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Editorial

Inverse Problems in Structural Engineering

Sang-Youl Lee,[1] Guillermo Rus,[2] Georgios E. Stavroulakis,[3] and Woo-Young Jung[4]

[1]*Department of Civil Engineering, Andong National University, Andong-Si, Gyeongsangbuk-Do 760-749, Republic of Korea*
[2]*Department of Mecanica de Estructuras, Universidad de Granada Politecnico de Fuentenueva, 18071 Granada, Spain*
[3]*Department of Production Engineering and Management, Institute of Computational Mechanics and Optimization, Technical University of Crete, University Campus, 73100 Chania, Greece*
[4]*Department of Civil Engineering, Gangneung-Wonju National University, Gangneung 210-702, Republic of Korea*

Correspondence should be addressed to Sang-Youl Lee; lsy@anu.ac.kr

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When it is possible to determine governing equations, shapes and sizes of the domains, boundary and initial conditions, material properties of structures, and internal sources and external forces or inputs, then the analysis determining the unknown field is considered mathematically or numerically solvable. This issue compiles excellent articles, most of which are very meticulously performed reviews of the available current literature.

The availability of cheap electronic monitoring systems and computers makes the structural health monitoring affordable. More and more practical applications will appear in the next years. The need of studying inverse problems in structures becomes higher. Inverse techniques for various structures are studied by a host of investigators using a variety of approaches.

S. H. Cho and J. H. Im deal with mathematical approach in rheological characterizing of asphalt emulsion residues. In their study three different emulsion residues, such as SS-1HP, HFE-90, and SS-1VH (Trackless), and a base asphalt binder (PG 64-22) are compared to characterize rheological properties by using DSR test. J. Song et al. propose a derivation method for the foundation boundaries of the hydraulic numerical simulation model based on the elastic Boussinesq solution. The paper by S.-Y. Lee proposes an advanced coupled genetic algorithm for identifying unknown moving loads on bridge decks.

The tendon force identification method is addressed in three manuscripts. K.-S. Park et al. study feasibilities on tension estimation technique for hanger cables using the FE model-based system identification method. In their work, the applicability of the tension estimation methods using the system identification approach is investigated using the hanger cables. M.-H. Noh and W.-Y. Jung verify the applicability of tension estimation method based on the finite element model with system identification technique. The proposed method is applied to estimate the tension of benchmark numerical example, model structures, and field structures. M.-H. Noh and W.-Y. Jung present field application of cable tension estimation technique using the h-SI method.

Besides those, there are several interesting topics in the issue. K.-M. Lee et al. suggest a mass change prediction model for sulfate attack of concrete containing mineral admixtures through an immersion test in sulfate solutions. For this, 100% OPC as well as binary and ternary cement concrete specimens are manufactured by changing the types and amount of mineral admixture. W. Li et al. preform interring gas dynamic analysis of piston in a diesel engine considering the thermal effect. B. S. Ju et al. review probabilistic risk assessment in piping fragility due to earthquake fault mechanisms. B. S. Ju and W.-Y. Jung review evaluation of seismic fragility of weir structures in South Korea.

By compiling these papers, we hope to enrich our readers and researchers with respect to various inverse problems and their solutions in structural engineering.

Sang-Youl Lee
Guillermo Rus
Georgios E. Stavroulakis
Woo-Young Jung