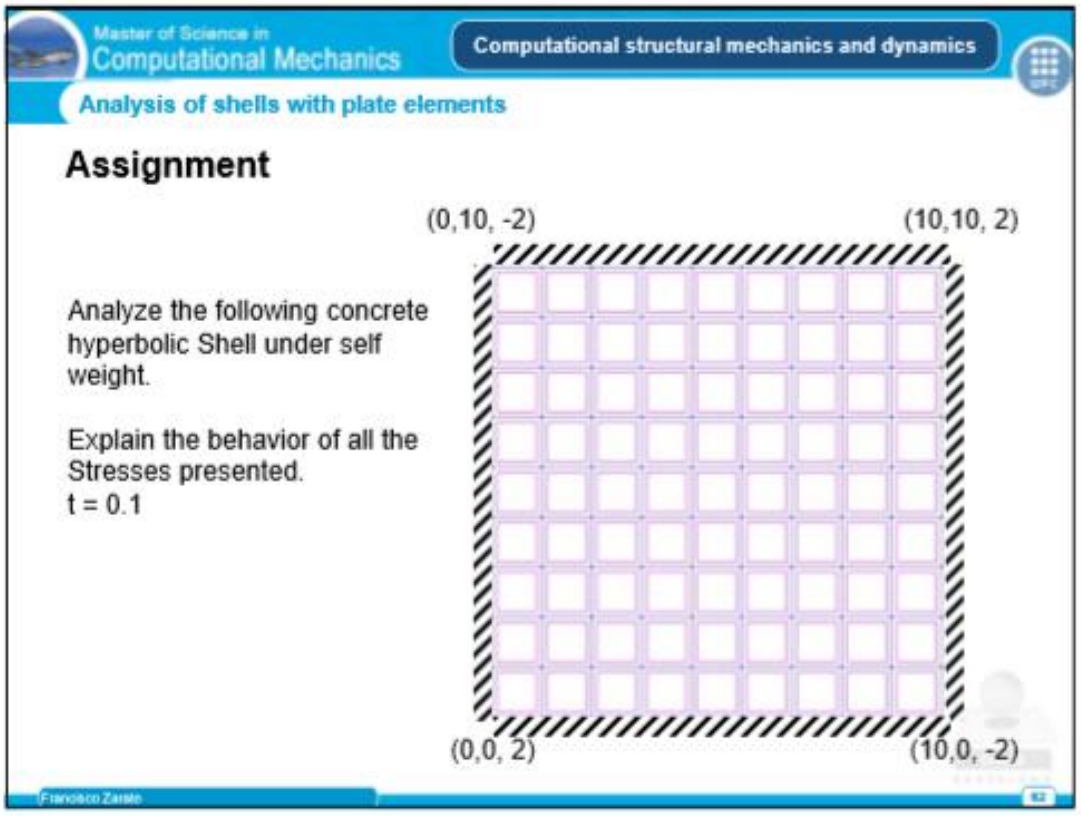
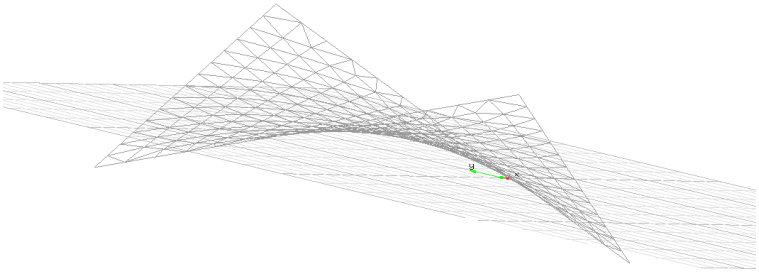
Assignment 8- Nicolas Andre Caronte Grønland

Task:



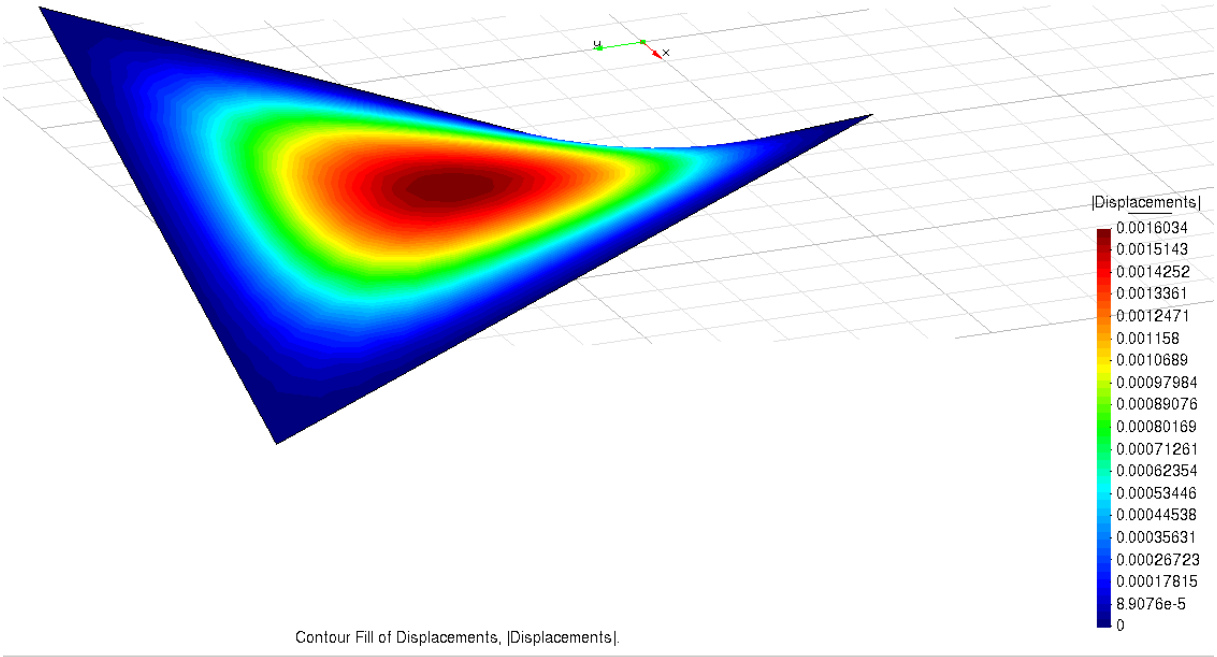
Solution:

Firsty I downloaded the GID extension "MAT-fem.shells" to define the geometry and the mesh in GID. Here I drew the geometry, assigned the material and boundary conditions. Also the element type was chosen as first order triangular elements. This gave the following mesh:



After that I could export the mesh to MATLAB to run the analysis. This was done using the Lamina_T_RM.m that is provided on CIMNE. Next the results from the MATLAB script was exported back to GID for post processing. The results are as follows:

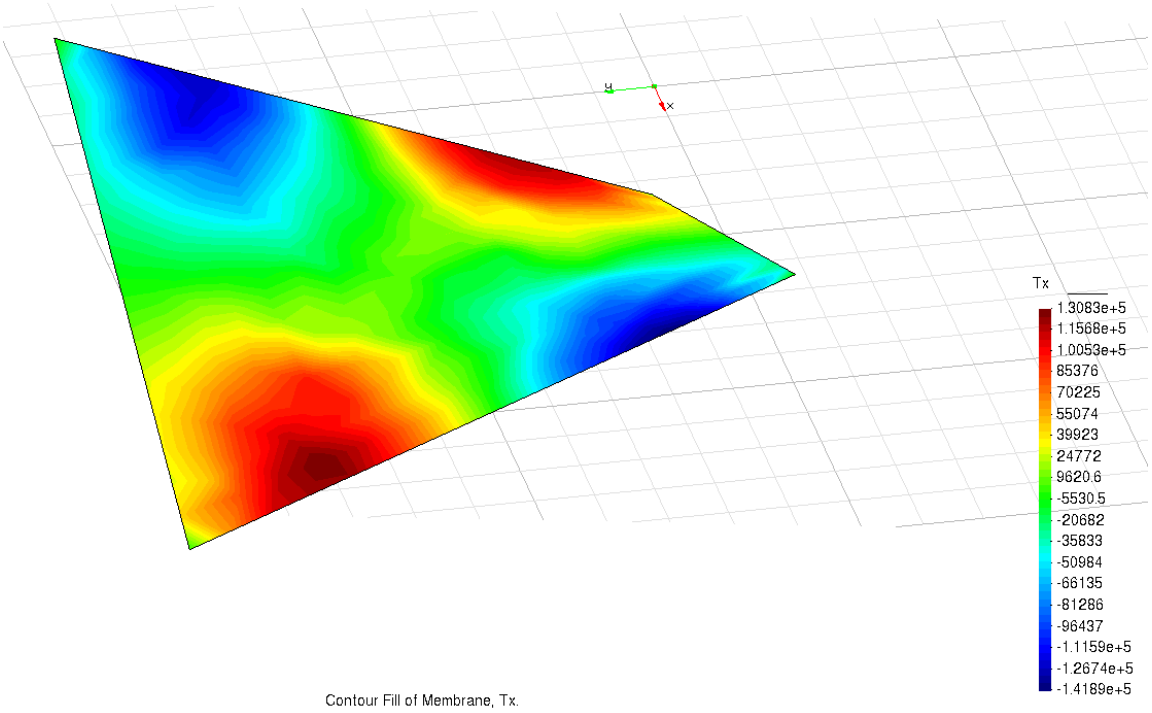
Displacements:



As expected, the largest displacements occur in the middle of the plate, farthest away from the clamped supports that run along all four edges. The largest displacement is 0.0016034m or roughly 1.6 mm. One can therefore conclude that the displacements under self-weight are very small. This is due to the geometry being a shell. Some of the gravity loads will act as an in-plane load, and thus the response is improved.

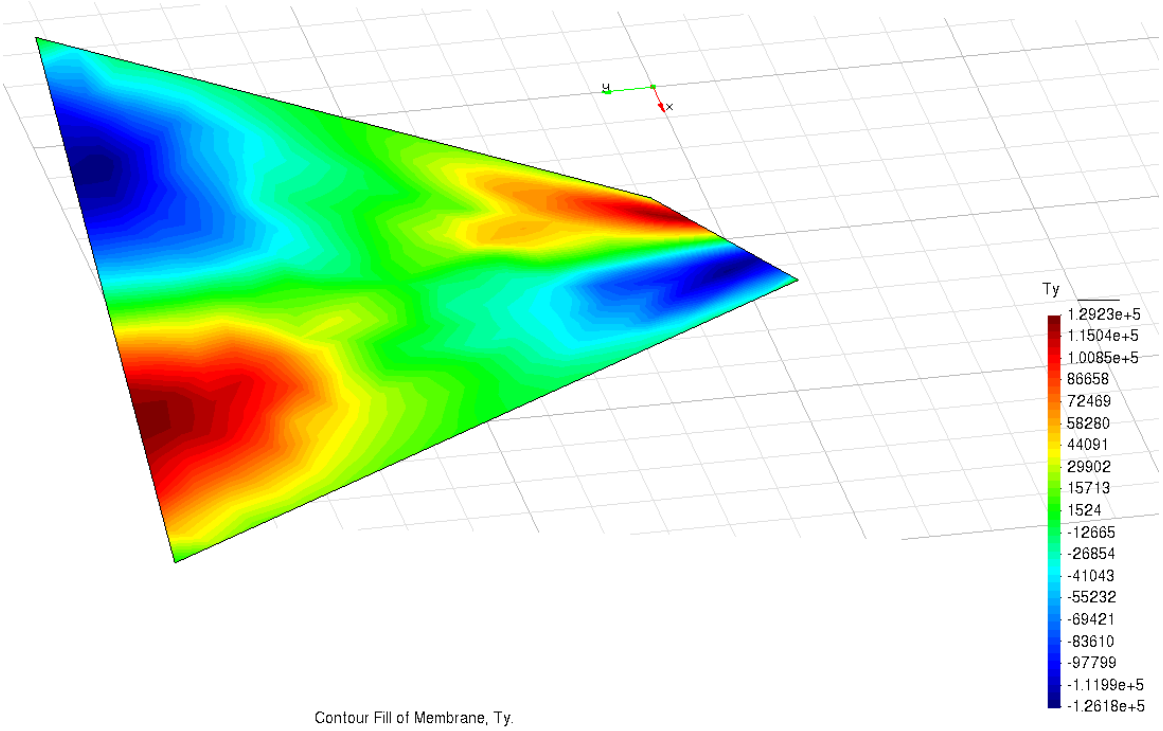
Stresses:

On the following pages I have attached the resulting membrane stresses that the shell will experience under its self-weight. As one would expect the lower parts of the shell, meaning around (0,10,-2) and (10,0,-2) are in compression, marked as blue spots on the figures. We can note that the membrane stresses in both X and Y direction are close to zero in the middle of the plate. For the material being concrete it is favorable with compressive stresses, and thus the use of a curved shell compared to a flat shell is favorable, seeing that for a flat shell there would be no compressive stresses under self-weight.



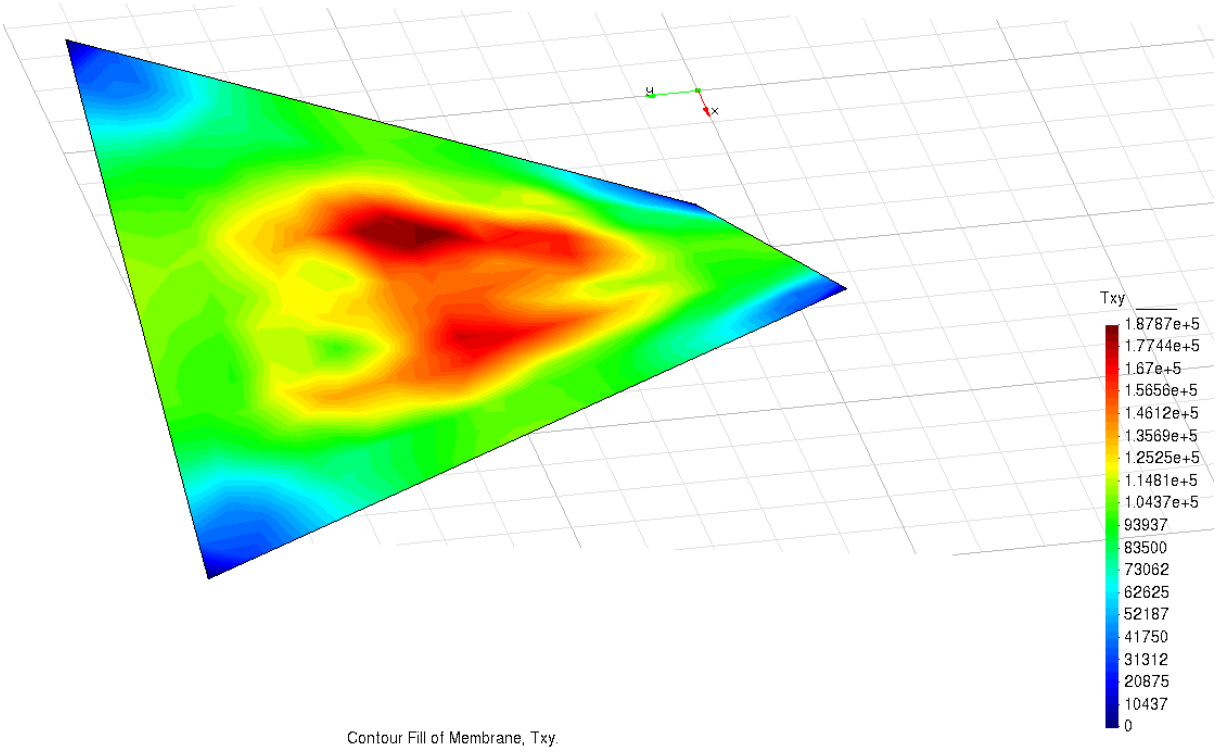
Contour Fill of Membrane, Tx.

