series of triaxial experiments in the undrained state was used. In the lowest confining pressure case, the load-bearing capacity for the geotextile reinforced column will be 1.18 times higher. Whereas for the geogrid-reinforced stone column, the load-bearing capacity is 1.31 times higher. In this study, standard Ottawa sand, gravel with a unit weight of 17 kN/m^3 and a friction angle of 47,48o, geotextile and geogrid layers, and triaxial test apparatus are used. Triaxial specimens were 10 cm in diameter and 20 cm in height. Stone column dimensions of 2 cm in diameter and 20 cm in height are selected, respectively. Due to the limitations in the laboratory and the simulation of natural conditions, the unit weight of sand samples and stone columns made in triaxial test molds were selected as 15 and 17 kN/m3, respectively. Precipitation is used to fabricate cylindrical sand samples for triaxial testing. In this method, firstly attach the membrane to the underside of the triaxial apparatus and fasten the detachable bifurcation mold to the membrane and attach the membrane to the detachable mold walls by suction pumping about 2 bars. The aim is to create a homogeneous sample with uniform rainfall velocity to obtain a sample with evenly possible porosity. The method of precipitation depends on two parameters, one is the intensity of rainfall (amount of sand poured in a given volume at a specified time), and the other is the height of the sand fall, which is the distance between the sand outlet from the precipitation tank to the sand bed. The important point is that to achieve the same porosity, and this distance must be kept constant throughout the precipitation process. After construction, the test is performed according to ASTM D7181-11. Triaxial CU experiments on Ottawa sand were carried out in three cases: unreinforced, reinforced using geotextile encased stone column and reinforced using geogrid encased stone column. In triaxial experiments, three confining pressures of 200, 300, and 400 kPa were used.

Key Words: Ottawa sand, stone column, geosynthetic encasement, Triaxial test.

duction increases. In addition, the flow and pressure lines also become almost horizontal.

Key Words: Tsunami, water tank, wave, numerical simulation.

PHOTOCATALYTIC TREATMENT OF REAL OIL REFINERY WASTEWATER USING TIO$_2$/AG-DOPED NANOPARTICLES

M. Delnavaz(corresponding author)
delnavaz@khu.ac.ir
M.A. Bos'hagh
bsh.mohamadamin@gmail.com
Faculty of Engineering
Dept. of Civil Engineering
Kharazmi University
DOI:10.24200/J30.2020.55673.2763

Sharif Civil Engineering Journal
Volume 37, Issue 2.1, Page 121-129, Research Note

- Received 12 April 2020; received in revised form 14 September 2020; accepted 4 October 2020.

Abstract

In this study, the removal and degradation of organic pollutants from real oil refinery effluent was investigated using a synthesized TiO_2/Ag photocatalyst fixed on lightweight concrete plates. Petroleum compounds are a set of hydrocarbons some of which are stable, long-term decomposing, poisonous and even carcinogen for human. One of the attractive wastewater treatment techniques is photocatalytic purification and this process has the potential to mineralize all organic and inorganic compounds found in petroleum impregnated processes and convert them into biodegradable and biodegradable compounds. Characterization of synthetic photocatalysts was done using X-Ray Diffraction (XRD) Fourier Transform Infrared Spectroscopy (FT-IR) techniques, Scanning Electron Microscopy (SEM) with EDX analysis, and Nitrogen Adsorption and Desorption (BET). The photocatalytic pilot consisted of three20 × 20 × 5cm lightweight concrete plates coated the nanoparticles on the concrete surface and powered by 36-watt UVA lamps. SEM experiment results showed relatively uniform TiO_2/Ag coating on lightweight concrete surface. The synthesized photocatalyst XRD pattern showed the successful synthesis of Ag crystals in the nanocomposite structure. BET results showed that when TiO_2/Ag was synthesized, the cavities became mesoporous. Investigation of the effect of pH on the system efficiency in the range of 3 to 12 showed that at pH 4.5, the removal efficiency reached its highest level. The effect of mass loading of TiO_2/Ag nanoparticles on the concrete plates showed that the highest removal efficiency in mass loading was 15 gr/m^2. To study the rate of COD removal under sun light, the reactor was transferred to the yard in Kharazmi University in Tehran. To obtain results, the experiment was performed three times in both states of using TiO_2 and TiO_2/Ag under optimum conditions. The rate of COD removal under sunlight for 8 hours and the use of UV-A lamps for TiO_2/Ag photocatalysts were 51.8% and 76.3%, respectively. The results showed that the synthetic photocatalyst was capable of treating real wastewater using UV rays.

