MODIFICATION OF THE ANSYS MALE COMPUTATIONAL PHANTOM AND RESULTING FEM PERFORMANCE

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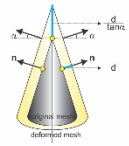
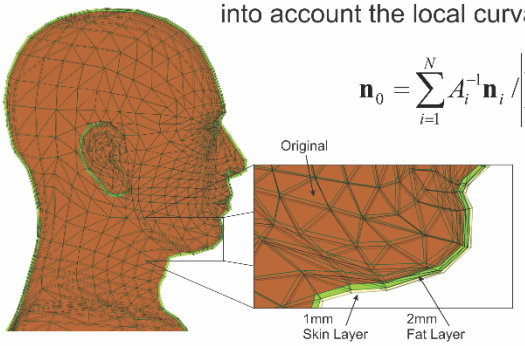
The ANSYS human male phantom, developed in the mid-2000's, has a geometry that is particular to the patient upon which it is based and does not necessarily reflect the body types that present applications require. This paper presents the systematic modification and augmentation of the original model to enhance its applicabilty and demonstrates the proof of concept of both isotropic and anisotropic mesh adaptations to fit a changing human population. The resulting computational metrics for the corresponding computational electromagnetic simulations are reported.

New layers may be created by expanding the nodes of the original surrounding shell outward in the normal direction, taking into account the local curvature.

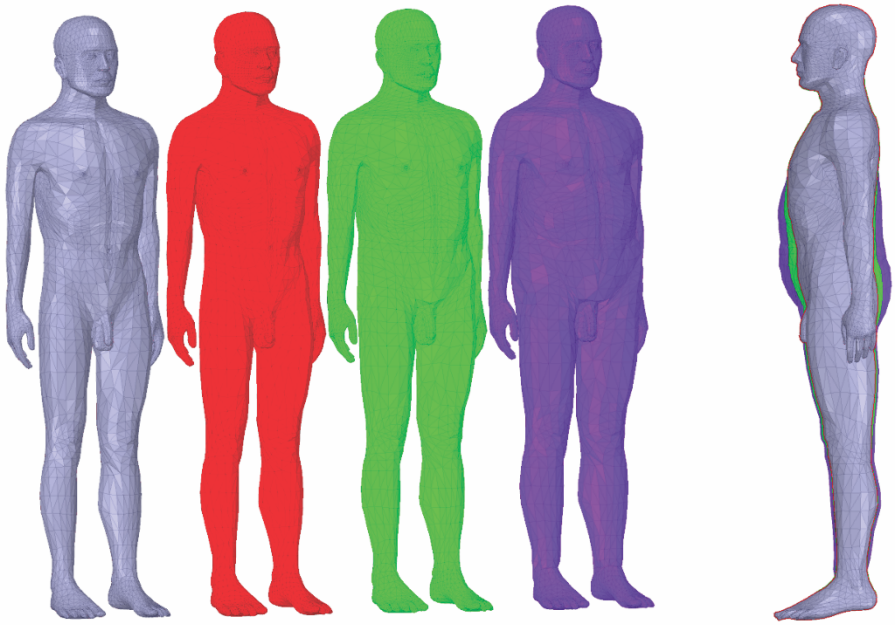
$$\mathbf{n}_0 = \sum_{i=1}^{N} A_i^{-1}\mathbf{n}_i \Big/ \left|\sum_{i=1}^{N} A_i^{-1}\right|$$



$$\mathbf{p}_i = \mathbf{p}_i + d\frac{\mathbf{n}_0}{|\mathbf{n}_0|^2}$$



Isotropic layers may be automatically created in this manner. Anisotropic layers are generated by repeating this outward normal expansion using masking regions.



All simulations performed using ANSYS HFSS in Electromagnetics Suite 16.1.0 on a server employing AMD Opteron Processor 6174 (4 processors per node) with 192 GB of RAM. Excitation was a vertically polarized 300 MHZ incident plane wave and all simulations used the Classic meshing scheme with five adaptive passes.

Model Configuration	Performance Characteristics			
	Volume of Fat (mm^3)	Body Fat %	Number of Tetrahedra	Runtime in Real Time (HH:MM:SS)
Original	2.538e-3	3.25	772,537	04:34:46
Modification 1	4.534e-3	5.52	748,718	05:37:21
Modification 2	9.71e-3	13.6	759,895	05:38:20
Modification 3	23.7e-3	23.4	896,656	06:10:56