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Dipartimento di Ingegneria Civile, Ambientale e Meccanica

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# AVVISO DI CORSO

Si comunica che **mercoledì 09 aprile 2014 a partire dalle ore 10.30** si terrà presso l'aula **R2** (via Mesiano 77) il seguente corso

# Problems with the Finite Element implementation of anisotropic elasticity


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Finite Element Analysis is a computational method which has successfully solved countless, otherwise intractable, problems for deformed solids. It works perfectly fine for linear elasticity, where strains are infinitesimally small. However, its extension to non-linear elasticity, where deformations can be as large as desired, has proved very difficult. In a series of papers we have explored the performance of existing commercial and open codes relying on FEA and unearthed some crucial problems, which must addressed before simulations on the behaviour of soft matter, gels and soft tissues can be expected to have a predictive power.

For instance, when a sphere of anisotropic linear metal is under hydrostatic pressure, it deforms into an ellipsoid. We found that when we subject a sphere of anisotropic non-linear soft tissue to a hydrostatic pressure or tension, ALL current Finite Element codes predict that it will turn into another sphere, which is clearly wrong. This shortcoming puts the accuracy of all FEA biomechanics simulations into question, as all deformations include a spherical part. We studied this problem, found its origins, and proposed a remedy.

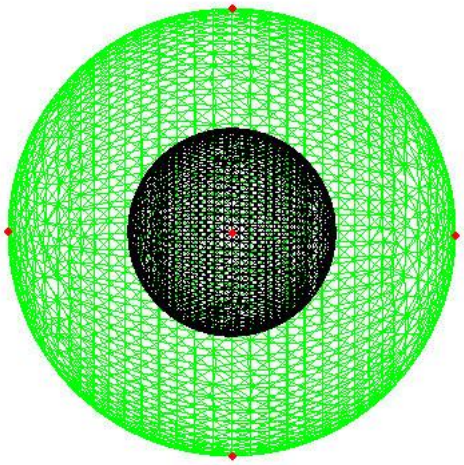

Figure 1:
A sphere of Hozlapfel-Gasser-Ogden (HGO) material reinforced with two families of stiff fibres is put under hydrostatic tension: ABAQUS predicts that it will turn into another sphere, which is clearly wrong.

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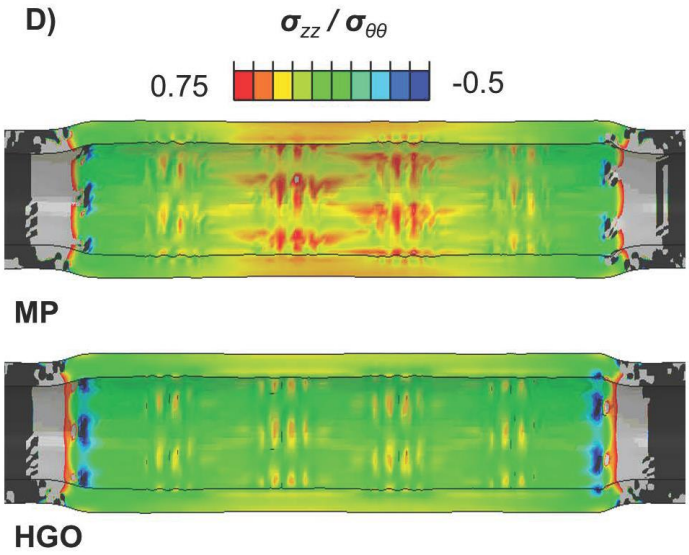


Figure 2:
Contour plots illustrating the differences in stress computed by our Modified Potential (MP) model and the HGO model after stent deployment (ratio of axial stress to the circumferential stress).

Tutti gli interessati sono invitati a partecipare.

Il seminario è organizzato dal gruppo di Scienza delle Costruzioni
(D. Bigoni, L. Deseri, N.Pugno, M. Gei, F. Dal Corso, A. Piccolroaz, R. Springhetti)

Solid and Structural Mechanics Group
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