Key Words: Nano-photocatalyst, TiO_2/Ag, petroleum refinery wastewater, photocatalyst treatment.

PERFORMANCE OF REINFORCED STONE COLUMN USING GEOTEXTILE & GEOGRID ENCASEMENTS IN TRIAXIAL TEST

M. Nasiri(corresponding author)
nasiri.ma@razi.ac.ir
M. Hajiazizi
mhazizi@razi.ac.ir
Faculty of Engineering
Razi University
DOI:10.24200/J30.2020.55894.2788

Sharif Civil Engineering Journal
Volume 37, Issue 2.1, Page 131-137, Research Note

- Received 9 June 2020; received in revised form 19 August 2020; accepted 29 September 2020.

Abstract

The use of stone columns is one of the effective ways to increase the bearing capacity of soils. An alternative system that can provide sufficient lateral confinement to support stone columns and increase bearing capacity is geosynthetic encased stone columns. These methods have been well utilized in Europe and South America. If the soil bed requires excessive confinement, the use of geotextile and geogrid encase around the stone columns is one way to improve the performance of these load-bearing members. This study aims to compare the behavior of geotextile and geogrid layers in reinforcing stone columns in standard Ottawa sand. In this study, a

• Received 18 April 2020; received in revised form 26 September 2020; accepted 11 October 2020.

Abstract

According to the basic theorems of plastic analysis of structures, increasing the strength or stiffness of a part of the structure does not weaken it under a specific static load. This result is widely used to simplify the modeling and design of structures, but these theorems have not been proven under dynamic loading like earthquake excitations. This study applies the results of the safe theorem numerically in a two-dimensional steel moment-frame structure with five stories under nonlinear dynamic analysis with 29 different earthquake ground motion records. Under transient dynamic loading conditions, because the mechanism or collapse does not occur in the structure, the safety of the structure is investigated by maximum rotational deformation of the members. By changing the characteristics such as local stiffness and strength of the members in the range of 0.8 to 1.5 times the initial value, the maximum deformation demand of the members has been compared. The results of the dynamic analysis show that upon increasing strength, in most cases, the demand for ductility decreases and with increasing stiffness, in almost all cases, the ductility demand increases. The results of nonlinear static analysis are compared with the nonlinear dynamic analysis in cases where increasing stiffness has increased the ductility demand. From this comparison, it can be concluded that upon increasing the stiffness of the members locally, the demand for ductility in the dynamic analysis is less than its corresponding value in static analysis. As a result, it can be said that by increasing the stiffness of the structure, observing the limitations of the codes for the ductility capacity of members and connections leads to the safety of the structure. Generally, it is concluded that the safety of the structure is not compromised by minor increase in the strength and minor increase in stiffness of some members of the structure under dynamic loading if regular limitations of the codes for the ductility capacity have been observed.

Key Words: Safe theorem, nonlinear dynamic analysis, resistance, stiffness, ductility demand.

NUMERICAL SIMULATION OF WAVE GENERATION IN A TANK BY WALL AND FLOOR OSCILLATION

H. Akhtari Shishavan(corresponding author)
aktari1362hamed@gmail.com
I. Mirzaee
i.mirzaee@urmia.ac.ir
N. Pourmahmoud
n.pormahmod@urmia.ac.ir
Dept. of Mechanical Engineering
Urmia University
S. Hamzehpour
solymanmahabadi17@gmail.com
Dept. of Mechanical Engineering
Elm o Fan University, Urmia
DOI:10.24200/J30.2020.54710.2663

Sharif Civil Engineering Journal
Volume 37, Issue 2.1, Page 113-119, Research Note

• Received 7 December 2019; received in revised form 18 October 2020; accepted 8 November 2020.

