Modelling linear elasticity in two dimensions using finite elements; with a wall bracket as an example

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This study seeks to understand the elasticity of a thin body experiencing plane stress. It focuses on static analysis of state of the stress of an L-shaped wall bracket in 2- dimensions with a view to determine the position of maximum stress and deflection on the wall bracket. The study was carried out in two phases. One phase considered the wall bracket fixed at its two endpoints. The other phase was having the entire wall bracket fixed to the wall. In both cases, more elements were added at the sharp corner of the wall bracket in order to increase its strength. The finite element method was used to discretize the domain of the problem and solve the mathematical model for the stress distribution in the bracket. Matlab programs were designed to generate the mesh of the wall bracket. The resulting boundary value problem was then solved numerically. The numerical results are found to be sufficiently accurate as they agreed with the principles of engineering by predicting where the wall bracket fails when loading is done at three nodal points while the bracket is either fixed at two end points or on the entire vertical part of the wall. It was demonstrated that deformation as well as the position of the maximum stress are significantly influenced by the type of the fixed support and the number of fillets added to the support. This shows that stability of the wall bracket is influenced more by its shape than the position when the load is applied.