Numerical and practical experiments for maximally stiff structure under tensile loading based on the topology optimization theory and the FEM

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Abstract

In this study, numerical studies for a maximally stiff structure based on the topology optimization theory, i.e., the density method and the adjoint variable method, and the finite element method (FEM) are carried out [1], and the result of some actual tensile tests for the optimized structure is shown. Although papers related to research on the topology optimization and experiments can be seen [2], it is difficult to find research papers that have considered the weight reduction based on the topology optimization and experiments. Therefore, in this study, the specimens for tensile testing are made using 3D printer, and the thickness of the optimized model is also investigated, assuming the displacement of the optimized model to be the same as that of the initial model. In addition, the numerical results by changing filtering radius are shown [3] (See Fig.1).

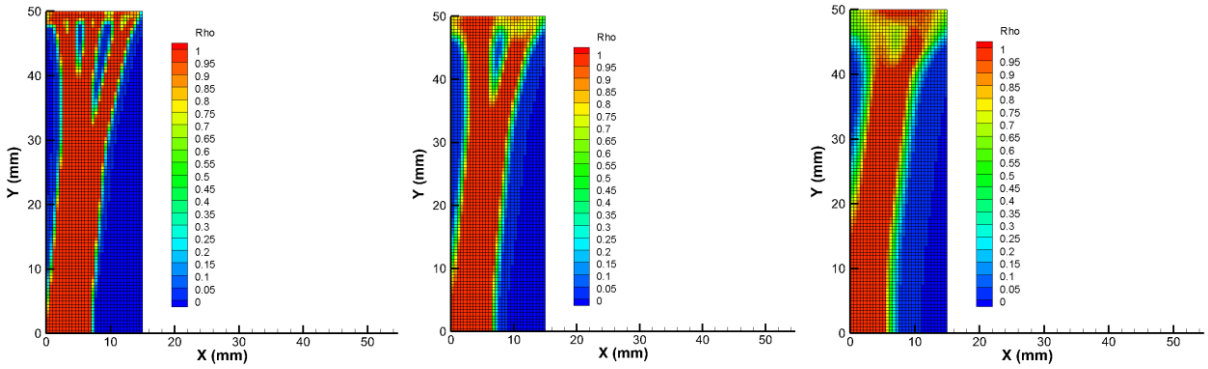

Fig.1 : Comparison of optimized structures, i.e., density distribution, in each filtering radius "*R*". (Left *R*=0.75mm, Middle *R*=1.50mm, Right *R*=2.50mm) This is the result of 1/4 model in tensile loading test. 1MPa is acting on upper surface, and the symmetric surface is set on lines of *x*=0mm and *y*=0mm.

References

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