Abstract

Tsunamis occur every year in different seas and oceans around the world. These waves propagate at high speeds in various directions and, if they reach the shore, cause irreparable damage to these areas and their structures and facilities. Therefore, understanding this complex phenomenon and predicting its behavior can reduce the damages. In the present study, numerical simulation studies of the tsunami phenomenon were carried out. The purpose of the study was to predict the tsunami wave characteristics when reaching the coastal area. The use of numerical simulation greatly reduces the cost of laboratory work and can also be used for complex geometries and models. The tsunami waves were considered as viscous fluid by Navier-Stokes equations for shallow water as governing equations with fluid volume fractionation method for simulating water surface in software. Wave generation was created by simulating a tank that fluctuates once to its left wall and once to its bottom. This work was carried out by Fluent software. In the following, the influence of shaking side wall angles on the generated waves is investigated. The simulation results show a significant increase in wave height due to the oscillating wall angle. The effects of the oscillating bottom wall have also been studied. In this thesis, the method of producing and propagating tsunami waves is described and the equations are defined. Also, since the most important issue in dealing with this phenomenon is their control, a method for controlling tsunami waves is presented in this thesis. Finally, a multi-phase method is used to simulate the movement of waves in a tank with a tremor wall. Finally, the obtained results have been compared to the analytical results by Green equation method and there are good agreements between them. The results showed that there is no change in wave height at distant points and with the oblique wall obliquity being increased by 30 degrees, the wave pro-

heterogeneity between people in accepting this technology. For this purpose, first, using the UTAUT, the latent factors affecting acceptance have been identified and in the next step, considering the socio-economic variables, heterogeneity has been investigated. To evaluate the conceptual model, 641 stated preference (SP) surveys were distributed to the residents of 22 districts of Tehran in 2019. The results of model calibration indicate the positive and significant effect of all latent variables (performance expectancy (PE), effort expectancy (EE) and social influence (SI)) on acceptance. Also, gender and the postgraduate education moderate the coefficients of EE and SI, age over 65 years and possessing a driving certificate moderate the coefficients of PE and EE. The results of this study can be used by transportation authorities to identify the incentives and inhibiting factors concerning the acceptance of AVs.

Key Words: Autonomous vehicles, heterogeneity between people, unified theory of acceptance and use of technology, moderator variables, structural equation modeling.

MODIFICATION OF BASE SHEAR OF MOMENT STEEL FRAME TO ENSURE THE LEVEL OF LIFE SAFETY IN POST-EARTHQUAKE FIRE

P. Pourkeramat
peyman.pourkeramat@stu.malayeru.ac.ir
V. Ghiasi(corresponding author)
v.ghiasi@malayeru.ac.ir
Dept. of Civil Engineering and Architecture
Malayer University
B. Mohebi
mohebi@eng.ikiu.ac.ir
Faculty of Engineering
Imam Khomeini International University
DOI:10.24200/J30.2020.56242.2814

Sharif Civil Engineering Journal
Volume 37, Issue 2.1, Page 93-102, Original Article

- Received 11 July 2020; received in revised form 29 September 2020; accepted 11 October 2020.

Abstract
In this paper, post-earthquake fire (PEF) modeling in 3- and 9- story structures of moment steel frame is discussed. In this modeling, different levels of ground motion intensity and several time intervals for extinguishing the fire during PEF are considered. The structures are modeled using OpenSees software and tested to the performance level of life safety. First, the structures are subjected to a scale of earthquake accelerograph, then, assuming 60 seconds of free vibration until the structure is damped, the thermal load is applied as a 9-point thermal gradient to the beams and columns exposed to heat in this software. These structures were examined in different durations of post-earthquake fire based on the ISO 834 standard fire curve and fire scenarios in 3-story structure are considered as fire in 2 lower floors and 2 upper floors and in 9-story structure as fire in 3 lower and 3 upper floors. Having a maximum drift of the floors under PEF and the maximum allowable drift for the life safety level of the moment steel frame, which is 0.025 (according to FEMA356 Standard), Sa(T1) a scale of accelerograph that the structure under earthquake alone will reach the maximum values of drift under PEF can be calculated. According to the direct relationship between the base shear and the pseudo-acceleration spectrum component at the time of period of the first mode of the structure Sa (T1) the base shear of the structure can be modified. The results of the study show that these structures are more sensitive to general fire scenarios in the lower floors and the maximum relative displacement between the floors increases under these scenarios. Also, in the 3- and 9-story structures, according to the fire scenarios considered, the resistance of the structure to the level of life safety can be increased by 160 seconds by increasing the base shear by 4.4% and 8.3%, respectively. As a result, according to the time required to extinguish the post-earthquake fire, the structure can be designed by modifying the base shear for the performance level of fire safety under PEF.

