FOREWORD

It is generally accepted that the finite element method is the established method for analysis of the problems in linear structural mechanics.

And the extensive application to dynamic response analysis of structures under earthquake motion has been made all over the world.

For analysis of nonlinear vibration analysis under earthquake motion, however, establishment of a reliable method of solution is desperately needed.

For such purpose the load incremental procedure based on the finite element method is considered the most powerful method. Unfortunately this method has a serious drawback from the practical point of view.

That is, generally it requires a great amount of manpower and computer time and thefore only simple nonlinear problems have been solved even by using the large scale computing system and computer program.

On the other hand classical Reyleigh-Ritz's method usually requires solution of the linear equations or eigenvalue problems of much smaller matrix size to compare with the finite element method for results of the same accuracy, but integration of the energy terms is formidable task.

Basing on such consideration, the present author proposes a Rayleigh-Ritz's method in which the objective structures is considered as a general three dimensional body and for which continuous displacement functions are assumed appropriately, and by using the finite element procedure energy terms of the structure is evaluated on the individual element basis and then transformed into the generalized coordinates in the Rayleigh-Ritz's space, thus reducing the matrix size considerably such that it can be handled by the medium scale computer. The pilot study on the feasibility of this method showed a satisfactory result and now extensive numerical study is underway.

It is believed that this method could be powerful in matrix condensation and solution of the large scale eigenvalue as well as stiffness equations, and with some appropriate modification of the procedure, it can be effectively applied to the solution of nonlinear problems in structural mechanics within reasonable computing time and labour.

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