Interaktive computer graphics in the analysis of high rise buildings

Autor(en): **Goyal, B.K. / Saxena, M. / Janrode, V.N.**

Objekttyp: **Article**

Zeitschrift: **IABSE congress report = Rapport du congrès AIPC = IVBH Kongressbericht**

Band (Jahr): **14 (1992)**

PDF erstellt am: **22.06.2024**

Persistenter Link: https://doi.org/10.5169/seals-853185

Interaktive Computer Graphics in the Analysis of High Rise Buildings

Infographique interactive pour le projet de maisons hautes

Interaktive Computergraphik zur Berechnung von Hochhäusern

B.K. GOYAL
Assist. Dir.
Struct. Eng. Research Centre
Ghaziabad, India

M. SAXENA
Scientist
Struct. Eng. Research Centre
Ghaziabad, India

V.N. JANRODE
Junior Techn. Assist.
Struct. Eng. Research Centre
Ghaziabad, India

1. INTRODUCTION

In recent years there have been major advances in the interactive Analysis and Design of Structures to support the engineering design process. The use of interactive menu driven graphics for defining the structural model, creating numerous input required for analysis, controlling analysis & redesign and interpreting results of analysis distinguishes the interactive analysis & design from conventional analysis and design software[1]. Interactive analysis and design makes sophisticated analysis accessible to practitioners and makes engineering designs creative and innovative. With this in view efforts have been made to develop an interactive graphic pre and post processor for the analysis of high rise building frames. The pre and post processors are menu driven and user friendly. The preprocessor enables the designer to transform a physical model of the structure into a mathematical form in an efficient way. The postprocessor allows the designer to interpret the analysis results and enable to take decision to arrive at efficient and economical design. The number crunching operations such as generation and solution of stiffness matrix, computation of member forces etc. is performed by batch processing. The interactive mode is provided for the processes such as modeling of structure, creating/editing inputs and interpretation of analysis results etc. This enables a sense of creativity to the designer.

2. APPROACH FOR INTERACTIVE ANALYSIS OF HIGH RISE BUILDINGS

A package FRAME3D[2] has been developed by the authors for static and dynamic analysis of 3D high rise buildings with rigid floors as well as for 2D plane frames with or without shear walls. This package was designed to operate in batch mode which requires input in fixed format and results are listed for all structural members. The graphic based interactive modules work as a interface between the designer and main program. With the help of preprocessor data input is simpler and can be checked by the user at every stage minimizing the wastage of man and machine time.. Depending on the Bending Moment and Shear Force diagrams the designer can take quick decision to change the structural member properties.

2.1 Modeling

The menu driven preprocessor module enables the designer to describe the physical model to the computer[3]. This is used to create a structural model and define load conditions for either a static or dynamic analysis. This module makes queries familiar to the user for creating the required input and also avoids data of repetitive nature. A view of typical screen for creating load input is shown in fig. 1. This figure has been plotted on Clacomp 1077 plotter. By using submenus member properties, static and dynamic loads and other parameters are assigned to

the model. The data generated by this module is used directly by the analysis program as input file.

2.2 Analysis

In this main module frames are analyzed using stiffness matrix method. Tridiagonal technique is applied to solve stiffness matrix, requiring minimum core storage[2]. It also computes the member forces and stores results in a file in numerical form.

2.3 Postprocessor

The post processor enables to draw the bending moment, shear force diagram and axial force for the various structural members and load combinations. The bending moment, shear force diagram and deflected shape of the structure can also be plotted on the plotter.

3. CONCLUSION

An interactive graphics menu driven pre and post processor for analysis of high rise buildings have been presented. These modules are developed in FORTRAN 77 on Tektronix 4301 graphic workstation and uses PLOT 10 - IGL graphic library. By using this package a designer can analyze multistorey frames quickly and achieve economical and innovative designs.

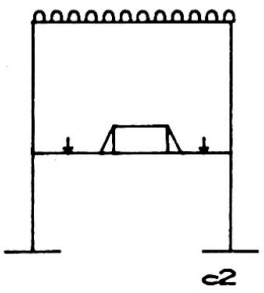
ACKNOWLEDGEMENT

This paper is published with the kind permission of the Director, SERC Ghaziabad.

REFERENCES

1. KULKARNI, A.G. and TALPADE, N.V., 'Interactive Integrated CAE Software for RC Framed Buildings, Proceedings 'International Conference on Engineering Software, IIT, Delhi, Narosa Publishers, 1989, pp.49-56.
2. GOYAL, B.K., GUPTA, A.K., AGARWAL, S.K., PREMCHAND and SHARMA, S.P., 'Computer Analysis of Multistoryed Buildings', International Journal of Structures, Vol.7, No.2, 1987, pp.139-154.
3. CARLOS I. PESQUERA, WILLIAM MCGUIRE and JOHN F. ABEL, 'Interactive Graphical Preprocessing of Three Dimensional Framed Structures', Computers & Structures, Vol.17, No.1,1983, pp.1-12.

No. of Storeyes 2
No. of columns 2



Load Cases Diagram

1. Point Loads
2. Variable Loads
3. Load Combination