Key Words: Post-earthquake fire, heat transfer, thermal analysis, performance-based design.

NUMERICAL SAFETY ANALYSIS OF STEEL MOMENT FRAME UNDER SEISMIC DYNAMIC LOADS

E. Dehghani(corresponding author)
dehghani@qom.ac.ir
Z. Aryani
z.aryani@qom.ac.ir
Faculty of Engineering
Qom University
DOI:10.24200/J30.2020.55472.2738

Sharif Civil Engineering Journal
Volume 37, Issue 2.1, Page 103-112, Original Article

S. Shabanlou(corresponding author)
saeid.shabanlou@gmail.com
Dept. of Water Engineering
Kermanshah Branch, Islamic Azad University
DOI:10.24200/J30.2020.55987.2793

Sharif Civil Engineering Journal
Volume 37, Issue 2.1, Page 69-79, Original Article

- Received 14 June 2020; received in revised form 6 September 2020; accepted 11 October 2020.

Abstract

Irregular withdrawals from water resources, unprincipled agriculture at the upstream of Shadegan wetland, and the drainage of agricultural drains and municipal effluents have severely reduced the quality of water entering the wetland. Also, the construction of the Marun and Jarreh dams on the rivers supplying the wetland demand has led to severe hydrological changes in the river and eventually, its environmental demands have not been met in some years. Common water resources operation methods focus on maximizing socio-economic benefits and pay little attention to meeting ecosystem demands. The aim of this paper is to investigate the performance of meta-exploratory algorithms in planning and proper allocation management to resource and uses at the upstream of Shadegan Wetland and the determination of the ecosystem demand of the downstream so that in addition to maximizing the percentage of the basin demand supply during the operation period, this algorithm attempts to reduce the salinity of the inflow to Shadegan Wetland. Due to the importance of the wetland as a seasonal habitat for birds and also one of the important tourist attractions and the importance of protecting its ecosystem, the development of a quantitative-qualitative optimization model for optimal use of available water resources is the purpose of this study. Initially, based on current conditions, the prepared model entitled "reference scenario" is developed for a future 30-year period (2021 to 2050). To achieve the best system response in terms of qualitative and quantitative criteria, the efficiencies of the MOICA and MOPSO algorithms as the optimal scenario are compared. The results indicate that the MOICA algorithm has a better performance in supplying various demands as well as decreasing the salinity of the inflow to Shadegan Wetland more than the MOPSO. With the implementation of the optimal solution obtained by the MOICA, in addition to supplying demands with high reliability in the whole system, the amount of river salinity at the entrance to Shadegan Wetland, especially in low water months, is reduced by about 55%. The coupling model proposed in this research is applicable for other study areas with a quantitative-qualitative operation approach and is able to calculate the environmental demands of the river as well as the downstream ecosystem by taking into account all uses.

Key Words: Multi-Objective optimization, MOICA, MOPSO, ecosystem demand, shadegan wetland.

HETEROGENEITY ACROSS INDIVIDUALS IN ACCEPTING AUTONOMOUS VEHICLES USING UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY

I. Farzin
Iman.farzin@modares.ac.ir
A.R. Mamdoohi(corresponding author)
armamdoohi@modares.ac.ir
Dept. of Civil and Environmental Engineering
Tarbiat Modares University
F. Noori
f.noori@imps.ac.ir
Dept. of Industrial Engineering
Institute for Management and Planning Studies
DOI:10.24200/J30.2020.56205.2809

Sharif Civil Engineering Journal
Volume 37, Issue 2.1, Page 81-91, Original Article

- Received 4 July 2020; received in revised form 14 September 2020; accepted 26 September 2020.

