Ruhr-Universität Bochum

Master Thesis

My Nicely Formatted Thesis, or: How to Present Your Results Well

Thesis submitted to the
Ruhr-Universität Bochum, Angewandte Informatik

submitted by
Max Mustermann

at the
Chair of Computing in Engineering
Prof. Dr.-Ing. Markus König

Submission Date:	April 4th, 2016
Student ID:	108007256794
1st advisor:	Prof. Dr.-Ing. Markus König
2nd advisor:	Marcel Neuhausen, M. Sc.

Abstract

The ABSTRACT is to be a fully-justified text following the title page. The text will be formatted in 12 pt, single-spaced Computer Modern. The title is "Abstract", set in 12 pt Computer Modern Sans Serif, centered, boldface type, and initially capitalized. Writing the abstract in English is mandatory even if the thesis itself is written in German. The length of the abstract should be roughly about 200 words but must not exceed 250 words.

As usual, the abstract should clearly summarize the aim, the background and the results of your thesis so that an interested reading can decide if he or she wants to further read your (interesting) written report. Also, the abstract should be kept simple. That is, do not include tables, figures or cross references in the abstract. You will have plenty of time in your thesis to explain things more clearly.

Erklärung

Ich erkläre, dass das Thema dieser Arbeit nicht identisch ist mit dem Thema einer von mir bereits für eine andere Prüfung eingereichten Arbeit.

Ich erkläre weiterhin, dass ich die Arbeit nicht bereits an einer anderen Hochschule zur Erlangung eines akademischen Grades eingereicht habe.

Ich versichere, dass ich die Arbeit selbstständig verfasst und keine anderen als die angegebenen Quellen benutzt habe. Die Stellen der Arbeit, die anderen Werken dem Wortlaut oder dem Sinn nach entnommen sind, habe ich unter Angabe der Quellen der Entlehnung kenntlich gemacht. Dies gilt sinngemäß auch für gelieferte Zeichnungen, Skizzen, bildliche Darstellungen und dergleichen.

Statement

I hereby declare that except where the specific reference is make to the work of others, the contents of this thesis are original and have not been submitted in whole or in part for consideration for any other degree or qualification in this, or any other university.

This thesis is my own work and contains nothing which is the outcome of work done in collaboration with others, except as specified in the text.

Date Author

Contents

1 Layout

The layout of the title page is as shown on the title page of this document. It contains the thesis' title bordered by horizontal edges, information about the student, and information about the supervisors.

All pages except the title page and the abstract are numbered. Numbers are placed on the pages' outer sides. Indicies are numbered in roman numerals whereas the rest is numbered in arabic numerals.

Sections are numbered automatically. You can write sections and subsections to structure your text (using the corresponding LaTeX keywords). If necessary, you can further use a "subsubsection" keyword, but that should be enough.

1.1 Structure

The structure of a thesis is as follows:

- Title page
- Declaration
- Abstract
- Table of Contents
- Thesis Specific Structure of Sections
- Lists of Figures, Tables, Listings (only if absolutely necessary)
- References
- Appendex (only if necessary)

2 Formatting

All text is in single-column format. It is fully-justified 12 pt Computer Modern. The Table of Contents–depth is set to 2, so even if there are deeper subsections, they not included in the Table of Contents.

2.1 Figures and Tables

Figures can be placed in your text to show some interesting stuff. In the simplest case, use the floating "figure" environment with a good caption (see Fig. 1).

Figures should not contain code, use listings (see section 2.3) instead. Captions contain a full description of the figure including parameters and color codes if not given within

Figure 1: A picture of a cat, the second most popular Internet theme.

Table 1: A simple table example using the *tabularx* package

Pet Type	**Price [EUR]**
cat	33.00
dog	22.00
guinea pig	11.00

the figure. All figures have to be referenced in the text. Subfigures are alphabetically enumerated where the letters are parenthesized. Caption are written *below* figures, but *above* tables (see Table 1).

2.2 Equations

All equations have to be referenced in the text and should be written as LaTeX math code and not included as an image. See any LaTeX math tutorial how to do this, for example the Wikipedia book on this subject: `https://en.wikibooks.org/wiki/LaTeX/Mathematics`.

2.3 Listings

All listings should be referenced in the text. There is a *listings* package that can you can use to clearly show some code snippets in your text. See the CTAN website for more details: `https://ctan.org/pkg/listings`. In any case, listings should be used sparsely, use pseudo-code instead of source code where applicable.

2.4 References

When you refer to another publication or a website in your thesis, you must give a proper reference using Bibtex. You can cite a book, for example the LaTeX book by Leslie Lamport [3]; or a conference paper, for example one given at Oulu, Finnland [1]; or a paper in a journal, for example a paper in "Visualization in Engineering" [2].

Citing a website (URL) is OK, but include as much information as possible, not just the URL [4].

2.5 Appendix

- Lots of pictures and diagrams...
- Lots of important pieces of program code...
- Long tables of important, but boring, numbers...
- Anything else which is important, but will hinder the reading in the main text...

3 Structure of scientific work

In order to ensure a systematic structure, scientific work should be structured similarly to the structure described below. In addition to the cover page and the declaration of authorship, scientific papers usually include at least one index of contents, illustrations and tables as well as a list of abbreviations, followed by the actual main part and a bibliography. In general, it should be noted that a reasonable structure depends to a large extent on your topic and your chosen method. Thus, the structure of literature reviews, conceptual work and development work usually differs from each other.

