

2004

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Development of the Seismic Evaluation System for HANARO

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360-9

(HANARO, Hi-flux Advanced Neutron Application Reactor)

30MW

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(SES, Seismic Evaluation

System)

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Abstract

HANARO(Hi-flux Advanced Neutron Application Reactor) is a multi-purpose research reactor with a thermal power of 30MW. Systems and structures related to the safety of the HANARO are classified as seismic category I. When an earthquake occurs, it is necessary to take prompt action to obtain the response information to the earthquake at the reactor building and the safety related system of the HANARO. A Seismic Evaluation System(SES) has been developed to evaluate promptly on the seismic safety of the reactor building and the safety related system of the HANARO. After an earthquake, using the seismic signal obtained from the field sensors, the SES can perform 3-D seismic analysis of the reactor building and local analysis of the safety related systems in the HANARO building. In addition, the newly developed SES equipped with the graphical monitoring and document reporting on those analysis results, will be used in the HANARO for the safety evaluation and analysis of an earthquake.

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[1~4].

가 OBE(Operating Basis Earthquake)

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, OBE

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[5].

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(Floor Response Spectrum)

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MMI(Man-Machine Interface)

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2.

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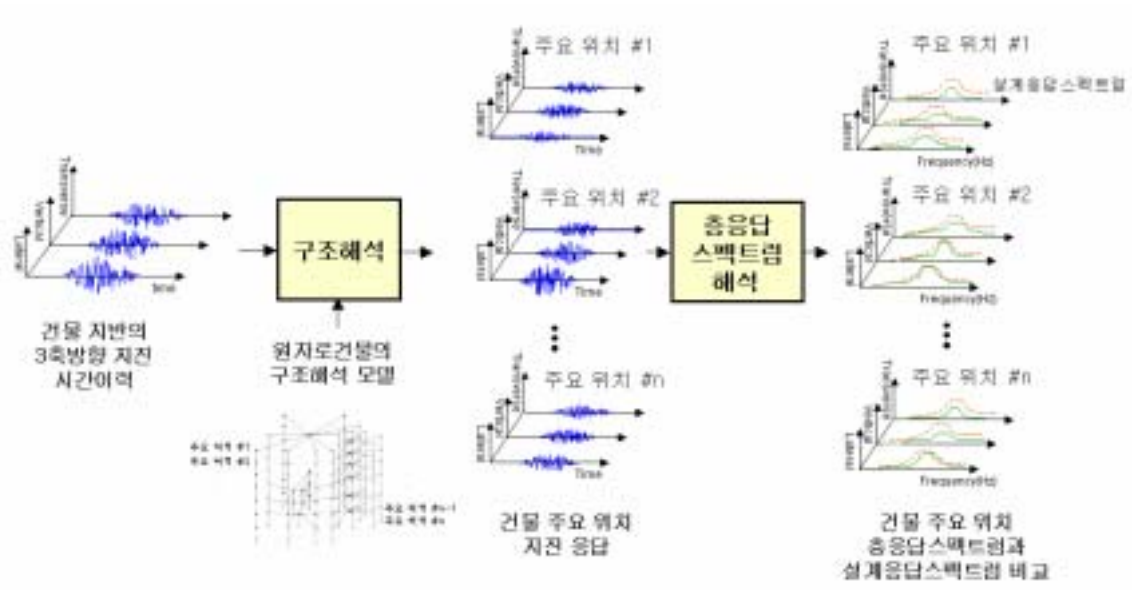
1

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[1~4]

3

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1 가

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가 2.1 2.4

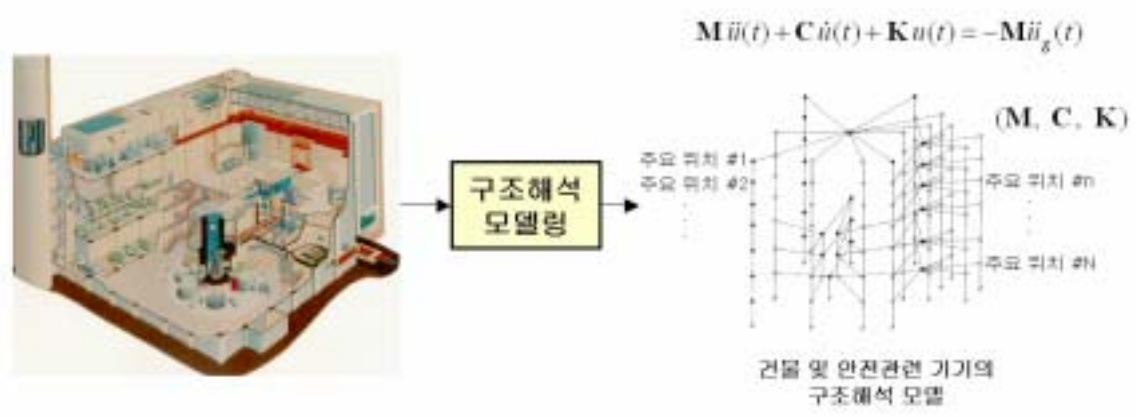
2.1

가

3

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2

$$\mathbf{M} \ddot{\mathbf{u}} + \mathbf{C} \dot{\mathbf{u}} + \mathbf{K} \mathbf{u} = -\mathbf{M} \ddot{\mathbf{u}}_g \quad (1)$$