Abstract

Autonomous vehicles (AVs) provide safe and efficient transportation without human intervention through their sensors and communication technologies. The advent of such vehicles will lead to an unprecedented revolution in transportation. Higher acceptance rates justify investment in the infrastructure required for the expansion of such technologies as well as their ultimate success since eliminating economic and technical obstacles while neglecting the human barrier of acceptance would be futile. Most researchers have employed the Unified Theory of Acceptance and Use of Technology (UTAUT) to investigate the latent variables affecting the acceptance of AVs. Although the theory incorporates the majority of variables from eight technology acceptance models, it overlooks several factors. Moreover, the majority of studies on acceptance of AVs have been conducted in developed countries. The purpose of this study is to investigate the

yielding stress of the bracing core, the ratio of cable pre-stressing force to the cable yielding force, and the ratio of cable to core area. For the yielding stress of the core two values of 240 and 360 MPa, for the pre-stressing ratio five values from 0.1 to 0.5, and for the area ratio, seven values of 0, 0.25, 0.5, 1, 2.5, 5 and infinity were selected. So therefore, a total of 62 models of 9-story structures with dual steel moment resisting frame system equipped with self-centering buckling restrained brace were constructed. The models were analyzed using OpenSEES finite element software. Performing nonlinear analyses under cyclic loading, the hysteresis diagrams were obtained. The optimal design for these models was performed considering residual displacement and energy absorption as two main parameters. Finally, the performance of the optimized structure equipped with self-centering buckling restrained brace was compared with the structure equipped with ordinary buckling restrained brace. According to the results, the optimized self-centering structure may reduce 60% of the residual displacement while its energy absorption drops by only 37%. Generally, the results indicated the prominence of the optimized self-centering structure.

Key Words: Self-centering system, steel, residual displacement, energy absorption, buckling restrained brace.

PERFORMANCE OF FLOOR ISOLATION EQUIPPED WITH SHAPE MEMORY ALLOYS

M. Asadi
maede.asadi@alumni.ut.ac.ir
M. Ghassemieh(corresponding author)
m.ghassemieh@ut.ac.ir
Dept. of Civil Engineering
University of Tehran
DOI:10.24200/J30.2020.55808.2780

Sharif Civil Engineering Journal
Volume 37, Issue 2.1, Page 61-68, Original Article

- Received 31 May 2020; received in revised form 7 October 2020; accepted 6 December 2020.

Abstract

Today, there is an increasing interest in use of seismic isolation to protect the structures against earthquakes. The most common type of seismic isolation is called base isolation, in which the isolation layer is installed under foundations to separate the structures from the ground and reduce the earthquake forces. However, the use of this type of seismic isolation faces some difficulties such as construction in congested urban areas or construction of near sea structures. Furthermore, for seismic retrofitting of existing buildings, the installation of the isolation under foundations is difficult or even impossible; so, it needs to be located on the middle floors of the buildings. The method of isolation design is called floor or middle story isolation. Despite the advantages of seismic isolations, they have some limitations such as instability in large deformations, residual displacement, and the need for replacement after severe earthquakes. The use of Shape Memory Alloys (SMA) regarding their unique properties is considered as an appropriate solution to overcome the above problems. These smart materials show high strength and strain capacity, high re-centering ability, and high resistance to corrosion and to fatigue. The purpose of this study is to investigate the effect of combination of middle story isolation utilized by Natural Rubber Bearing (NRB) and iron-based shape memory alloys in steel structures and to compare the performance of such structures with and without the presence of the shape memory alloy in the middle-story isolation system. Then, a three-story steel structure has been modeled and evaluated. For this purpose, a structure with floor isolation and iron-based shape memory alloy was modeled in OpenSees computer program. The structures were then subjected to seismic loading. The results were presented in the form of story drift, floor acceleration, floor shear forces, and base shear. The outcome of this research showed that the use of these alloys in the middle-story isolation reduced the overall base shear and floor shear forces. The overall story drift, floor acceleration and displacement are reduced; with the exception at the isolation level. Thus, utilizing the natural rubber bearing isolator along with the iron-based shape memory alloy can be considered as a desirable system for the seismic protective design of buildings.

Key Words: Floor isolation, shape memory alloys, residual displacement, energy dissipation, seismic retrofit.