Summary or Abstract

The summary or abstract is detached from the actual elaboration and contains, in addition to a description of the task or objective, in particular the procedure, the methods applied as well as the essential results and summarises them as briefly as possible. The Summary or Abstract is not part of the structure of the work and therefore is not numbered.

Table of Contents

The table of contents includes all first, second and third level headings listed later in the work. A deeper structure than in the third level is to be avoided in the context of scientific work. In this context, the bibliography and the appendix are included as first level headings in the structure and thus in the table of contents, but are not numbered.

The table of contents is not included in the structure of the work and is explicitely not numbered!

Optional: I List of Figures

The list of figures lists all the illustrations and figures used in the work, including the caption and the corresponding page numbers (preset in this template). The list of figures is the first list with an independent, otherwise Roman section numbering. This list only needs to be appended when necessary. In individual cases, it may be helpful to consult the work supervisor.

Optional: II List of Tables

The list of tables lists all the tables used in the work, including their labels and the corresponding page numbers (preset in this template). This list only needs to be appended when necessary. In individual cases, it may be helpful to consult the work supervisor.

Optional: III List of Formulas

The list of formulas lists all formulas used in the work, including the label and the corresponding page number. It is only necessary if there are at least 3 or more formulas used in the work. This list only needs to be appended when necessary. In individual cases, it may be helpful to consult the work supervisor.

Optional: IV List of Abbreviations

The list of abbreviation lists all abbreviations used in the work, including their definition. This list only needs to be appended when necessary. In individual cases, it may be helpful to consult the work supervisor.

Optional: V List of Symbols

The list of symbols lists all mathematical symbols used in the work, including their definition. This list only needs to be appended when necessary. In individual cases, it may be helpful to consult the work supervisor.

1 Introduction

Within the introduction, the objective is formulated, placed in an superordinate context and distinguished from other topics. The most important terms of the topic must be

placed within the context to be considered in the introduction while an thorough formulation is particularly important. In addition, information on the methodology can be provided. The structure of the work should be presented.

Thus the first section contains the following aspects:

- Description of the problem to be solved with this work
- Objective of the work and the delivered contribution to science
- Structure of the work

In the case of extensive scientific work, such as bachelor's and master's theses, the introduction should consist of one to three pages. In addition, it is useful to insert a figure at the end of the section which shows the structure, the argumentative sequence or important core statements of the work. Experience shows that the introduction should only be formulated in detail at the end of the work in order to avoid repeated changes to the main text.

2 Related Work

Based on the introductory explanations, this section focuses on the contextualisation of the problem or objective described and the synthesis of the necessary fundamental principles. Necessary fundamental principles contain knowledge on topics that cannot be assumed to be engineering knowledge in the field of construction sciences or computer science.

In this context it is important to explain elementary terms, definitions and/or theories on the one hand and to present the state of research in the respective subject area on the other hand. Accordingly, a summary is given of the scientific basis on which the scientific work to be written is based.

3 Methodology

This section focuses on the methodology chosen to achieve the research objectives or to answer the research questions. It is made clear how the objective of the work formulated in the introduction is to be achieved or implemented using scientific methods.

4 Additional Main Section(s)

In general, this main section or sections represents your results. The concrete structure of the scientific work depends largely on the task to be solved or the research questions to be answered, so that no detailed recommendations for this section can be given here, but exemplary sections could be requirements analysis, conception, development, evaluation for a development work or test setup, test execution, evaluation for an experimental work.

For the specific structuring of the main section(s) a consultation with the supervisor of the work is helpful in any case.

5 Discussion

The discussion serves to interpret or critically discuss the results achieved on the basis of the problem or question formulated in the introduction as well as in the context of current and relevant literature on the topic. In this context, unexpected results or contradictions to assumptions made or to the existing scientific literature will be specifically worked out.

6 Conclusion

The conclusion completes the scientific work as a final statement. The objective, the methodology applied and the conclusions drawn are summarised once again and assessed in terms of the extent to which the introductory objective could be achieved. It is advisable to consider possible limitations of your work and to reflect critically on your approach. In addition, you should formulate in an outlook how further scientific work could tie in with its results and which priorities you see for further research work in the topic area of your work.

Bibliography

In the bibliography, all sources used in the context of scientific work are specified in detail.

Appendix

In principle, only those contents are included in the appendix which are not essential for the understanding of the content, but which may have an important relation to the own elaborations or an additional information character. These include, for example, questionnaires specially developed for the purpose of a study.

References

[1] T. Hilfert and M. König. Low-cost virtual reality environment for engineering and construction. In *32nd International Symposium on Automation and Robotics in Construction and Mining*. University of Oulu, Finnland, June 2015. URL `http://isarc2015.org`.

[2] T. Hilfert and M. König. Low-cost virtual reality environment for engineering and construction. *Visualization in Engineering*, 4(2), January 2016. doi: 10.1186/s40327-015-0031-5.

[3] L. Lamport. *LATEX: a document preparation system; user's guide and reference manual*. Addison-Wesley, Boston, 2005. ISBN 0201529831.

[4] Wikipedia contributors. LaTeX — Wikipedia, The Free Encyclopedia, 2011. `https://en.wikipedia.org/w/index.php?title=LaTeX&oldid=413720397` [accessed 30-November-2018].