

CIMNE^R

**Computational Structural Mechanics and
Dynamics**

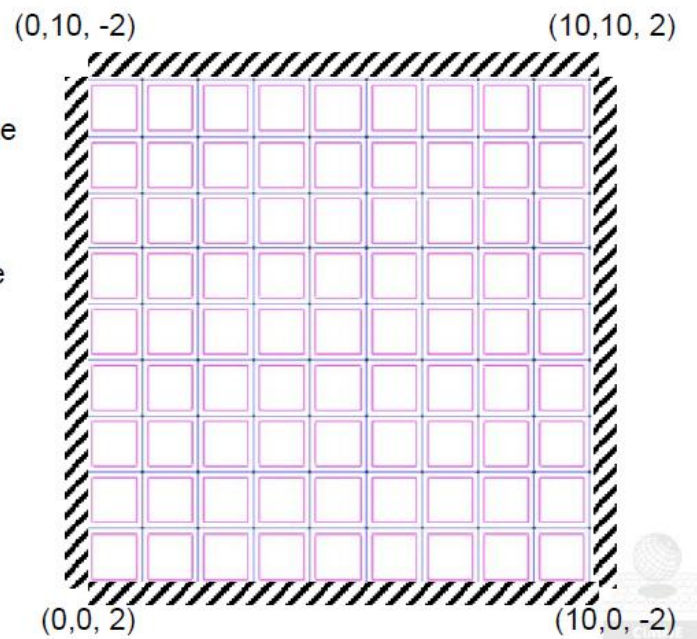
Assignment 8

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Assignment

Analyze the following concrete hyperbolic Shell under self weight.

Explain the behavior of all the Stresses presented.
 $t = 0.1$



- Surface of concrete hyperbolic Shell : 10x10
- Thickness of the concrete hyperbolic shell : 0,1m
- We should consider its behavior when exposed to its self-weight. The boundary conditions for the shell are clamped along the edges and both the displacement and the rotation are constrained in all directions.

In the Figure 1. Concrete hyperbolic shell is shown.

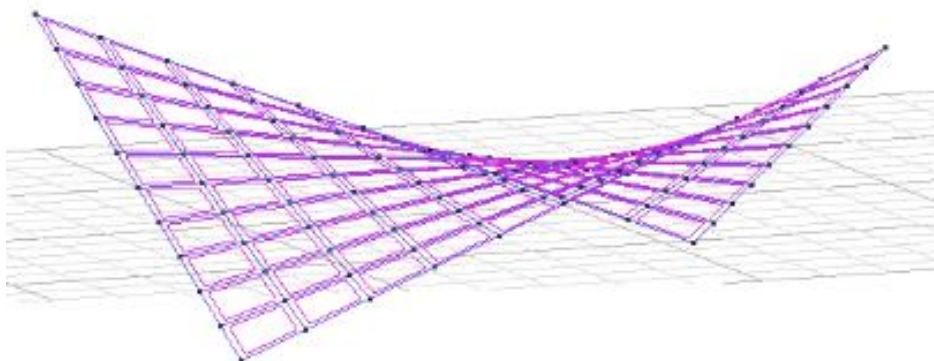


Figure 1-Concrete Hyperbolic shell

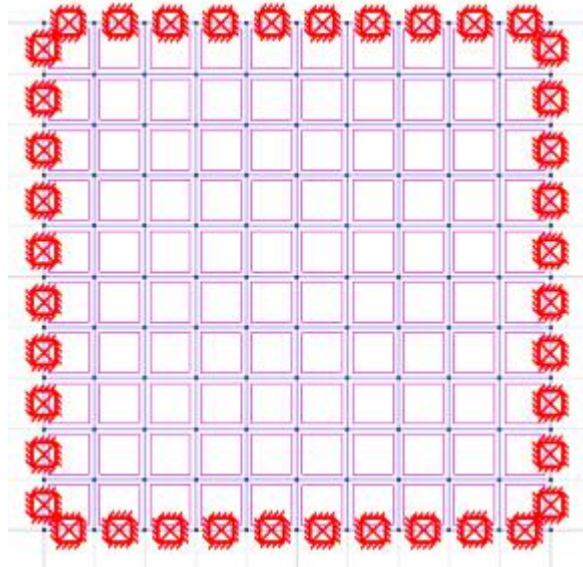


Figure 2-shell division and edge fixities in XY-plane

And we get the below results for shear stresses:

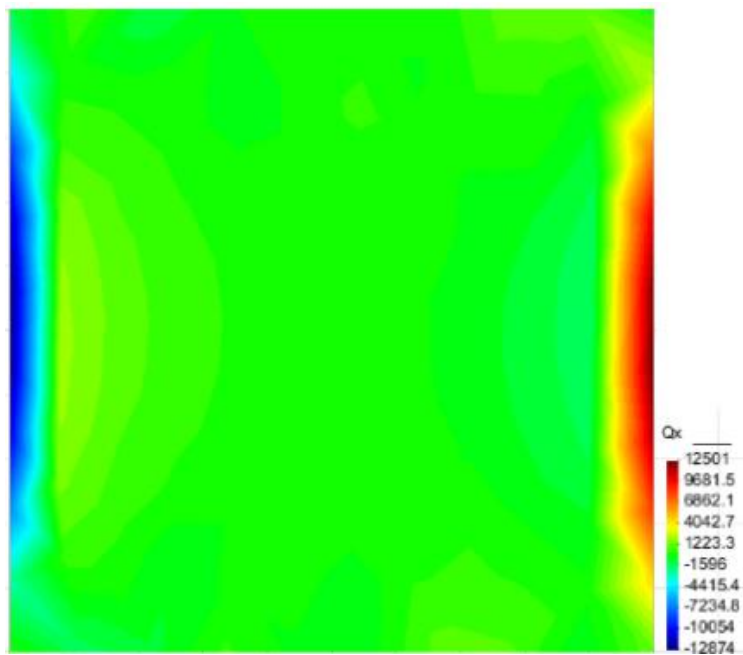


Figure 3-Shear Stress Qx

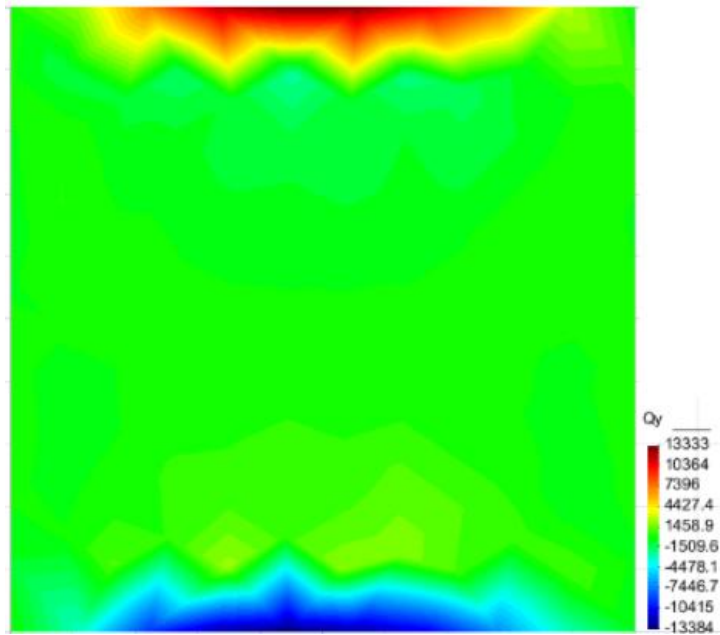


Figure 4-Shear Stress Qy

About the shear stresses we get, we can say that the shear stress is concentrated on the edges of the shell. When we move away further from the edges, we get the lower stresses.

Moreover, the stresses in the opposite directions are barely same.

The results for Membrane stresses are given in Figure 5, Figure 6 and Figure 7.

