

New Frontier of Education and Research in Wind Engineering

Theme 1: Stiffness evaluation and modal parameter estimation of experimental and operational low-rise buildings using vibration tests

Objectives

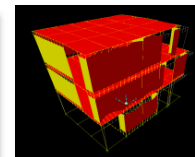
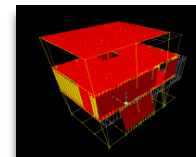
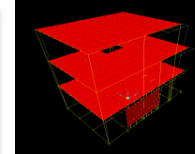
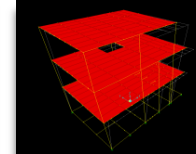
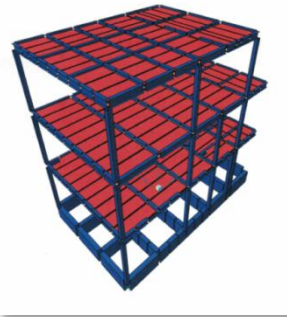
- ❑ Influence of stiffness changes (Due to structural components: ALC wall, mortar, sealing, connection)
- ❑ Influence of excitation amplitudes (Small amplitude, medium amplitude and large amplitude)
- ❑ Influence of vibration tests (Free, ambient, sweep, white noise, earthquake tests)

Main tasks

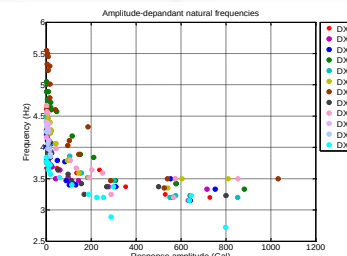
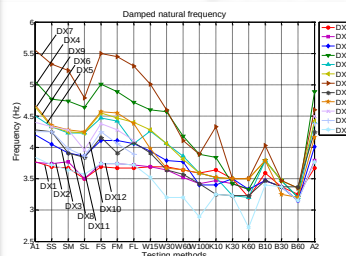
- ❑ Build up two operational three-storey buildings and an experimental one-storey building
- ❑ Measure excitation and response from various vibration tests with various assembled structural cases at three levels of excitation amplitudes
- ❑ Extract modal parameter estimation (natural frequency and damping) from vibration data using identification methods
- ❑ Build 3D finite element modeling of structural and non-structural components, as well as frame-wall connection modeling
- ❑ Model updating of structural parameters using sensitivity analysis and vibration data in order to build up proper and more accurate finite element modeling of low-rise building with influences of structural components and frame-wall interaction connection



Full-scale and experimental buildings



3D FEM and free vibration analysis



Modal parameter estimation and investigations



Name and Title

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Hometown
Hanoi, Vietnam

Education
Ph.D., Kyoto University
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Research Interests
Bridge & Building
Aerodynamics
Ambient, Wind-excited
Vibration Monitoring; System
Identification
Orthogonal and non-
orthogonal Decompositions;
Time-frequency Analysis;
Numerical Simulation
Methods



Theme 2: System identification methods for ambient and wind-excited structures

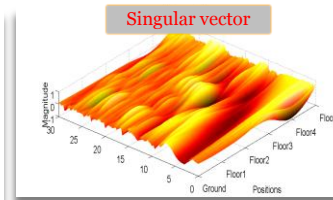
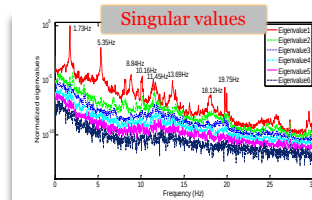
New tools based on proper orthogonal decomposition and time-frequency analysis for wind effects on structures

Objectives

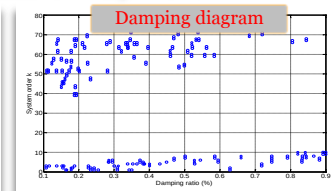
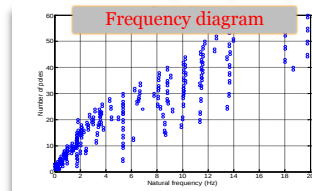
- ❑ Treat with different kinds of response data obtained from vibration tests in Theme 1 using both output-only and input-output system identification methods
- ❑ Develop sophisticated modal identification techniques for ambient and wind-induced vibration structures
- ❑ Develop new tools using orthogonal and non-orthogonal decomposition, and time-frequency analysis for various wind engineering topics

Main tasks

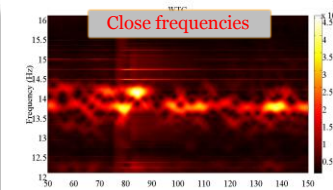
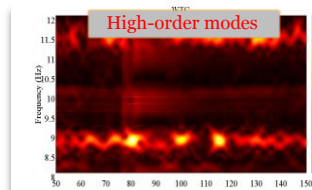
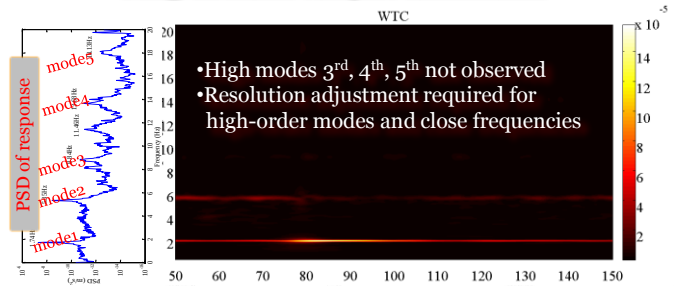
- ❑ Modern system identification methods in both the time domain and the frequency domain, especially the most recent methods based on the time-frequency domains using wavelet transform and Hilbert-Huang transform focused on
- ❑ Refinement techniques using with wavelet transform for high-order modal identification and close frequency extraction
- ❑ Removal of external excitation using proper orthogonal decomposition and random decrement technique
- ❑ Spectral proper orthogonal decomposition and wavelet transform to study coherence of turbulence and pressure; as well as covariance proper orthogonal decomposition to predict unsteady buffeting response of structures
- ❑ The most recent decomposition techniques using independent component analysis and empirical mode decomposition for analysis and synthesis of turbulence and pressure



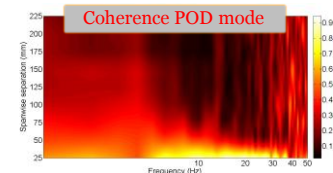
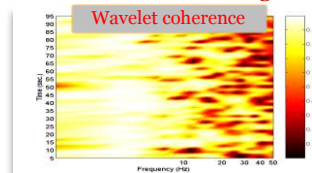
Using frequency domain decomposition



Using stochastic subspace identification



Using wavelet transform



Coherence maps of pressure

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Biography

Dr. Le has worked for some research/academic institutions as the Institute for Transport Science and Technology, Vietnam Academy of Science and Technology, Kyoto University and Vietnam National University before he participated to the Global COE Program, Department of Architecture and Wind Engineering, the Tokyo Polytechnic University with a current position of Program Associate Professor since January 2009.

He has research and teaching experience, including consulting, analysis and design as bridge/structural engineer. Dr. Le has also gained several prizes and awards in Japan and Vietnam for his research activities.

He recently focuses on vibration monitoring and system identification of ambient and wind-excited structures; new tools and applications based on orthogonal and non-orthogonal decompositions, time-frequency analysis for evaluating wind effects on structures.