Advanced Postbuckling of the Plastic Shanley-Hutchinson Column

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Abstract

The postbuckling behavior of the well-known Shanley-Hutchinson plastic model column is examined both in the initial buckled state and in the advanced postbuckling regime. A new, simple, explicit upper bound for all solutions to the problem is found when the tangent modulus at bifurcation vanishes compared to the linear elastic (unloading) modulus. The difference between the upper bound and an the solution to an actual problem is determined by an asymptotic expansion involving hyperbolic trial functions (instead of polynomials) which fulfill general boundary conditions at bifurcation and infinity. Comparison with numerical solutions shows that the method provides an accurate estimate of the maximum load even if it occurs in an advanced postbuckling state.