Technische Universität München

Fakultät für Informatik

Lehrstuhl für Robotik, Künstliche Intelligenz und Echtzeitsysteme

Title
Subtitle

Your Name

Vollständiger Abdruck der von der Fakultät für Informatik der Technischen Universität München zur Erlangung eines

Doktors der Naturwissenschaften (Dr. rer. nat.)

genehmigten Dissertation.

Vorsitz: Chairman

Prüfer*innen der Dissertation:

1. Prof. Dr.-Ing. habil. Alois C. Knoll

2. ...

Die Dissertation wurde am 1. Januar 1970 bei der Technischen Universität München eingereicht und durch die Fakultät für Informatik am 1. Januar 1970 angenommen.

Acknowledgement

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Garching, January 01, 1970   *Your Name*

Abstract

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

Zusammenfassung

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

Contents

Chapter 1

About TUMlatex

1.1 Introduction

This TUMlatex project represents a cooperation of several chairs of the Technical University of Munich to provide a compact and easy-to-use LaTeX package for both, employees and students.

If you are interested in using this package, please read Section 1.2.

If you are an advanced LaTeX user and want to contribute to this project, please read Section 1.3.

If you are responsible for the LaTeX templates of your chair and you are interested in joining this collaboration, please contact the current maintainer Michael Kreutz (m.kreutz@tum.de).

1.2 Quick-Start-Guide for Beginners

This project aims to provide an easy-to-use solution for unexperienced or even first-time LaTeX users. As a first step, please read the installation instructions of Section 1.2.1.

1.2.1 Installation

If you are using TUMlatex for the first time, please pass through the following steps carefully.

Setup your LaTeX Environment

First of all you have to install a LaTeX environment on your PC. You may skip this step, if you are using a PC of the university with a pre-installed LaTeX environment (e.g. TUM-PC).

- For **Windows** users: Please install the newest version of MiKTeX (see below for full installation).

- For **Mac** users: Please install the newest version of MacTeX (see below for full installation).

- For **Linux** (Ubuntu, TeXLive) - Option A (outdated version - not recommended): Install the default packages texlive-full and biber via apt-get shipped with your Ubuntu distribution.

- For **Linux** (Ubuntu, TeXLive) - Option B (**newest version - recommended**): Download the TUMlatex package of your chair (see Section 1.2.1), unzip it and run the automatic installer script `UbuntuInstallTexliveNewest.sh` as root

(sudo ./UbuntuInstallTexliveNewest.sh) located in XXXTools (replace XXX by your chair abbreviation).

Note: Without any warranty you may use a different LaTeX environment.

Important: If the amount of free memory on your PC permits, be sure to install all packages. Otherwise it is likely, that you are missing some necessary packages and have to install them on your own.

- For **Windows** users: Install all packages via the MiKTeX Package Manager.

- For **Mac** users: Install the Full MacTeX package.

- For **Linux** users: Both options (A and B) mentioned above will install a full installation of TeXLive.

Optional: Update your LaTeX Environment

In some cases this is necessary in order to avoid compilation errors due to outdated standard packages. Again you may skip this step if this is not your private PC.

- For Windows users: Please follow this guide.

- For Mac users: You can use the graphical updating tool TeX Live Utility to update your packages.

- For Linux users: If you chose option B (see Section 1.2.1) open a terminal and update the TeXLive package manager and all packages with the command sudo tlmgr update -self -all -reinstall-forcibly-removed

Setup your LaTeX Editor

You can use any editor you like. However, the open-source and cross-platform LaTeX editor TeXstudio is recommended. In this case you can use the **auto-completion feature** by copying the provided syntax file (.cwl-file, shipped within the .zip file, see Section 1.2.1) to the folder

- %APPDATA%\Roaming\texstudio\completion\user for Windows users or equivalently

- ~/.config/texstudio/ for Linux or Mac users.