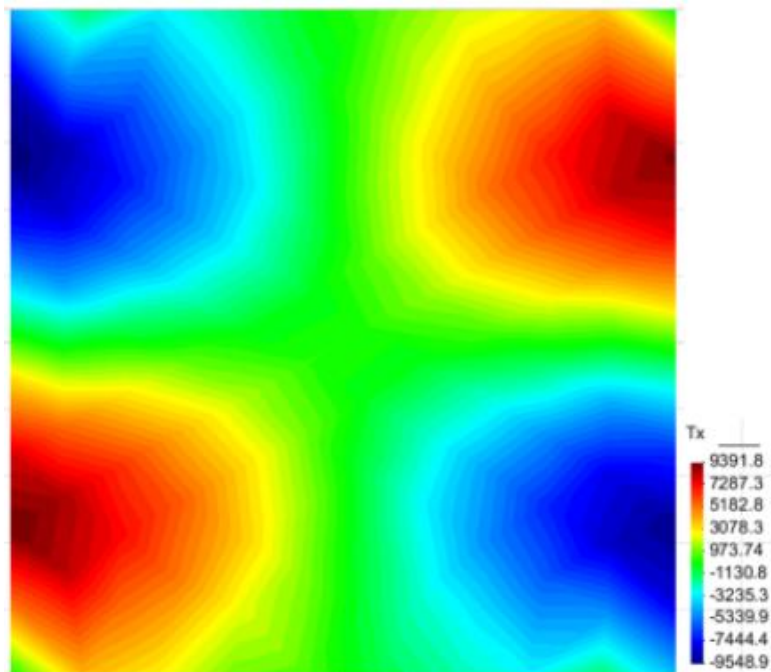


Figure 5-Membrane Stress Tx

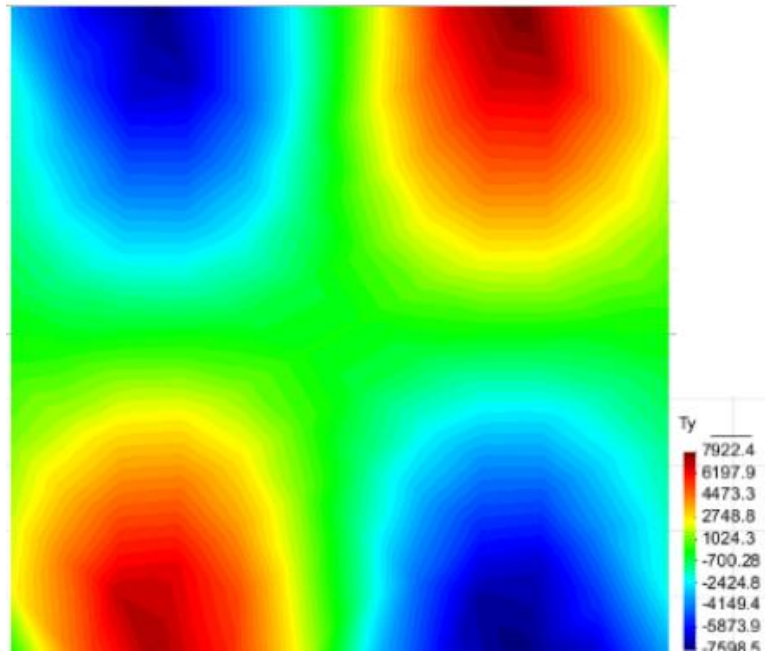


Figure 6-Membrane Stress T_y

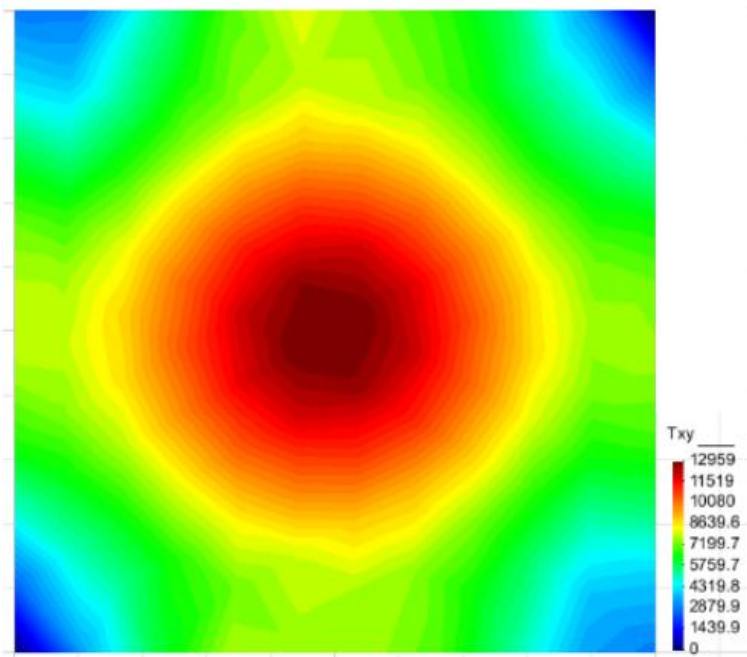


Figure 7-Membrane Stress T_{xy}

The stresses are concentrated at the edges of the membrane in a diametrically opposed way. Therefore we say that the highest stresses in the XY direction T_{xy} in the middle of the membrane.

