{}
```

```
\coexaminer{}
\issuedate{}
\submissiondate{}
%\place{}                    %default: Ulm
```

Listing 2.3: Required informations

There are some fields in the preamble of *my_mrmthesis.tex* to be filled in as shown in Listing 2.3. The fields are self-explanatory. The field \authortitle{...} is optional and empty by default. The field \place{...} is optional and contains the place which is printed under the signature on the affirmation page. The default is Ulm. The fields \author{...} and \supervisor{...} have an optional argument (either `f` or `m`), which switch between the respective female and male (default) labels if German is selected.

2.4 Let's get started - The main document

```
\begin{document}
%-----------------
    \frontmatter
        \maketitle
        \projectdescription{\input{doc/projectdescription}}
        \affirmation

        %\extrafrontchapter{Foreword}{type in your text here}

        \tableofcontents
        %\listoffigures
        %\listoftables
        %\printnomenclature
%-----------------
    \mainmatter
        %\input{doc/}
        .
        .
        .
```

Listing 2.4: Main document

The document is always spitted in four segments: Frontmatter, mainmatter, appendix and backmatter. This section deals only with the frontmatter and mainmatter. The appendix and backmatter will be explanined in section 2.5. The frontmatter contains all pages which will be printed before the actual mainpart such as the title page, project description and so on.
\maketitle generates the title page depending on the informations you should have filled in before.
The field \projectdescription{} is used to generate a description page. The description text is usually provided by your supervisor and can directly be included in the cambered

brackets.
\affirmation generates the affirmation page depending on the given author, place and submissiondate.
With the optional field \extrafrontchapter{}{} it is possible to add as many chapters as you want. The first brackets must contain the name of the chapter, the remaining brackets the content of the chapter.
The commands \tableofcontents, \ listoffigures , \ listoftables and \printnomenclature are self-explaining. **Note:** List of figures, list of tables and nomenclatur are optional, but your thesis should always contains a table of contents and could also be part of appendix.

\mainmatter introduces the content of your thesis.

Hint: Don't loose the track of your thesis. It is recommendable to use one separate tex-file for each chapter or even one separate tex-file for each section for very large chapters. If a TEX-Editor is used (see recommendations in section 4.4), a project file can manage all tex-files together.

2.5 Appendix and bibliography

