Thesis Title

Master Thesis

at

University of Bayreuth

Chair of
Scientific Computing
in cooperation with

Partner's name

by Name Name
Supervised by Prof. Name
19 February 2021

Preface

This document is an example of how LaTeX can be used to create a Thesis. Basically it's a cut down version of my Master Thesis. It's goal is to provide a template for studens to fasciliate their first contact with LaTeX. Therefore, feel free to use this document as a starting point for your own work. If you prefere a different layout, adapt it to your liking.

Good luck!

Bayreuth, February 2021

Thomas Rau

Contents

Introduction

Write some introduction to your thesis. Normally it should contain a short overview of your work and describtions of the chapters.

Chapter 1

Some Basic Stuff

In this chapter some basic usage of LaTeX will be shown.

1.1 Organize your text

We start with some basics.

1.1.1 Basics - I

Let's have a look at the elasticity equations. Let $\Omega \subset \mathbb{R}^3$ with$\Gamma := \partial\Omega$ be given. The solution of the boundary value problem

$$
\begin{aligned}
-\sum_{j=1}^{3} \frac{\partial}{\partial x_j}\sigma_{ij}(u,x) &= 0 && \text{für } x \in \Omega,\ i = 1,2,3, && (1.1)\\
u(x) &= g_D(x) && \text{für } x \in \Gamma_D, && (1.2)\\
\sum_{j=1}^{3} \frac{\partial}{\partial x_j}\sigma_{ij}(u,x)n_j(x) &= g_{N,i}(x) && \text{for } x \in \Gamma_N,\ i = 1,2,3, && (1.3)
\end{aligned}
$$

is to be found.

The homogenous elasticity equations (1.1) describe the deformations of linear elatic and homogenous materials. You can cite literature like this [1].

Let's define something.

Definition 1.1.1
Let $\Omega \subset \mathbb{R}^d$ be $s \in \mathbb{N}_0$ given. The Sobolev Space $H^s(\Omega)$ is defined as

$$H^s(\Omega) := \left\{ u \in L_1^{loc}(\Omega) : D^\alpha u \in L_2(\Omega) \text{ for all } \alpha \in \mathbb{N}_0^d \text{ mit } |\alpha| \leq s \right\}.$$

Here we formulate a theorem for Sobolev Spaces defined in Definition 1.1.1:

Theorem 1.1.2 (Trace Theorem)
Let $\Omega \subset \mathbb{R}^d$ be a Lipschitz domain with boundary Γ and $s \in (\frac{1}{2}, \frac{3}{2})$. The Trace Operator

$$\gamma_0 : H^s(\Omega) :\rightarrow H^{s-\frac{1}{2}}(\Gamma)$$

is linear and continous.

Proof. It's a good excersices to do it for yourself. □

1.2 Numerics

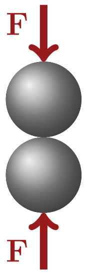
For simulation some numerics are needed.

1.2.1 A Very Short Introduction

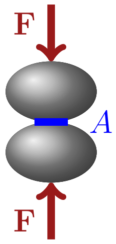
Assume there is a force F acting on Ω. For the pressure the condition

$$\int_A p(y) dS_y = F \tag{1.4}$$

holds. This is visualized in figure 1.1.



(a) Before



(b) After

Figure 1.1: Deformation of Spheres

1.2.2 Need for Speed

The computational methods need to fullfill some criteria.

- It needs to be fast
- To be popular it should be easy to use

Chapter 2

Numerical Examples

In this chapter some numerical examples will be presented.

2.1 Plots in LaTeX

It is also possible to create plots directly from data.

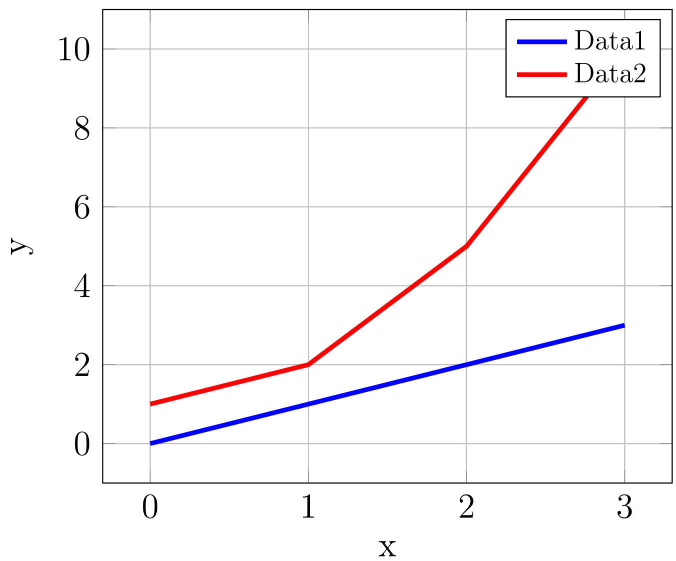
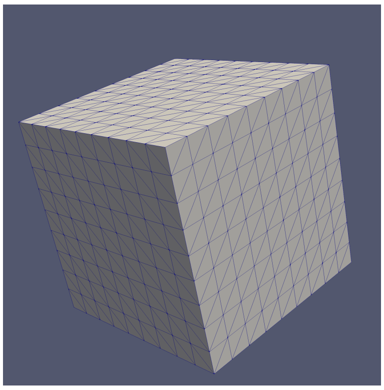


Figure 2.1: Some Plots

2.2 Test der Randelement-Vorkonditionierer

Remark 2.2.1
Here the usage and style of remark is shown.

LaTex also supports the creation of tables. Graphics can be imported to. The package subfigure allows ordering of floating elements inside one figure.



Level	Elements	Nodes
L_1	972	488
L_2	3 888	1 946
L_3	15 552	7 778
L_4	62 208	31 106

Figure 2.2: Mesh of cube $\Omega = [-1, 1]^3$

Summary

Summary of your work. What did you do, what where the central new insights...

Appendix A

Linear Systems

Let $A \in \mathbb{R}^{n \times n}$ be a symmetric, positiv definite matrix. The linear system

$$Ax = b$$

is to be solved.

References

[1] M. Bebendorf: *Hierarchical Matrices - Lecture Notes in Computational Science and Engineering*. Springer, (2008).