Numerical Solutions of Bending and Buckling of Structural Mechanics

In order to approximate solutions to mathematical problems that are difficult to solve, or have no known analytical solution, various numerical methods are used. We are investigating the application of two numerical approximations, the finite difference method and the shooting method, to the differential equations describing the structural phenomena of bending and buckling in beams or columns. The finite difference method approximates differential equations with difference equations derived via Taylor Series. The shooting method aims to convert a boundary value problem into an initial value problem and requires iteration to reach the desired boundary condition. Initial work has been done in writing code and observing the accuracy of the finite difference method when applied to structural problems with known solutions. In order to attempt to increase the accuracy of the approximations, the shooting method, using splines, is employed for both the bending and buckling problems for linear and nonlinear cases. For large deflections, accounting for the nonlinear effects is important. The present study will demonstrate quantitatively the limitations of the classical linear theories.