X-direction



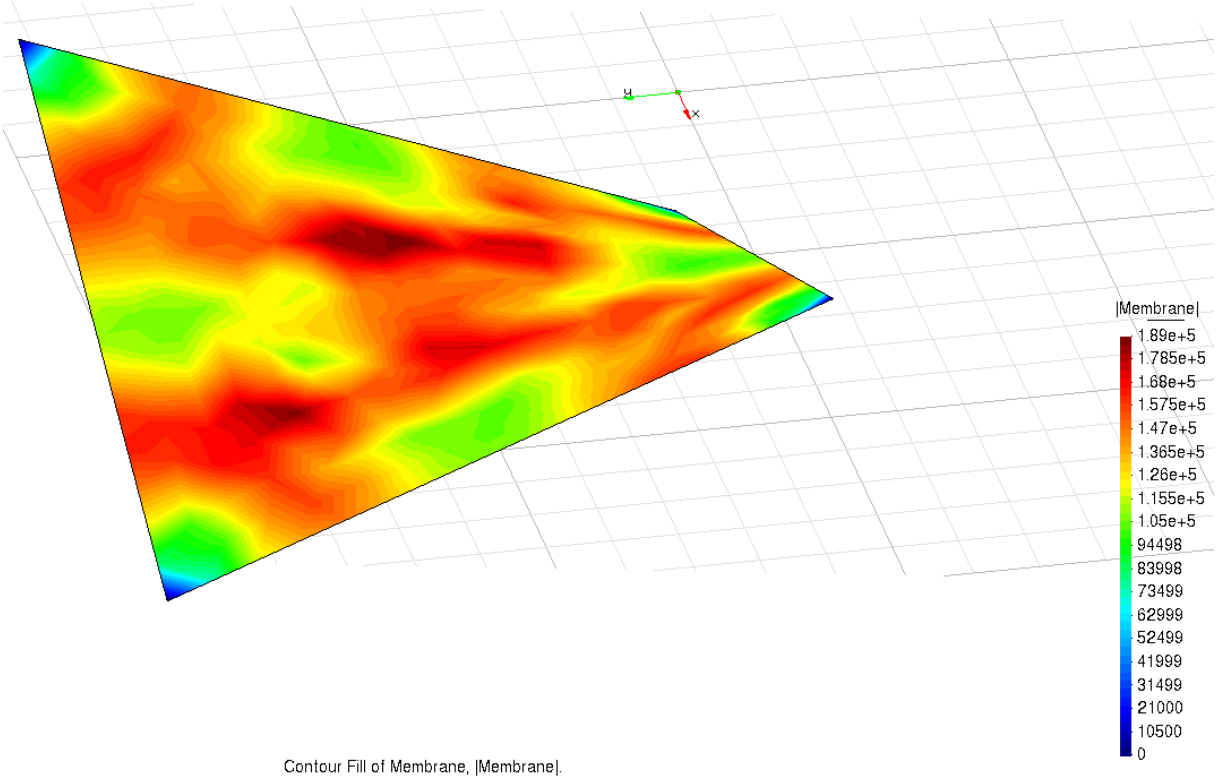
Contour Fill of Membrane, Ty.

Y-direction



Contour Fill of Membrane, Txy.

XY-direction



Contour Fill of Membrane, |Membrane|.

Overall