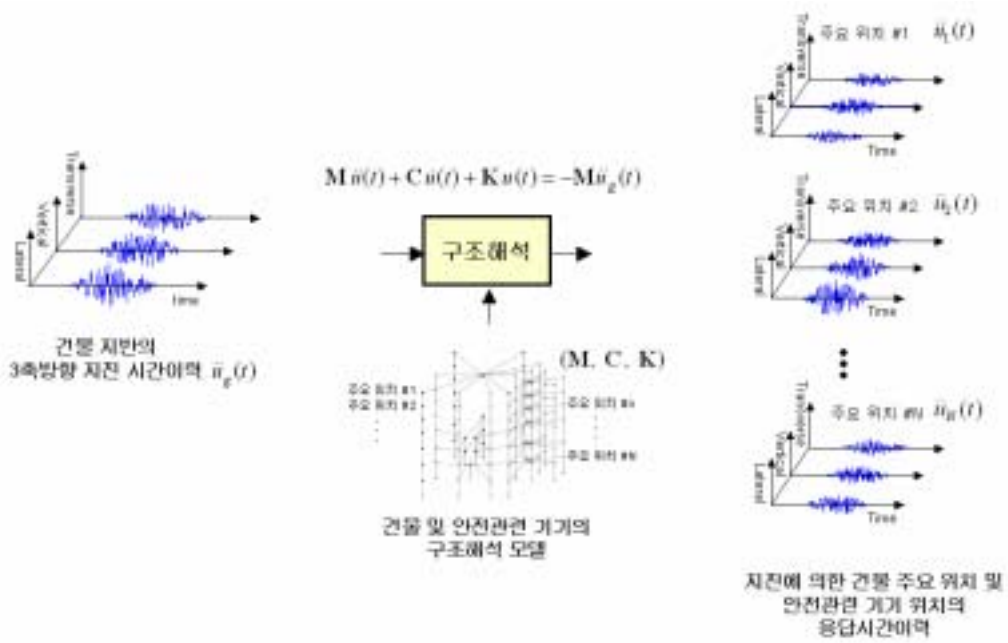
$$\mathbf{M} \ddot{\mathbf{u}} + \mathbf{C} \dot{\mathbf{u}} + \mathbf{K} \mathbf{u} = -\mathbf{M} \ddot{\mathbf{u}}_g \quad (1)$$

(1) $\ddot{\mathbf{u}}, \dot{\mathbf{u}}, \mathbf{u}$ 가 , $\ddot{\mathbf{u}}_g$

2.2

가 3 (1) 가 ()

3 가 (1) Wilson- θ [6]



2.3

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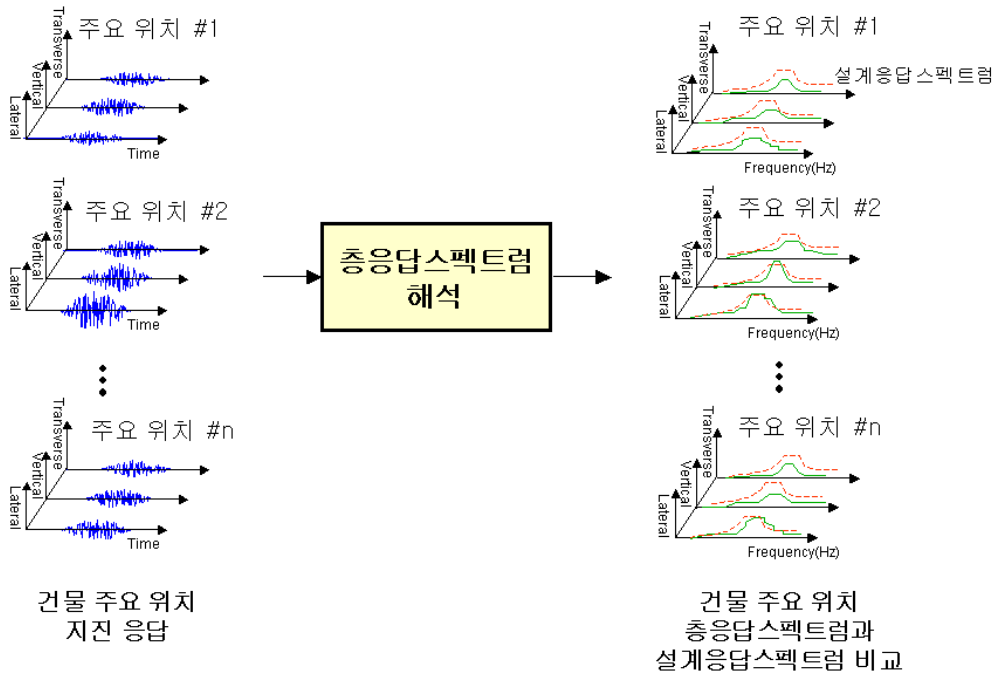
[7].