MULTI-OBJECTIVE OPTIMIZATION OF OPERATION OF WATER RESOURCES SYSTEMS FOR SUPPLYING DEMANDS OF AQUATIC ECOSYSTEMS

Z. Goorani
zahra.goorani.ac@gmail.com
Dept. of Water Engineering
Razi University, Kermanshah

Kh. A.Esmaeili
esmaeili@semnan.ac.ir
Dept. of Civil Engineering
University of Semnan
H. Taghaddos(corresponding author)
htaghaddos@ut.ac.ir
Dept. of Civil Engineering
University of Tehran
MS. Karimi
mskarimi@semnan.ac.ir
Dept. of Civil Engineering
University of Semnan
DOI:10.24200/J30.2020.55765.2773

Sharif Civil Engineering Journal
Volume 37, Issue 2.1, Page 39-49, Original Article

- Received 19 May 2020; received in revised form 29 September 2020; accepted 11 October 2020.

Abstract

Traditional push-based planning systems often result in several types of waste due to mainly improper distribution of resources. Waste may have several adverse effects on a project, including the increases in cost, duration, and emission. Thus, the practitioners and researchers have provided various lean production tools such as pull concept, implementation of supermarket concepts, and standardization to reduce waste and to enhance the execution process. Although researchers have attempted to transfer some lean manufacturing principles to the construction industry in the last two decades, the employment of some lean concepts (e.g., pull, standardization) in the construction has been challenging. On the other hand, employing a lean concept before the construction phase can be beneficial in identifying the waste of execution process and subsequently reducing time and cost the project. To evaluate the performance of lean concept scenarios before the construction phase, it seems necessary to employ a promising tool that can anticipate the various aspects of the execution process including resource utilization, time, cost, and process waste. Many researchers demonstrated the capability of Discrete Event Simulation (DES) to evaluate the implementation of optimal alternatives in the executive process planning. The traditional concept of lean manufacturing is borrowed in the current study to identify some sorts of wastes and existing bottlenecks over the executive steps of a construction process. However, due to difficulties in applying lean manufacturing on construction projects, this study proposes a simulation-based framework to evaluate various types of waste in the current situation before the commerce of the construction phase to enhance the future state in the construction industry. Such a hybrid framework integrating DES with lean concepts has been rarely used in the current and future planning phase of construction projects to evaluate the existing plan. The proposed approach is applied successfully to an actual construction case study in Tehran, Iran.

Key Words: Discrete event simulation (DES), lean construction, pull concepts, standardization, supermarket.

OPTIMIZED DESIGN AND INVESTIGATION OF CYCLIC BEHAVIOR OF DUAL INTERMEDIATE STEEL MOMENT RESISTING SYSTEM EQUIPPED WITH SELF-CENTERING BUCKLING RESTRAINED 2-STORY-X-BRACE

M.R. Ahadpour Khaneghah
reza_ahadpour@civileng.iust.ac.ir
E. Mohammadi Dehcheshmeh
esmaeil_mohammadi@civileng.iust.ac.ir
V. Broujerdian(corresponding author)
broujerdian@iust.ac.ir
Dept. of Civil Engineering
Iran University of Science and Technology
DOI:10.24200/J30.2020.55635.2758

Sharif Civil Engineering Journal
Volume 37, Issue 2.1, Page 51-60, Original Article

- Received 2 June 2020; received in revised form 9 August 2020; accepted 11 October 2020.

Abstract

Conventional seismic resistant systems generally dissipate earthquake energy through the plastic deformation of structural elements. These systems withstand high residual displacements increasing the cost of repair or even necessitate reconstruction of the building. In recent years, researchers have focused on self-centering lateral load resisting systems due to earthquake energy absorption in replaceable elements and reduced residual displacement. One of the recent types of these systems is self-centering buckling restrained 2-story-X-brace system. In this study, the hysteretic performance of a 9-story structure with a dual steel moment resisting frame system equipped with a self-centering buckling restrained brace is investigated.

At first, the parameters affecting the performance of the bracing were specified. These parameters included the