```
1  %- - - - - - - - - - - - - - - - -
2          \appendix
3                  %\input{doc/}
4                  %\input{doc/}
5  %- - - - - - - - - - - - - - - - -
6    \backmatter
7  %  \nocite{*} %add all items of bib file to bibliography. Replace "*" by a list of
       specific
8  %              % bibentry keys to select only some, or comment this line
9  %              %normally, all bib entries should be cited in the text
10   \printbibliography[heading=bibintoc]
```

Listing 2.5: Introducing appendix and backmatter

\appendix introduce the appendix part. Use this part to embed e.g. some additional calculations and further information which is too detailed for the main chapters.
\backmatter introduce the last segment of the document. The bibliography is always a part of it.

To create a bibliography, *mrmthesis* uses Biblatex. You can organize your entries in a single bib-file which will be chosen by the field \bibliography{} in the preamble. Alternatively you can create a bib file for each chapter. Biblatex can be installed on-the-fly by using the Package Manager in most LATEXdistributions. If your distribution does not offer the biblatex package, download Biblatex from [bib] and follow the instructions

in the provided readme file. **Note:** It is strictly required that you install your LaTeX distribution (e.g. MiKTeX) first.
mrmthesis provides an empty bib-file called *my_mrmthesis.bib*. Read the documentation of Biblatex and fill this file with some bibliography entries by using a simple editor or Jabref. Jabref can be downloaded at [jabref] and is provided on the PCs of the institute as well. To activate the "BibLaTeX mode" in Jabref, go to Options → Preferences → Advanced.
As shown in Listing 2.5 in line 7, the bibliography can be printed with the command `\printbibliography`. Please note that the option used here is required to get the right output. If entries from your bib-file should be listed in the bibliography without being cited in your document (what should be avoided!), you can use the command `\nocite` to print all bib-file entries (using a star "*" as argument) or only some not-cited entries (list the bib-entry keys as argument).

2.5.1 Bibliography Style

mrmthesis comes with its own bibliogaphy style *mrmbibstyle*. For this style to work, the files *mrmbibstyle.bbx* and *mrmbibstyle.cbx* must be in the same directory as your main file (normally *my_mrmthesis.tex*).

The style is based on standard Biblatex styles, with explicitly adapted entry types *article, book, electronic/online, incollection, inproceedings* and *thesis*. The style should work for all other types as well. Should you encounter any problems, please feel free to contact the author.

article Use the entry type *article* to cite a paper from a journal.

book This entry type is used for books. If there is only a single number in the field *edition*, the word edition (or Auflage in German) is added automatically in the bibliography. Otherwise, you have to write it into the field if needed. Take care to write the German version as `Auf\noligature lage`.

electronic This type is an alias for *online* and used for online resources or web sites. The date of your last visit of the page/resource can be written into the field *urldate*. It will then be shown in the bibliography. If the entry has no author, only empty brackets ([]) will be shown in the bibliography. In this case, use the field *label* to generate your own label. Please choose your label as close as possible to the auto-generated labels.

incollection You can use this type for a book from a series. To specify the number of

the book within the series you can either use the field *number* or the field *volume*. Only use both fields if there's several volumes of one book in the collection, which should happen only very rarely. **Example:** You have a book with three volumes (1, 2, 3) which are number 57, 58 and 59 of a series. If you want to cite the second book use *volume* 2 *number* 58. In case the book has only one volume, which is number 58 of the series, you can use either *number* 58 or *volume* 58.

inproceedings To cite papers from conference proceedings, please use this type.

thesis Can be used for any kind of thesis. Use the *type* field to specify the type of the thesis (bachelor, master, diploma, phd etc.).

For other entry types as well as all required and optional fields for each entry type, please refer to the biblatex package documentation [bib]. An example of a possible output of a bibliography is shown at the end of this documentation.

2.5.2 Usage

mrmthesis relies on *biber* as backend for the bibliography, which offers several advantages compared to Bibtex. To compile the bibliography, you have to use the command `biber` instead of `bibtex`. Biber should be provided by your LaTeX-ditribution.

To compile your document when the bibliography has changed, you have to call pdflatex (or latex in DVI and PS mode) first then biber to generate the bibliography. Use (pdf)latex again to finish compilation.

Example:

```
1 > pdflatex my_mrmthesis.tex
2 > biber my_mrmthesis
3 > pdflatex my_mrmthesis.tex
```

Listing 2.6: Complete compilation of a document with bibliography

In some cases it can be necessary to re-run pdflatx a second time after the biber run to get all cross-references right, please refer to the pdflatex output (or log-file).

Hints:

- The command `\nocite{*}` effects that all entries of the bib file (even if not cited in the document) will be printed in the bibliography. Instead of the "*", a

comma-separated list of bib keys can be given to choose only some of the not cited entries to be included in the bibliography.

- Using `\cite` with an undefined keyword will **not** be printed as **???** like with bibtex. Instead, the undefined keyword with brackets will be printed. If you get the warning message "*There were undefined references.*" in your log file, try to localize invalid bib keys by searching the log file for warnings like *Citation 'XX' on page YY undefined on input line ZZ.*.

3 Implementation of *mrmthesis*

3.1 Required packages and their options

Some packages listed below are defined as required packages because *mrmthesis* will need them e.g. to include some graphics. This packages will be loaded in the given order with exact the given options. **Do not load the following packages in the preamble by using** `\usepackage{}`**.** For more information on the packages, please refer to their documentation in your texmf directory or on [CTAN].

package	*options*	*description*
ifpdf	-	implements and sets the switch `\ifpdf`
ifthen	-	provides distinction of cases and loops
kvoptions	*patch*	provides options in key value format; *patch* allows to use braces and Umlauts in the values
scrpage2	*automark*	for KOMA headings and footings; *automark* for automatically refresh of the columntitle
scrhack	-	fixes KOMA bugs and activates some nice-to-have features
setspace	-	set (extra) space between lines
microtype	-	an interface to the microtypographic features of pdfTeX

babel			multilingual support for Plain TEX or LATEX
	ngerman,english	*2	
	english, ngerman	*3	
inputenc	*latin1*		translates various standard and other input encodings into a "'LaTeX internal language"'
fontenc	*T1*		allows the user to select font encodings
lmodern	-		Latin Modern typeface
graphicx	-		enhanced support for graphics
caption			customizing captions in floating environments, at least version 2008/08/24 is required
	format=hang,		.. text "'hangs"' on the identifier
	font=rm, *textfont=rm,* *labelfont=bf,*		
	margin=0.5cm		.. extra border
subcaption			allow subfloats with subcaptions, see section 4.3
	format=hang,		.. causes the label to hang out to the left of the caption text
	labelfont=rm, *margin=0.15cm,* *subreffformat=parens*		.. extra border
xcolor	-		driver-independent color extensions for LATEX and pdfLATEX
amsmath	*intlimits,tbtags*		add standard mathematical features; loaded by class before hyperref to avoid problems
hyperref			extensive support for hypertext in LATEX
	colorlinks=true,		

	linkcolor=black,	
	citecolor=black,	
	urlcolor=black,	
	hyperfootnotes=false	.. disable links for footnotes
	breaklinks=true *1	
biblatex		reimplementation of the bibliographic facilities provided by LaTeX
	style=mrmbibstyle,	
	sorting=anyvt,	
	sortcites=true,	
	firstinits=false,	
	uniquename=init,	
	hyperref=auto,	
	minnames=3,maxnames=99,	.. # letters for the citekey depending on the author last name
	minitems=3,maxitems=99,	
	minalphanames=3,maxalphanames=4,	
	autopunct=false,	.. controls whether the citation commands scan ahead for punctuation marks
	backend=biber	replacing bibtex as backend for biblatex*4
	bibencoding=latin1,	
	bibwarn=true,	
csquotes		context sensitive quotation facilities
	autostyle=try,english=american *2	
	autostyle=try,german=quotes *3	

*1 only if pdflatex will be used; *2 if the document language is English; *3 if the document language is German; *4 bibtex8, if backendbibtex option is set to true

3.2 Known issues

There are no known issues at the moment. Please contact `michael.buchholz@uni-ulm.de` for bug reports or ideas for new features .

4 Tips and Tricks

4.1 Recommended packages

my_mrmthesis.tex contains many lines beginning with *%\usepackage*. The listed packages are a collection of very often used packages. To use these packages delete **%** in the corresponding line. For each package a short explanation is given. For more information on the packages, please refer to their documentation in your texmf directory or on [CTAN].

4.2 Hyphenation in LaTeX

Sometimes the hyphenation algorithm of LaTeX fails because a word is unknown or a composition of several words. Also, if a word contains a hyphen, the word will be only separated at this position. It is very easy to detect such a word in your output file: Look for words which are not conform with the justification.
Hyphenation could be set manually, local as well as global. The example below shows how to setup a global list of comma separated words with hyphenation rules by using a LaTeX-Macro in the preamble of the document.

```
\hyphenation{fortran,er-go-no-mic} %indicates that "fortran" cannot be
    hyphenated and indicates allowed hyphenation points for "ergonomic"
```

Listing 4.1: Example: List of some global words with hyphenation rules

There exist also several commands for local hyphenation control (listed in tables 4.1 and 4.2). Most of them require the babel packages *german* or *ngerman*.

Note: In most cases, the use of `"=` for words with hyphens should be used instead of `"-`!

`\-`	hypenation allowed exclusive at this position (no automatic hyphenation of this word, multiple manual hyphenation commands possible)
`"-`	hyphenation allowed here and at any automatically detected position
`""`	like `\-`, but hyphenation without hyphen
`"|`	like `"-` with additional little space to resolve misplaced ligature

Table 4.1: Local hyphenation commands

`-`	no automatic hyphenation of the word, line breaks only here or any other manual hyphenation (e. g. `-` or `\-`)
`"~`	no hyphenation allowed after this hyphen
`"=`	automatic hyphenation of the word allowed additionally to allowed hyphenation after this hyphen (this should normally be used for words with hyphens!)

Table 4.2: Hyphen commands with and without hyphenation

For further information please visit e. g. [hyph].

4.3 Creating floats with several subfloats

Especially for figures, but sometimes also for other floats like tables, it is useful to pool two or more of them in to one main float with a common caption. Nonetheless, in most cases, the subfloats should have their individual captions additionally. For this reason, the subcaption package is loaded and configured by the mrmthesis document class. An example for the usage of the subcaption package is given in Listing 4.2 and the result is shown in Figure 4.1.