Furthermore you may enable the shell-escape option of pdflatex (optional, but neccessary for tikz-externalize to work):

1. Navigate to *Options → Configure TeXstudio → Commands*

2. Change *PdfLaTeX* to pdflatex -synctex=1 -shell-escape -interaction=nonstopmode %.tex

You also should change the default bibliography tool from *bibtex* to **biber**:

1. Navigate to *Options → Configure TeXstudio → Build*

2. Change *Default Bibliography Tool* to txs:///biber

Note: You can also use bibtex as bibliography backend with the TUMlatex packages. However, you have to pass optBibtex *instead of* optBiber *to the package. Furthermore some commands related to the bibliography are different (ask Google for help).*

Get the latest Release of the TUMlatex Package

If you are reading this document you probably already have downloaded the TUMlatex package. However, it is recommended to check if you are using the latest version. In the following table you find the chair-related TUMlatex packages:

Dept.	Chair	TUMlatex Package
MW	Aerodynamics and Fluid Mechanics	AERlatex.zip
MW	Applied Mechanics	AMlatex.zip
MW	Automotive Technology	FTMlatex
MW	Machine Tools and Industrial Management	IWBlatex.zip
MW	Central Teaching Unit	ZLlatex.zip
IN	I6 - Robotics, AI & Embedded Systems	RAIlatex.zip

The packages include (replace "XXX" by your chair abbreviation)

- the main class file XXXlatex.cls,

- the main package file XXXlatex.sty (This is an alternative to using the main class file. This is helpful, if you write a paper and have to use the baseclass provided by the publisher),

- the syntax file XXXlatex.cwl for auto-completion in TeXstudio,

- a license file XXXlatex_LICENSE.txt containing licensing information,

- a folder XXXDocumentation containing the package documentation (therein precompiled as main.pdf),

- a folder XXXTemplates containing a selection of useful templates which you can copy and directly use.

- a folder XXXTools containing a selection of useful tools (e.g. TeXLive setup script).

1.2.2 Create your own Document

The **recommended way** to create a new document is to

1. select an appropriate template in the template folder XXXTemplates,

2. **copy the whole template folder** (e.g. XXXDocument) wherever you want,

3. open the main.tex file in the template folder with your favorite LaTeX-editor,

4. initially compile it (using *pdflatex* and optionally *biber/bibtex*) and check for errors,

5. make your changes and fill it with content and

6. compile it (using *pdflatex* and optionally *biber/bibtex*).

*Note: As an alternative way it is possible to use the main class (.cls-file) or the main package (.sty-file) as a shared resource by copying it to your local texmf folder. However, in this case you may not be able to compile old documents, which have been created with a different version of this package. Thus it is **strongly recommended** to make a copy of the main class file (XXXlatex.cls) for each of your documents!*

1.2.3 Documentation

The documentation of the packages is included in the folder `XXXDocumentation` (precompiled as file `main.pdf`). Feel free to have a look at the source code of the documentation, in order to learn how to do stuff. Be aware that most of the source code is automatically generated.

1.2.4 Bugs, Errors and Suggestions

If you recognize any bug/error or you have a suggestion to make this package (even) better, please feel free to open an Issue.

Important: Assign the corresponding maintainer of your chair to the issue (see LRZ GitLab). Expect no support for unassigned issues - they will be deleted immediately!

Please use the default **Labels** to categorize your issue. Please also provide additional information like your

- operating system (+ version),

- LaTeX environment (+ version) and

- LaTeX editor and (+ version).

1.3 Guide for Developers/Contributors

For information on how to contribute to this project please have a look at the Contribution Guide.

1.4 Support

For support, please directly contact the responsible package maintainer of you chair (see "maintainer" in Section 1.2.4).