gressive method is that for identification of m modes of a structure, at least m sensors are needed. Besides, this method like other similar methods in this area such as frequency domain decomposition and stochastic subspace identification is appropriate for extraction of modal parameters from stationary measured dynamic structural responses. To address these issues, in this study, the Hilbert vibration decomposition method, which is a simple method for time-varying vibration decomposition based on the Hilbert transform, is adopted to improve the performance of the autoregressive method for extraction of frequencies and damping ratios of a structure from stationary or non-stationary responses recorded by a sensor. The efficiency and performance of the newly enhanced method are investigated through two numerical examples and a verification example. The first numerical example deals with a single-degree-of-freedom system subjected to a non-stationary force and the second one presents a two-degree-of-freedom structure excited by a stationary force. Finally, by using the proposed method, the frequencies and damping ratios of a support tower of the segmental bridge via an experimental test are obtained. The results indicated that the proposed method adequately estimated the frequencies and damping ratios of a structure from stationary and non-stationary responses recorded by only one sensor. Moreover, it is found that this method outperforms other relevant methods when dealing with non-stationary responses. Consequently, the enhanced method is strongly recommended for extraction of the frequencies and damping ratios of the structures from stationary or non-stationary responses, especially when the dynamic response of the structure is non-stationary and measured using only one sensor.

Key Words: Autoregressive method, hilbert vibration decomposition, modal identification, non-stationary responses.

MULTI-CLASS DYNAMIC TRAFFIC ASSIGNMENT WITH LINK CAPACITY CONSTRAINTS

B. Javani
babakjavani@ut.ac.ir
A. Babazadeh(corresponding author)
ababazadeh@ut.ac.ir
School of Civil Engineering
College of Engineering
University of Tehran
DOI:10.24200/J30.2020.55759.2777

Sharif Civil Engineering Journal
Volume 37, Issue 2.1, Page 29-38, Original Article

- Received 2 May 2020; received in revised form 4 July 2020; accepted 28 September 2020.

Abstract

One of the conventional methods for improving the performance of transportation networks is building new highways, which is not considered nowadays as an effective alternative especially for congested urban areas. Using the intelligent transportation systems (ITS) for traffic control and congestion reduction, as a powerful alternative, has attracted a lot of attention in the past two decades. Advanced traveler information systems (ATIS) are typical ITS applications which provide the travelers and the traffic control system operators with information in order to enhance the safety and performance of roadway facilities. The basic requirement of implementing and applying such systems is the modeling of time-varying traffic flows over the network. Therefore, there has been an extensive focus on developing the dynamic traffic assignment (DTA) models. The DTA models can capture the dynamic characteristics of the traffic flow by predicting the pattern of time-varying flows, provided that the time-varying travel demands are given. In this paper, an analytical multi-class DTA model is proposed which defines temporal path-link incidence and path-link fraction variables to explain the relationship between the link and path flows and travel times. This model applies the BPR performance function, while confining link flows to the link capacities and considering link queuing delays by employing link capacity constraints. Also, an algorithm is developed which rapidly converges to the optimal solution for large scale problems. In addition, the algorithm uses dynamic penalty functions to deal with the capacity constraints, whereby the queuing delays for each link and each time interval can be easily calculated. The suggested algorithm is applied to the DTA test problem of Tehran network, showing that it is able to efficiently solve the problem. The application of the algorithm for evaluating some multi-class ITS policies in Tehran is also investigated. Finally, a comparison between the dynamic and static results reveals significant differences.

Key Words: Dynamic traffic assignment, multi-class, capacity constraint, intelligent transportation systems, tehran network.

ENHANCING CONSTRUCTION PROCESS EMPLOYING LEAN PRINCIPLES AND DISCRETE EVENT SIMULATION

RELIABILITY ASSESSMENT OF WIND LOAD COMBINATIONS BASED ON IRANIAN NATIONAL BUILDING CODE

A. Kakaie
armankakaei@gmail.com
M.R. Salimi
mr.salimi@uok.ac.ir
R. Amadeh
roshanakamadeh@gmail.com
K. Nobakht Vakili
k.vakili@uok.ac.ir
A. Yazdani(corresponding author)
a.yazdani@uok.ac.ir
Dept. of Civil Engineering
University of Kurdistan
DOI:10.24200/J30.2020.54912.2685

Sharif Civil Engineering Journal
Volume 37, Issue 2.1, Page 11-18, Original Article

- Received 29 December 2019; received in revised form 12 July 2020; accepted 11 October 2020.

