CHAPTER V

CONCLUSIONS

The current study consists of two major parts. The first part involves the analysis of planar truss structures, taking into account the material and the geometrical nonlinearities. The second part explores the use of the genetic algorithm in sizing optimization of the steel trusses.

In the proposed approach, the design process is incorporated with the analysis automatically. This removes the limitation of the conventional analysis which requires separate member capacity checks and modeling of the member initial imperfections in representing the individual member strength.

The advanced analysis approach presented in the current study not only predicts the limit state of the structure, but also identifies the load sharing and force distribution mechanism of the individual members in the truss. Compared to the current specifications such as LRFD and ASD, it provides more information on the structural behavior of the entire system. Another advantage to the current design procedure is the evaluation of the strength of the individual members which assists the designer in modifying his system to enhance the structural performance.

Through a case study of the ten-bar truss, the efficicacy of the proposed method is illustrated. With the same configuration of the truss, the current approach offers a more economical solution compared with the conventional design. This study practically sets the initial stage for the more complex structures, such as plane frames, spatial trusses, etc. Nonetheless, the method should be extended to cover all possible types of buckling, e.g. local buckling of thin angle leg and flexural torsional buckling, in order for the approach to be more practical in the actual applications.

Since the load ratio history not only traces the behavior of the truss but also indicates the quality of the solution, the possibility of using various functions of the load ratio, e.g. the difference between $\lambda_{initial}$ and λ_{max}, the distribution of λ_i in this range, etc., should be explored.