Digest 2009

Prediction of Sediment Concentration Using Artificial Neural Networks†

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ABSTRACT

Estimation of sediment concentration in rivers is very important for water resources projects planning and management.

In the literature, most of the sediment transport equations do not agree with each other and require many detailed data on the flow and sediment characteristics.

The main purpose of the study is to establish an effective model which includes nonlinear relations between dependent (suspended sediment concentration) and independent (bed slope, flow discharge and sediment particle size) variables. Because of the complexity of the phenomena, a soft computing method artificial neural network (ANNs) which is the powerful tool for input-output mapping is used for estimating total sediment load concentration. In the present study, 60 experiments were used for establishing an ANN model. However, the ANN model worked out was compared with some sediment transport equations. The results show that the ANN model is found to be significantly superior to others. The ANN model proposed performs best followed by the model of Modified Einstein Formula (Einstein-Brown) and also results of Modified Einstein Formula are in agreement with observed data and the ANN model. The results of Graf and Acaroglu Formulae however, were not found to be in agreement with the observed data.

Keywords: *Sediment concentration, soft computing methods, artificial neural networks.*

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Pros and Cons of the Assessment Methods in the 2007 Turkish Earthquake Code†

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ABSTRACT

A new chapter has been added to the 2007 Turkish Earthquake Code for the assessment and retrofit of existing buildings. The assessment procedures proposed in the Code are classified as linear elastic and nonlinear procedures. A research has been conducted in this study to evaluate the differences between the two types of seismic assessment procedures in the 2007 Turkish Earthquake Code. For this purpose, two residential buildings in their existing and retrofitted states were comparatively assessed by employing both procedures, according to the principles proposed in the 2007 Turkish Earthquake Code. The assessment results were also evaluated in view of the actual performance observations from one of the investigated building which suffered damage during the 1999 Düzce earthquake. The results of this research study have been employed for determining the strengths and weaknesses of the 2007 Turkish Earthquake Code.

Keywords: *Earthquake code, existing buildings, assessment procedures*

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Digest 2009

Fuzzy Logic Model of Traffic Safety†

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ABSTRACT

The aim of this study is to determine the sections with accident risk on highways presently in use or those in construction or design phase and to propose the necessary precautions. It is a well-known fact that geometry of highways affects occurrence of accidents. In this study geometric properties of highways, effect of their environment, speed and similar factors each of which that has a role in occurrence of traffic accidents on rural highways were analyzed and evaluated. There seems to be great ambiguity about the occurrence of traffic accidents. For that reason in model formation the fuzzy logic approach was employed. The most important issue in development of a model depending on fuzzy logic is determining the membership functions. For developing the membership functions literature search was made use of. Multiple evaluations of factors that affect traffic accidents is performed.

Keywords: *Traffic Safety, Highway Safety, lane width, shoulder width*

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Effect of Basement Retaining Walls on Torsional Irregularity in Frame Type Buildings†

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ABSTRACT

In our country retaining walls are located on the outside of the structure where it contacts the soil to counteract the effects of soil pressure. These retaining walls are usually constructed at one side of the structure and over the height of a couple of stories. Therefore, these retaining walls cause intensive irregularities in the structural systems in the plan and also in the vertical direction. In this study, a parametric study is carried out to investigate the effect of the retaining walls on the torsional irregularity in frame type buildings. At the end of the study, it is observed that although the torsional irregularities taking place in the buildings with basement retaining walls attain significant levels, problems related to the design will not be encountered. Economical comparisons are also performed at the end and recommendations are provided.

Keywords: *Frame type building, Basement retaining wall, Torsional irregularity*

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Digest 2009

Finite Element Model Updating of the Kömürhan Highway Bridge†

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ABSTRACT

In this paper, it is aimed to compare the analytically and experimentally identified dynamic characteristics and to obtain an updated finite element model of the Kömürhan Highway bridge located over the Elazığ-Malatya highway. The analytical model of the bridge is worked out using the SAP2000 software and the dynamic characteristics are determined. The experimental measurements are carried out by making use of Operational Modal Analysis under traffic loads and dynamic characteristics are obtained experimentally. Vibration data are gathered from both box girder and the bridge deck. Measurement time, frequency span and effective mode number are determined by taking into account similar studies and the literature. Peak Picking method in the frequency domain is used for the output-only modal identification. At the end of the study, analytical and experimental dynamic characteristic are compared with each other and the finite element model of the bridge is updated by changing some uncertain parameters such as material properties and boundary conditions.