Abstract

The new generation of design codes is established by reliability-based calibration methods. The overall aims of these methods are to achieve consistent levels of safety or structural reliability under different type of uncertainties. According to these methods, the acceptable reliability level of structures is obtained based on statistical descriptions of loads and resistance and also consideration of different types of uncertainties such as the physical uncertainty, the statistical uncertainty and the model uncertainty. In the last decades, based on reliability-based calibration approaches, load and resistance factor design (LRFD) method has been developed for steel buildings design. In this method desired level of safety is obtained by a set of partial load and resistance factor. The design load combinations for steel structures in Iranian National Building Code (INBC), Part 6, are generally based on other codes such as ASCE/SEI 7-10 standard and National Building Code of Canada (for wind load factors), while the effect of Iranian statistical data for load and resistance has not been considered. In comparison to other loads, such as gravity loads, wind load has a high degree of uncertainty and also it is completely site dependent. Therefore it is important to estimate a suitable statistical model for wind load and also investigate the reliability level of structures subjected to wind load combinations. This paper is a parametric study to assessment the reliability level of wind load combinations for steel beams based on INBC. For this purpose, wind load statistical data are provided for whole of Iran by the climatology data of wind speeds. Based on the FOSM method explicit formulation for reliability index of beams is calculated. The reliability indices for a range of practical load ratios are obtained and compared to the target reliability index. The results indicated that reliability level of wind load combinations in INBC is lower than target reliability index. One of the main reasons for the low level of reliability index for wind load combinations is related to underestimation of reference speed. The results show that by considering the reference speeds based on statistical data, reliability index approaches to target reliability index.

Key Words: Reliability analysis, iranian national building code, load combinations, wind load, statistical parameters.

IMPROVING THE PERFORMANCES OF THE AUTOREGRESSIVE METHOD IN MODAL IDENTIFICATION OF OUTPUT-ONLY SYSTEMS USING HILBERT VIBRATION DECOMPOSITION METHOD

A. Nikkhoo(corresponding author)
nikkhoo@usc.ac.ir
H. Karegar
h.karegar@usc.ac.ir
Dept. of Civil Engineering
University of Science and Culture
R. Karami Mohammadi
rkarami@kntu.ac.ir
Dept. of Civil Engineering
K. N. Toosi University of Technology
DOI:10.24200/J30.2020.55163.2711

Sharif Civil Engineering Journal
Volume 37, Issue 2.1, Page 19-28, Original Article

- Received 19 January 2020; received in revised form 22 September 2020; accepted 11 October 2020.

Abstract

In this paper, an enhanced method for extraction of modal parameters (frequencies and damping ratios) of a structure from stationary or non-stationary measurement dynamic responses recorded by a sensor is presented. Surely, one of the simplest methods in area of ambient modal identification (operational modal analysis) is autoregressive method. Major problem of autore-

Abstracts of Papers in English

PARAMETER ESTIMATION OF THE NONLINEAR MUSKINGUM FLOOD-ROUTING MODEL USING THE NEW DRAGONFLY ALGORITHM

S. Khalifeh
khalifeh.saeid@mail.um.ac.ir
S.R. Khodashenas(corresponding author)
khodashenas@ferdowsi.um.ac.ir
K. Esmaili
esmaili@um.ac.ir
Dept. of Water Science and Engineering
Ferdowsi University of Mashhad
DOI:10.24200/J30.2020.55391.2726

Sharif Civil Engineering Journal
Volume 37, Issue 2.1, Page 3-10, Original Article

- Received 28 February 2020; received in revised form 23 August 2020; accepted 11 October 2020.

Abstract

Flood routing is one of the most complex problems investigated in hydrologic engineering and it can help design engineers to recognize the impacts of riverine projects. Among the different flood routing methods, the Muskingum model as the best hydrologic method of flood routing is widely used with high accuracy in river flood studies. In this paper, DragonFly Algorithm (DA) was used to this end. The results of the DragonFly Algorithm (DA) were compared with GA and HS algorithms. The results showed that DragonFly algorithm (DA (was capable to provide satisfactory estimates of nonlinear Muskingum parameters. The results showed that the DragonFly Algorithm (DA) could provide an appropriate estimation of the optimal values of nonlinear Muskingum model parameters so that for the Sum Squares Deviations (SSQ) and RMSE, the values for rainfed algorithm were 4.5551 and 0.711, respectively, for the DragonFly Algorithm (DA). The DragonFly Algorithm (DA) can be used for any continuous engineering problem.

Key Words: Hydrologic routing, DA algorithm, optimization, indirect penalty function.