Important: If your are not associated with a chair or your chair is not part of the TUMlatex project, please read following note: *We are happy that you use TUMlatex and that you appreciate our effort in making a good LaTeX template for TUM members. However, please understand that this project is maintained by various PhD students, who contribute to the template mainly in their spare time (actually we do not get paid for this - its our personal commitment). Thus, we limit our "support" to employees and students of our associated chairs. Certainly, we are happy for any bug report, however, we can not assist everybody in using this template neither can we respond to individual feature requests. We hope you can understand this.*

1.5 License Notes

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This work may be distributed and/or modified under the conditions of the LaTeX Project Public License, either version 1.3 of this license or (at your option) any later version. The latest version of this license is in http://www.latex-project.org/lppl.txt and version 1.3 or later is part of all distributions of LaTeX version 2005/12/01 or later.

This work has the LPPL maintenance status 'maintained'. The current maintainer of this work is Michael Kreutz (m.kreutz@tum.de).

This work consists of all files of the GitLab repository https://gitlab.lrz.de/AM/TUMlatex.

Chapter 2

I6 Submission Guidelines

2.1 Structure

In the past it has proven to be quite helpful to structure the dissertation text as follows:

I **Motivation and Introduction:** Why and what is the goal? What can my contribution be to the current state of research and beyond?

II **State of Current Research:** What exists already, what have others contributed, why did they get as far as they did?

III **Methodology Used:** How will I/we do it differently, what are our expectations, what do we expect to achieve?

IV **Experimental Results:** Proof of work performed/achievement and sustainability of the methodology via experiments such as test set ups.

V **Discussion:** Critical evaluation of one's own work and comparison of achieved results with currently existing results.

VI **Outlook:** What can be achieved in the future in this area? what are the next steps if we were to continue this research?

VII **Reference List:** A complete, detailed list of the literature used including own publications.

2.2 Citations

We recommend that you use `alphadin` citation style when working with bibtex, or `alpha` when using biblatex/biber. Your bibliography should look like this:

[BM92] Besl, P. J. and McKay, N. D. "Method for registration of 3-D shapes". In: Sensor fusion IV: control paradigms and data structures. Vol. 1611. International Society for Optics and Photonics. 1992, pp. 586–606.

[CM92] Chen, Y. and Medioni, G. "Object modelling by registration of multiple range images". In: Image and vision computing 10.3 (1992), pp. 145–155.

When quoting an author word-by-word please include a page number in the reference.

2.3 Figures

Please use vector graphics when including figures or diagrams in your thesis. If you create them with PGF/TIKZ or Inkscape it also possible to add texts directly from Latex to ensure a consistent typesetting. There is an unwritten rule, saying figures not referenced in your text are unnecessary.

When citing a figure include the reference in the figure's label (including the page number).

2.4 Math Notation

When using formulas or pseudocode use the following notation style:

Type	Example	Code (Math Mode)	Comment
General items			
Scalars	a	`a`	lower case, italic
Functions	$\sin(x)$	`\textrmsin(x)`	regular text
Units	$42\,\text{Hz}$	`42\,\textrmHz`	half-space between number and unit; unit in regular text
Angles	α	`\alpha`	Greek letters
Absolute value	$\mid a \mid$	`\mid a \mid`	
Modulo	mod	`\textrm{mod}`	
Vectors and matrices			
Vectors	$\boldsymbol{v}$	`\boldsymbol{v}`	lower case, italic, bold
Matrices	$\boldsymbol{M}$	`\boldsymbol{M}`	upper case, italic, bold
Variable indices	$\boldsymbol{x}_i$	`\boldsymbol{x}_i`	
Static indices	$\boldsymbol{x}_\text{min}$	`\boldsymbol{x}_\textrm{min}`	
Unit vectors	$\mathbf{e}_x$	`\textbf{e}_x`	
Identity matrices	$\mathbf{Id}_n$	`\textbf{Id}_n`	
Transpose	$\boldsymbol{x}^\text{T}$	`\boldsymbol{x}^\textrm{T}`	T in superscript and regular font
Vector product (cross product)	$\times$	`\times`	
Dot product	$\cdot$	`\cdot`	
Sets and sequences			
Sets	$A = \{1,2,3\}$	`A = \{ 1, 2, 3 \}`	upper case, italic
Sequence	$\mathcal{A} = \langle 1,2,3 \rangle$	`\mathcal{A} = \langle 1,2,3 \rangle`	
Set without	$A \backslash \{e\}$	`A \backslash \{ e \}`	
Unification	$A \cup \{e\}$	`A \cup \{ e \}`	

Always use single letters for variable names.