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Piece-wise Exact

(Exact Solution)

[7].



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2.4

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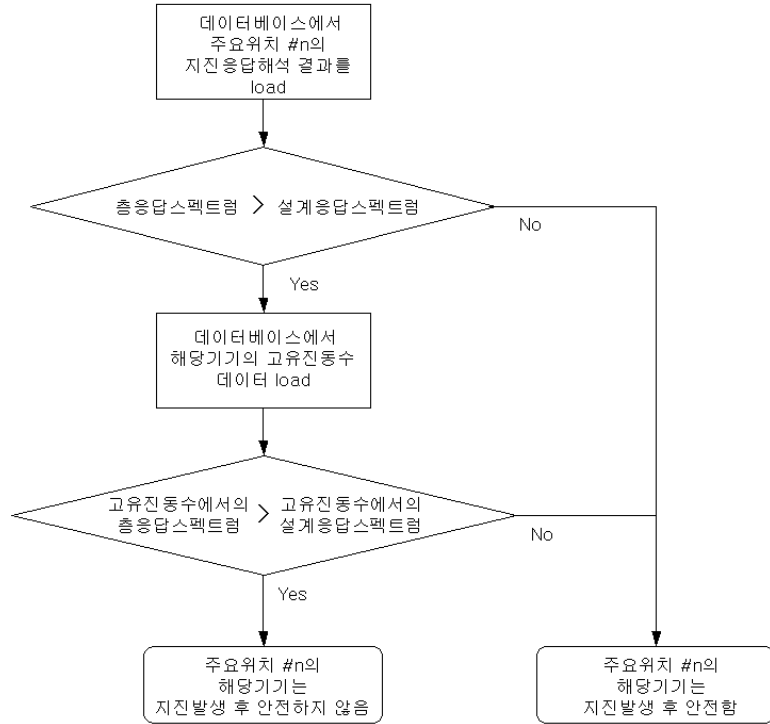
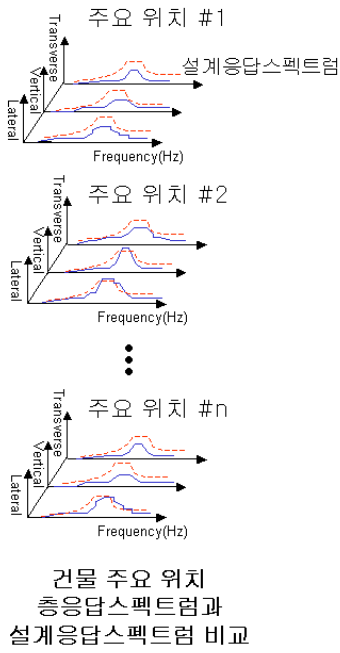
5

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가 가



5 가 가

3. 가 가

MMI

[8].

3.1

3.3

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3.1

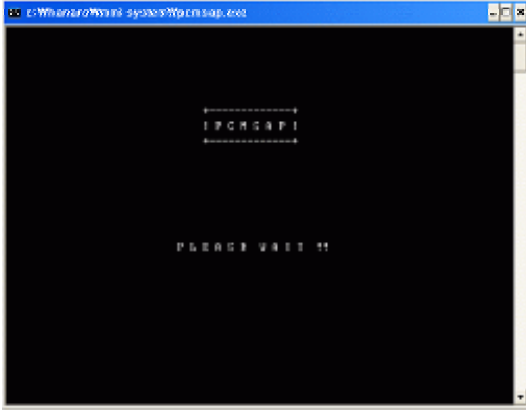
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(
3 (x, y, z)

(,)

가



(a)



(b)

6 가

3.2

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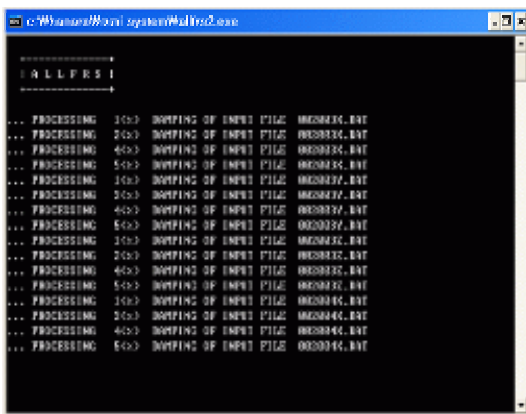
analysis)

