

Studying On Nonlinear Incremental Dynamic Analysis

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Abstract

In general, for systems that are expected to have nonlinear behavior, forces and deformations can be obtained using accurate analyzes. For this purpose, nonlinear dynamic analysis can be used to perform an accurate analysis of a structure. In this method, first, the nonlinear features of the structural members are defined, and then the analysis is made using accelerograms, which can be done either by incremental dynamic analysis or time history analysis. Incremental dynamic analysis is a seismic parameter analysis to attain the structural capacity curve under dynamic earthquake loads. This method, which has been introduced as an incremental dynamic analysis method (IDA), is a parametric method recently developed to estimate the seismic performance of structures. This method involves the effect of one or more earthquake records on the structure; each of these records has been scaled up to certain intensity. An incremental dynamic analysis presents a complete image of the structure behavior from elasticity to yielding and instability of the structure under the dynamic loads of the earthquake, but the high amount of operations and being very time consuming, are of the most important reasons that users are reluctant to use it to estimate structure capacity in the field of performance design. This method gives us the structural capacity as well as seismic behavior of the structure. It also and can be used to determine the seismic performance of the structures. In this paper, we first tried to find a comprehensive definition of the fundamentals of nonlinear dynamic analysis and then further to evaluate the advantages and disadvantages of this method, compared to other methods of nonlinear dynamic analysis.

Key words: nonlinear analysis, nonlinear incremental dynamic analysis, curve constitution.

1. Introduction

Increasing the capabilities of computers and the introduction of performance-based design methods led to pronounced changes in structures analysis methods against earthquakes from linear static to linear dynamic analysis, nonlinear static analysis and ultimately to nonlinear dynamic analysis. The simplest method of dynamic analysis is based on the linear model of the structure which allows the use of oscillatory properties (frequencies