Topology Optimization

Topology optimization is one of the methods used in order to minimize the amount of used material and the strain energy of structures while maintaining their mechanical strength.

Problem Formulation:

$$\text{Objective Function : } \min_x \ f := d^T \ K(x)d$$

$$\text{Constraints: } h := K(x)d = u,$$

$$g := V(x) \leq v \ , \ x \in [0,1].$$

Where K(x) is the stiffness matrix, V(x) is total volume, d is displacement, u is structural load

This problem is solved using 88line MATLAB code of Ole Sigmund, first defining material properties. By conducting the Finite element analysis, we obtain stiffness matrix.

The load is applied on the cantilever beam is oscillating upside and downward direction.
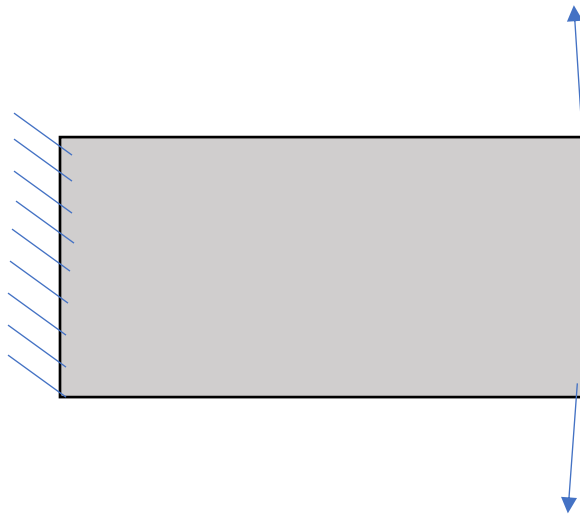
From the results obtained we can observe that load is acting symmetrically about the horizontal axis of the cantilever beam, also we can infer that it is in shape of truss.