(floor response spectrum

(FRS, Floor Response Spectrum)

7

4가



(a)



(b)

7 가

3.3 MMI

MMI(Man-Machine Interface) 가 SES(Seismic Evaluation System)

MMI

가 , 가
 가 , 가
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 . MMI (GUI)
 , 가 가 ,
 . 8 MMI



8 가 MMI

9 11 MMI 9 (a)
 가

가

9 (b) 가

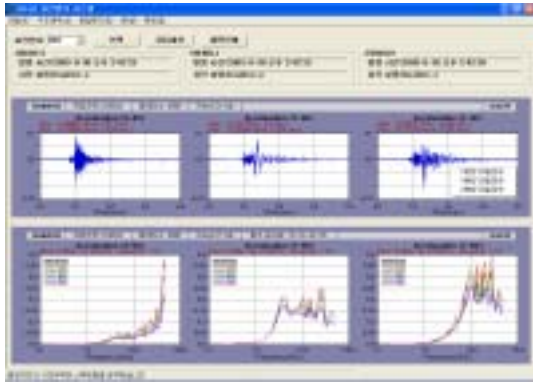
MMI

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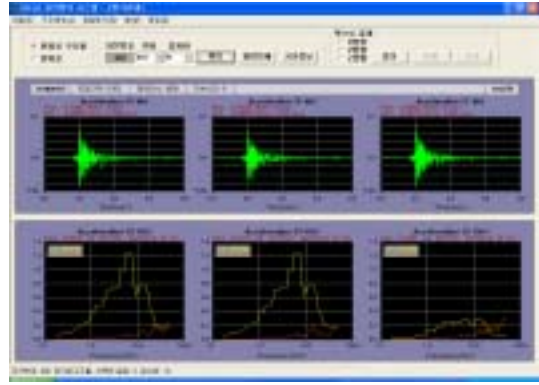
10 MMI

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‘ OBE ’

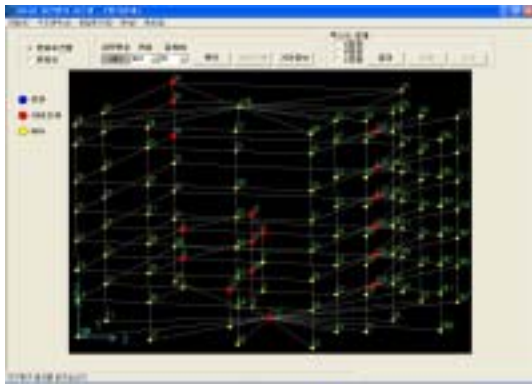


(a)

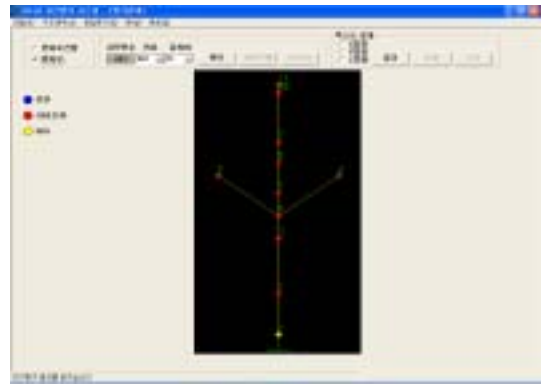


(b)

9 가



(a)



(b)

10 가
가

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11 (a)

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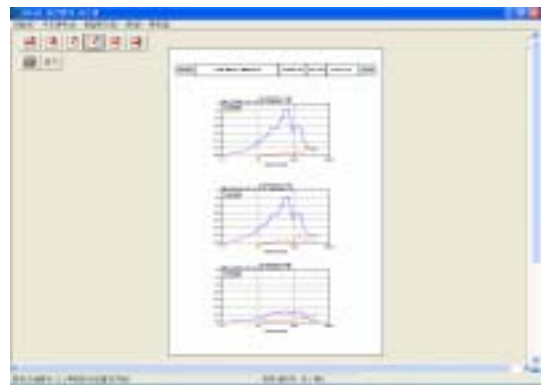
11 (b)

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(a)



(b)

11 가

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[1] J.-S. Ryu, D.-B. Yoon, H.-K. Kim, and J. S. Wu, "Development of a Seismic Monitoring Analysis System for HANARO, " Proceeding of Condition Monitoring 2003, BINDT, 2003.

[2] 가, " , , , " , 2003 , 2003.

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