2.5   Length

The length of the monograph should be as short as possible, between 100 and maximum 150 pages (not counting chapter VII) in the standard format. Chapter I and II usually make up about 20 while chapter VI, regardless of the topic of the monograph is usually not more than 10.

Chapter 3

Examples

This chapter shows a number of examples that might be useful when you have not worked with LaTex or TUMlatex before.

3.1 Figures

This paragraph shows the differences of pixel based images and vector graphics. As you can see in figure fig. 3.1 the `*.png` image becomes quite blurry when scaled to large, while the other, vector based images look flawless at any zoom rate.
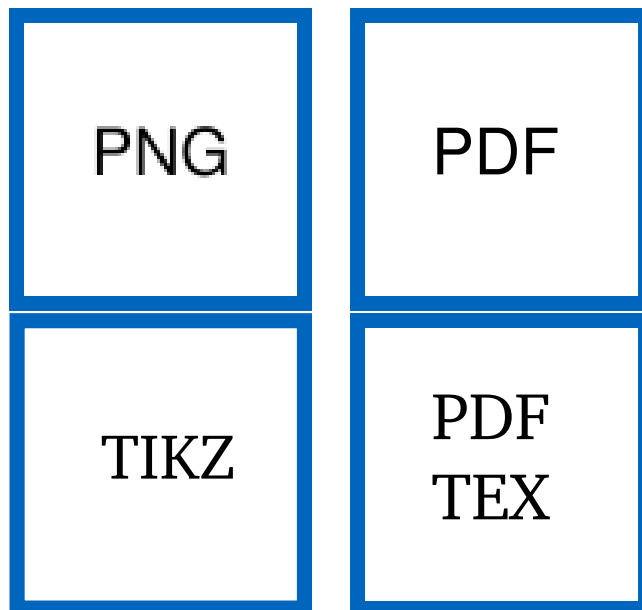

Figure 3.1: Image description.

3.2 Tables

Tables can be referred to in the same way as figures. The four letters after the `\begin{table}` statement indicate the placement of the table environment as listed in table 3.1, where the first letter is the preferred position, the second one the next best alternative and so on.

We recommend to use the `\toprule`, `\midrule` and `\bottomrule` commands from the `booktabs` package to generate nice looking tables.

Letter	Placement
h	here
t	top of the page
b	bottom of the page
p	standalone page

Table 3.1: Placement options for floating environments.

3.3 Equations

Besides of LaTeX general math mode, that allows you to put some formulas like $a^2 + b^2 = c^2$ directly in your paragraph, we can also use an enumerated, standalone environment for more complex statements, such as Equation 3.1:

$$E = mc^2 \tag{3.1}$$

3.4 Plots

Plots might appear to be just another kind of images, however, *tikz* allows you to define them right in your LaTeX code, as done in figures 3.2 and 3.3.
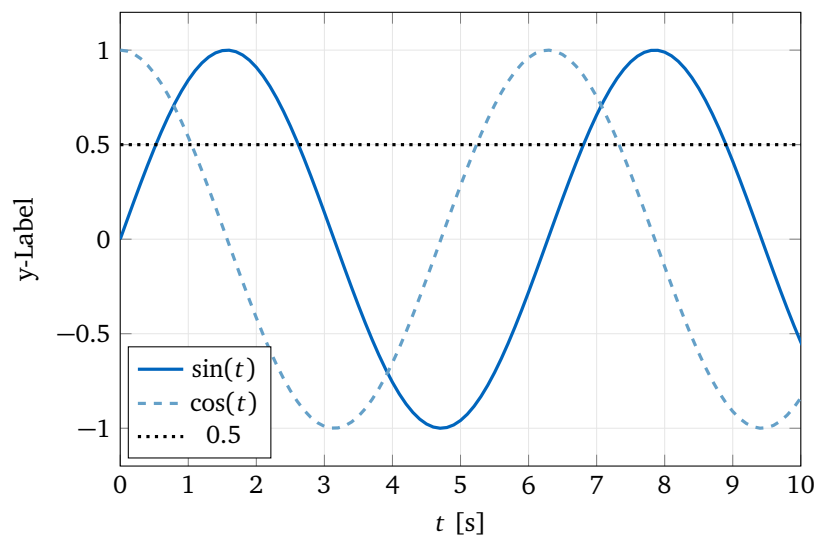

