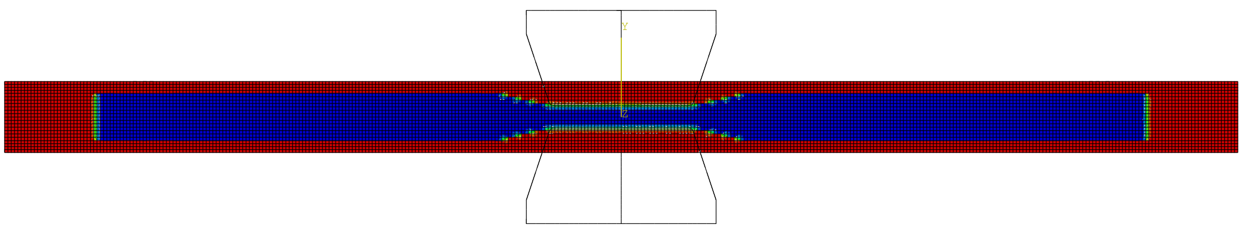
Assignment 6

Nalet Meinen and Pascal Wyss
Finite Element Analysis I

May 16, 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 cornes 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.

Figure 2: Node to node with no sliding

Figure 3: Result of the previous assignment with eulerian result

3 Results and Discussion

The analytical and the experimental results are similar. Logically the experiment with introduced friction (friciton coefficien 0.2) results in a higher stress/strain ration, as energy of the compression gets lost in friction. during modelling, we ran into troubles with the simulation due to the sharp corner of the press. Thus we introduced a small 1mm fillet to smoothen the process. This worked out fine and the results got better and were calculated more quickly.

The stress/strain ratio calculations which allowed for small sliding show a higher stress per strain ratio.

References

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