Keywords: *Dynamic characteristic, Kömürhan Bridge, Operational modal analysis*

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The Effects of Sand Particles on Determination of Consistency Limits†

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ABSTRACT

Plasticity chart have been used for fine-grained soil classification . As it is known, plasticity chart utilizes fine-grained soils based on their liquid limit and plasticity index values. Consistency limits are properties of clay and silts that are placed in the fine-grained soil group. However, when the releated standard for measurement of these limits are considered, the measurement is done with soil passing the 425 μm sieve. Within the soil groups passing this sieve, sand grains that are defined as coarse-grained take part beside fine-grained soil. It was investigated whether existence of these coarse-grained soil grains affects the measurement of fine-grained soils parameter or not. Probable effects of fine sand grains passing 425 μm sieve on the measurement of consistency limits was investigated and the obtained results were discussed in this study.

Keywords: *Consistency limits, Grain size, Sand percentage, Fine-grained soil, Soil classification.*

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Digest 2009

Portland Limestone Cement Part II - Sulfate Resistance[†]

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ABSTRACT

This paper presents the second phase of a research project which is supported by TUBITAK titled "Determination of Optimum Limestone Content in Portland Limestone Cement Production from the View Point of Mechanical Performance and Sulfate Originated Durability Problems". In the first stage of this research, blended cements incorporating limestone powders were prepared. In this part, mortar samples were prepared with the same cements and subjected to different environmental conditions (standard water curing, Na_2SO_4 solutions at different temperatures). Their performances in these conditions were investigated by compressive strength tests, length change measurements and micro-structural analyses. The main deterioration cause was formation of the ettringite crystal. Gypsum and thaumasite formations were also observed. It may be concluded that; from the view point of strength and durability, maximum limestone replacement should not exceed 10%, especially for the structures that are constructed in sulfate bearing environments in cold regions.

Keywords: *limestone cement, sulfate attack, ettringite, thaumasite*

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Modelling Traffic Accident Data by Cluster Analysis Approach†

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ABSTRACT

In recent years, traffic accidents have become an urgent problem due to increasing car ownership and traffic density. One of the most common methods for solution of this problem is determination and analysis of "black spots". The conventional black spot identification method includes marking the location of each accident with a pin and investigation of black spots considering density of the pins on a map. In this study, the traffic accidents data of Denizli city for the years of 2004, 2005 and 2006 have been analyzed using the k-means and the fuzzy clustering methods. The spots that are densely located around the cluster centers are determined as "black spots" and are analyzed. The results of the analysis are evaluated regarding all features of the black spots and recommendations for improving traffic safety are reported.

Keywords: *Cluster analysis, modelling, black spots, traffic accidents*

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Pile Integrity Testing and Drivability Analysis†

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ABSTRACT

This paper presents methods for determination of pile quality and two different related case studies. The first part of the conducted research study discusses the low-strain pile integrity testing, discontinuities and defects occurred during construction along the piles. The pile integrity testing results of 96 piles were evaluated that were performed in the field and the mentioned testing method was also simulated using TNOWAVE: SITWAVE with the signal matching technique. The analyses were performed by matching the signal data obtained in the field with the reference signals created by the software for the determination of pile quality. In the second part of the research, the hammer and pile properties were used as an input for pile drivability analyses where in this case the inverse technique was applied in order to evaluate the static and dynamic soil properties as well as the accurate soil profile.

Keywords: *Stress wave theory, wave equation, low strain, method of characteristics, pile drivability, signal matching, discontinuities.*

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Influences of Railway Vibrations on Passenger Comfort Invesigation on Sample Tracks†

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ABSTRACT

In this study, field vibrations were surveyed to investigate travel comfort of two different rail systems in Istanbul and the reasons of low comfort zones. With this purpose, first Aksaray-Airport metro line and then Zeytinburnu-Kabataş tram line were investigated with their superstructure information. For gathering information to determine travel comfort, a 3-axis accelerometer was placed under the seat of the driver. Results were evaluated according to the ISO 2631-4 standard. At the end of measurements, total weighted values toward the relevant axes were obtained with 1/3 octave band acceleration values by applying gains defined in frequency weight filters.