```
\begin{figure}
\centering
        \begin{subfigure}{0.45\textwidth}
        \includegraphics[width=\columnwidth]{img/unilogo_bild}
        \caption{Subfigure 1}
        \end{subfigure}
\qquad
        \begin{subfigure}{0.45\textwidth}
        \includegraphics[width=\columnwidth]{img/unilogo_bild}
        \caption{Subfigure 2}
        \end{subfigure}
\\
        \begin{subfigure}{0.45\textwidth}
        \includegraphics[width=\columnwidth]{img/unilogo_bild}
```

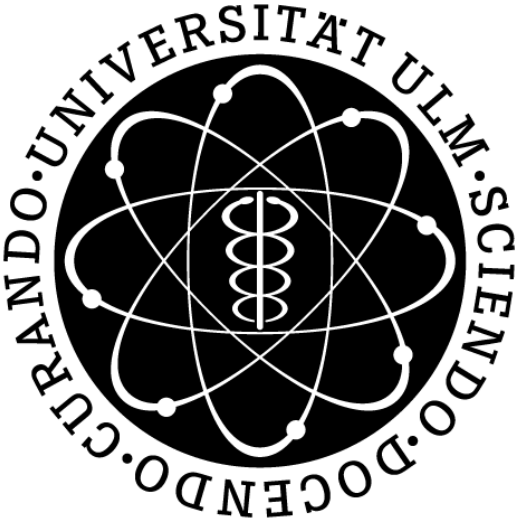
```
        \caption{Subfigure 3}
        \end{subfigure}
\caption{An example for pooling for figures using the \lstinline[language=TeX]|
    subcaption| package}
\label{fig:subcaption}
\end{figure}
```

Listing 4.2: Example: arranging subfigures

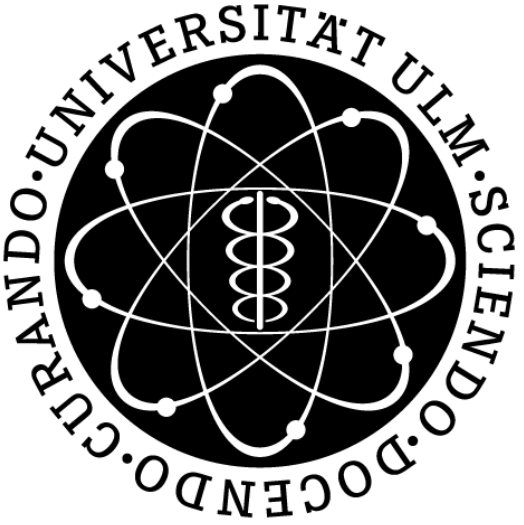
4.4 Using IDE for managing LaTeX documents

In principle, all tex-files could be edit with an standard text editor, e.g. Notepad. However, it is recommendable to use an editor which knows the LaTeX commands and could handle a feature called text highlighting to localize typos or missing brackets very fast. Comments and special commands will be displayed in another color as well. There are some Integrated Development Environments (short IDE) available for free. For MS Windows® users the IDEs [center] and [studio] will be very useful. Please note that you should install MiKTeX first (see [Sch10]). Unix/Linux users should fall back on [kile] for the KDE desktop environment or [emacs].

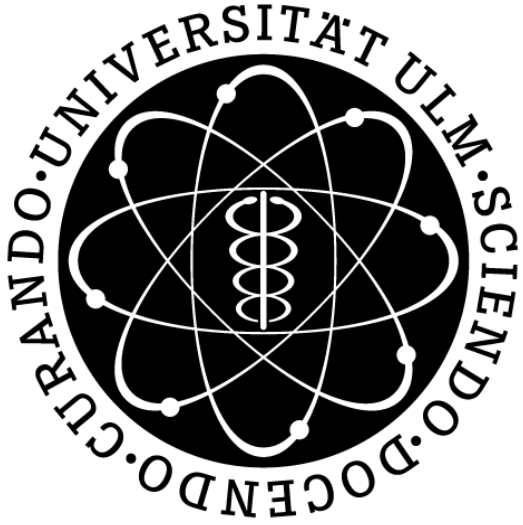
If you get familiar with one of IDEs, it is a good idea to organize your tex-files in a project. One advantage is that you can switch quickly between your chapters and compile the complete document by using one single command.



(a) Subfigure 1



(b) Subfigure 2



(c) Subfigure 3

Figure 4.1: An example for pooling of figures using the subcaption package

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