

Chapter 5

DISCUSSION AND CONCLUSION

Several example problems have been presented to demonstrate the effectiveness of the proposed iterative technique. For an iterative method to be good, it should be stable to ensure convergence and the rate of convergence should be fast to save computation time. In this chapter, the performance of the proposed technique is discussed concerning these two points in comparison with other schemes.

The effectiveness of the proposed iterative technique in improving the rate of convergence of numerical solutions is significant for cable structures with zero to moderate level of prestress (say 50-60% of the final cable force). These structures generally possess high degree of geometric nonlinearity. The utilization of the subdivision procedure succeeds in estimating the equilibrium displacement accurately even at the end of the first iterative cycle leading to rapid convergence and saving of computation time.

The accurate prediction of the equilibrium displacement at the end of the first iteration resulting from the subdivision technique is the key to the success of the scheme in ensuring numerical stability even for extremely nonlinear problems as exemplified by one of an inextensible cable carrying a point load. This problem is very

sensitive numerically since a small error in the displacement leads to an extremely large error in the internal forces and hence the unbalanced load. The proposed technique leads to a stable solution while others fail.

Some words on the number of subdivisions to be used are appropriate. The use of too small the number of subdivisions may retard the rate of convergence for highly nonlinear problems. For cable nets under very small initial weight, 100 or more subdivisions have been found to yield satisfactory results. It might be noted that the scheme is still successful even when 1000 subdivisions are employed.

Conclusion

A simple iterative technique has been presented in order to achieve an iterative improvement for the solution of highly geometric nonlinear cable net problems. The scheme provides a simple procedure to assess a good trial equilibrium state at the first cycle of iteration which is the key to the significant improvement over existing iterative procedures. Not only stable and convergent solutions are attained with the use of the proposed scheme, but also the speed of convergence is significantly improved in nonlinear problems.