Assignment 6

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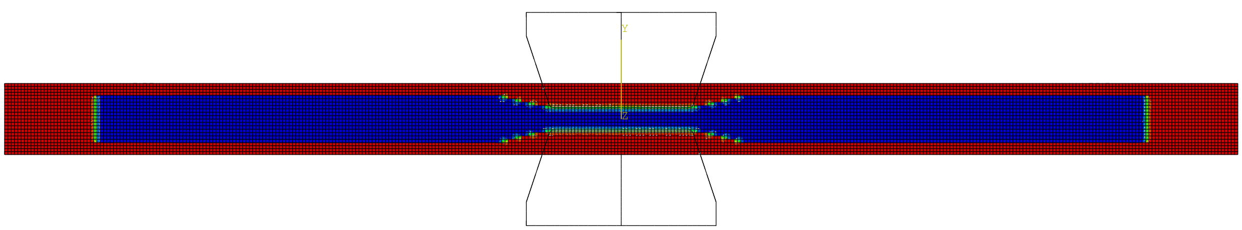
Finite Element Analysis I

May 17, 2019



Abstract

In this assignment we investigate the behaviour of a model cornea tissue sample consisitng of fibers at different angles respective to the applied force. The resulting foce / displacement relationship is our primary matter of interest.

Contents

1 Introduction

The cornea sample is modelled using abaqus. The fibers are orientated at 45 degrees respective to the applied force. The force is applied on the top of the sample, pulling upwards. In this simulation, a fixed deformation of factor 1.25 is performed, retrieving the corresponding force values. In a second simulation, the fibers are orientated at 30 degrees respective to the line of force, while maintaining orthogonality between the fiber sets. We expect a less symmetric behaviour of the sample during simulation due to the asymmetric setup.

Figure 1: Model of the plate with Eulerian formulation

As shown in Figure **??**, the fibers are orientated differently in both simulations.

2 Methods

2.1 Analyzing the data with Python

We created a model with CPS4R mesh type. Based on the last assignments, the reduced integration gave us the best result, so we stick with that.

2.2 Holzapfel-Gasser-Ogden Framework

We use the Holzapfel-Gasser-Ogden approach to model the biomechanical behaviour of our sample. This approach targets the anisotropic behaviour of the material with multiple layers of fibers at different angles. This is required in order to achieve a relatively realistic distribution of forces and strains within the sample.[**?**].

3 Results and Discussion

The results are

References

[1] Michel Goossens, Frank Mittelbach, and Alexander Samarin. *The LaTeX Companion*. Addison-Wesley, Reading, Massachusetts, 1993.

[2] Michel Goossens, Frank Mittelbach, and Alexander Samarin. *On the Use of Biaxial Properties in Modeling Annulus as a Holzapfel–Gasser–Ogden Material*. Sharaki et al., University of Toledo, Toledo, OH, USA, 2015.