Keywords: *Railway, Vibrations, Travel comfort*

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Seismic Performance Evaluation of an Existing Viaduct†

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ABSTRACT

In this study, Seismic Performance of Yarimburgaz Viaduct, which is at km:16+862 of the Istanbul - Edirne Highway, is evaluated. Multimodal spectral analysis is performed by linear methods for strength based evaluation under the seismic effect of the design earthquake. Same viaduct is also evaluated by deformation based nonlinear methods under seismic effects of simulated minimum and maximum earthquake loads. Pushover analysis and time - history analysis have been applied to the model of the structure. A detailed performance evaluation of an existing structure is clarified by comparing the conclusions of those analyses.

Keywords: *Viaduct, Linear and nonlinear performance analysis*

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Effects of Soil Bridge Interaction and Abutment Deck Continuity on the Live Load Distribution Factors in Integral Bridge Components†

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ABSTRACT

In this study, the effects of soil bridge interaction and abutment deck continuity on the live load distribution in integral bridge components are studied. For this purpose, 2-D and 3-D structural models of typical integral and conventional bridges having various structural, geometric and geotechnical properties are made. The analyses of the models are then conducted under the AASHTO live load. The analyses results revealed that soil-bridge interaction has significant effects on the live load distribution in abutments and abutment deck continuity and has considerable effects on the live load distribution in girders in short-span bridges.

Key words: *Integral bridge, live load, soil-bridge interaction*

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Applications of Experimental Modal Analysis for Bridges†

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ABSTRACT

Experimental modal analysis is used by researchers for the purpose of condition assessment and damage detection of structural systems. If the experiment and analysis are performed accordingly, it is possible to identify the dynamic parameters of the systems such as natural frequencies, damping ratios and the modal vectors. Since any damage in the system changes the stiffness and at the same time dynamic parameters of the system, it is possible to detect and locate the damage in the system. System parameters should be identified before and after the damage for such an evaluation. Experimental modal analysis technique is under study in IYTE, Civil Engineering Department. Through the paper a limited literature survey will be presented in relation with the application of modal analysis techniques for condition assessment and damage detection of bridges. Also a simple bridge model will be tested and analyzed with techniques that we have acquired in IYTE based on our accumulation of experience. In order to discuss the outcomes of the modal analysis results, a finite element model of the model bridge will also be provided.

Keywords: *Modal analysis, finite elements, bridge, system identification.*

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Earthquake Response Control of a Cable-Stayed Bridge by using μ-synthesis†

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ABSTRACT

This study is based on a benchmark control problem for seismic response of cable-stayed bridges that is introduced to compare the effectiveness of various control algorithms [1, 2]. The finite element model of the bridge is arranged according to its modal importance and is reduced to 1/6'th of its size. Special attention is given to the control of critical locations of the bridge response. Among these, the tower shear forces at the deck level were the hardest to reduce by using hydraulic actuators. An uncertainty tolerant design is introduced to account for the design model difference from the evaluation model. Finally, a μ-synthesis based controller is designed and used in the closed loop system simulation of the bridge.

Keywords: *μ-synthesis, active control, cable-stayed bridge, model reduction*

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Strength of Permanent Metal Deck Forms Used to Brace Steel Bridge I-Girders†

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ABSTRACT

Permanent metal deck forms (PMDF) are frequently used in the building and bridge industries as concrete deck formwork. PMDF are not currently relied upon as a bracing source for bridges due to eccentric connections that can dramatically reduce the stiffness of the deck system. However, previous studies have shown that the PMDF can provide substantial bracing against lateral torsional buckling to the bridge girders by performing simple modifications to connection details. This paper presents the results of an ongoing analytical study on the PMDF strength requirements for steel bridge girders. In the past, simplified finite element analytical (FEA) models were used to investigate the global buckling behavior of the PMDF braced systems. This paper focuses on results of modified FEA models to determine the stability brace forces of fasteners used to connect the PMDF along the sidelaps of the sheets and also to the girders. The results will be used to develop strength requirements for the PMDF used in the bridge building industry.

Keywords: *Permanent Metal Deck Forms, Stability; Steel I-Girders*

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A New Era in Structural Analysis: Construction Staging†

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ABSTRACT

Over the years, structural analysis techniques are improved by use of computers. In conventional structural analysis, the structure is assumed to be built in a second. However, this type of analysis does not always give reliable and healty solutions. When the results of the conventional analysis was compared to the construction staging analysis, the difference in results can vary from 10% to 50%. In construction staging analysis, the time dependent material strength variations and geometric variations are included in the investigation process. In this study, a cable supported pedestrian bridge, a standard prestressed precast I-girder highway bridge support condition and multi story building analysis was performed by construction staging to determine the differences from conventional analysis.

Keywords: *construction staging, structural analysis*

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