Sensitivity analysis 1: Prestretch and axial loading

Methods

Prestretch and an axial load are applied in the imaging state of six models (oks001, oks002, oks004, oks006, oks007, oks008), with the flexion angle fixed but all other DOFs free.

- Timesteps: (5 x 0.1)
  1. 0 - 0.1 Settling (nothing applied)
  2. 0.1 - 0.2 Prestretch application
  3. 0.2 - 0.5 Apply axial load (-20N)
- Prestretch values
  - 1 ligament prestretch changed at the time while the others are kept at 1.
    ACL: 0.9 – 1.05 in steps of 0.01
    PCL: 0.9 – 1.10 in steps of 0.01
    MCL: 0.9 – 1.10 in steps of 0.01
    LCL: 0.9 – 1.10 in steps of 0.01
- Looking at convergence

Results

Full results can be found in: *Sensitivity analysis 1 results.pptx*

oks001
Almost no problems for most of the simulations of the ACL, LCL & PCL prestretch factors. Convergence difficulties were present in the lower prestretch values of the MCL.
oks002
Almost no problems for most runs of the simulations of the ACL, LCL & MCL prestretch factors. More convergence difficulties were present in the simulations of the prestretch factors of the PCL.
oks004
ACL: ran for the prestretch values in the middle of the range tested
LCL: ran for a few prestretch values in the middle of the range tested
MCL: ran for a few prestretch values
PCL: ran for multiple prestretch values (mostly in the higher end of the range tested)
oks006
ACL: ran for some prestretch values
LCL: did not converge fully for any of the prestretch values
MCL: ran for some prestretch values
PCL: ran further for the presetretch values in the higher end of the range tested, did not run for all prestretch values
oks007

ACL: did not run
LCL: ran only 1 simulation fully
MCL: did not run
PCL: did not converge fully for any PS values
oks008
ACL: converged fully for all PS values
LCL: converged fully for all PS values
MCL: converged fully for most PS values
PCL: converged fully for most PS values

Conclusion

- Most of the models have trouble converging for part of the ligaments and the prestretch values to try.
- Most difficulties in model oks004, oks006 and oks007