AUXILIARY SENSITIVITY ANALYSIS APPLIED TO STABILITY PROBLEMS OF STEEL FRAME STRUCTURES

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Basic methods of the sensitivity analysis applicable in combination with numerical Monte Carlo type simulation methods are presented in the paper. An example of the influence of a plane steel frame initial imperfections on its load-carrying capacity variability is given there. It is shown in this paper that basic sensitivity analysis methods can be inaccurate in some cases. The updated modification of the procedures mentioned is proposed so that it were possible to apply them to the most various structure types solved by means of simulation methods. The influence of initial imperfections on the load-carrying capacity of steel plane frame is analysed by auxiliary sensitivity analysis. The realisations of input random quantities were simulated by the Latin Hypercube Sampling method. The load-carrying capacity was solved by geometrically and materially nonlinear solution.

Key words: *sensitivity analysis, simulation method, imperfections, yield strength, buckling*

1. Introduction

The rapid development of modern computers enables larger application of simulation methods in reliability analyses. Frequently and frequently, structures requiring complicated and, from the numerical point of view, considerably demanding computation models with numerous input random quantities [7] are analysed. By means of the sensitivity analysis, it was found out which initial imperfections exhibited the greatest influence on the output studied; this usually simplifies the whole analysis and accelerates obtaining the results [10]. If and whether the output quantity is little sensitive to the input quantity, this quantity can be considered to be deterministic one, i.e., it is not necessary to find out its statistical characteristics too accurately. Such approach is used abroad but rather marginally only [1, 11]. If and whether the results of numerical simulation are applied in practice, it is possible to determine, according to the relative sensitivity, the input quantities which the studied output is particularly sensitive to. The controlling activities can be then concentrated to find the satisfactory stability in static parameters or to decrease their random variability [6]. The attention can be especially paid and oriented to those input quantites which show great output sensitivity.

The influence of initial imperfections on the frame static ultimate load is analysed. All input imperfections were considered to be random quantities. The theoretical analysis is based on a non-linear finite element method, the steel plane frame being modelled by means of beam elements. Numerical problems which can appear when applying the sensitivity analysis are drawn attention to. In the paper, these problems are presented and a solution

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