Flexural stresses are shown in Figure 8 Figure 9 and Figure 10.

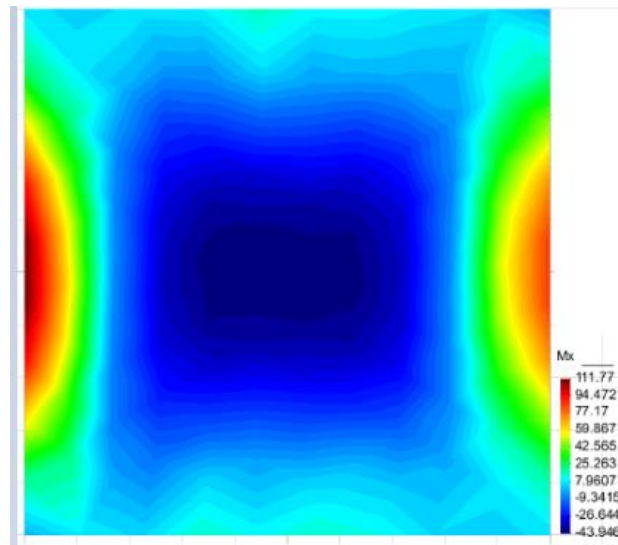


Figure 8-Flexural Stress M_x

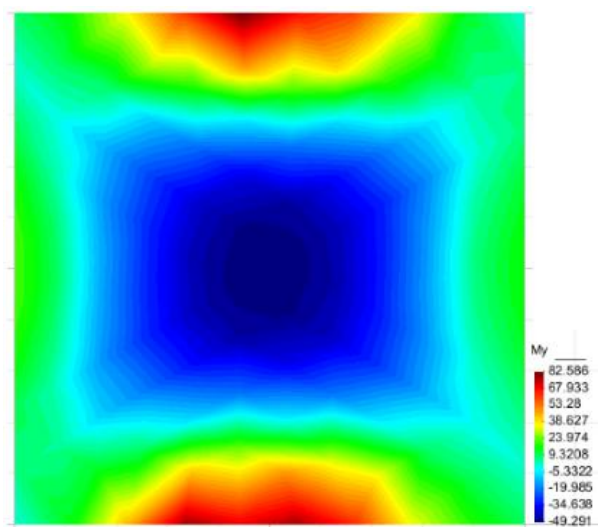


Figure 9-Flexural Stress M_y

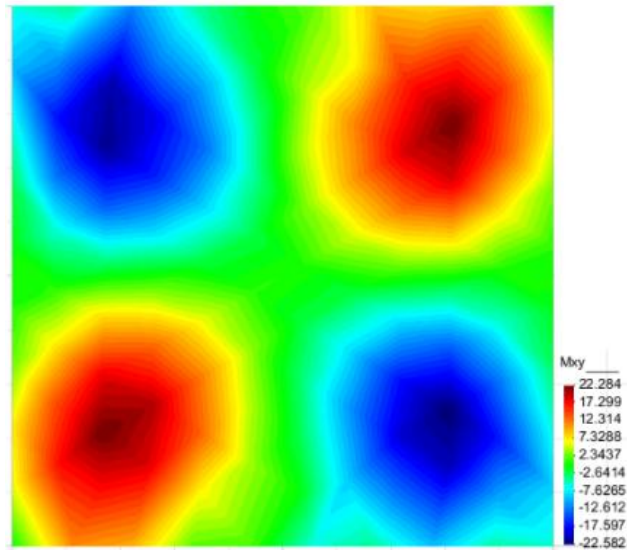


Figure 10-Flexural Stress M_{xy}

About the flexural stresses, we can say that the largest flexural stresses are located near the edges where the loads are the highest. Shells carry high flexural stresses. The existence of shear and membrane stresses at the supporting edges of the shell are related to these stresses.