Figure 3.2: Title of the 2D plot (using pgfplots).

3.5 Citations

This sentence is referring to a single source [BM92]. Sentence number two has a single source with a page number [CM92, page 123f.] The statement in this last sentence is even supported by multiple sources [Cho+05; TBF05].
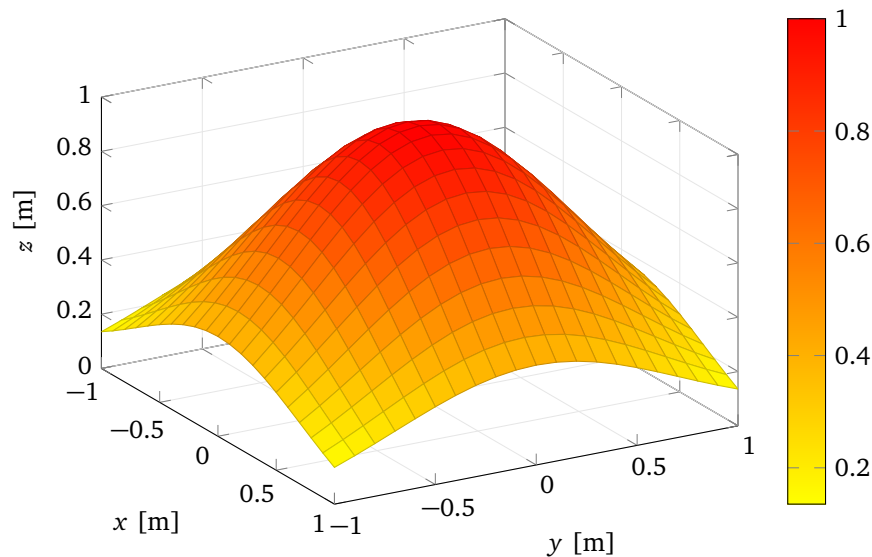
Figure 3.3: Title of the 3D plot (using pgfplots).

3.6 Sections

Of course it is also possible to define deeper levels of sections. Let's have a look at some `subsections` and `subsubsections`. However, when writing you thesis, try to avoid deeply nested structures.

3.6.1 Subsection 1

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

Subsubsection 1

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

Subsubsection 2

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest

gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

3.6.2 Subsection 2

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

3.6.3 Subsection 3

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

Appendix 1

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This is the second paragraph. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

And after the second paragraph follows the third paragraph. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

After this fourth paragraph, we start a new paragraph sequence. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

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[CM92]   Chen, Y. and Medioni, G. "Object modelling by registration of multiple range images". In: *Image and vision computing* 10.3 (1992), pp. 145–155.

[Cho+05] Choset, H. M., Hutchinson, S., Lynch, K. M., Kantor, G., Burgard, W., Kavraki, L. E., and Thrun, S. *Principles of robot motion: theory, algorithms, and implementation*. Cambridge: MIT press, May 2005. ISBN: 978-0-262-03327-5.

[TBF05]   Thrun, S., Burgard, W., and Fox, D. *Probabilistic Robotics*. Cambridge: MIT press, Aug. 2005. ISBN: 978-0-262-20162-9.