of everlasting challenges for the tunnel engineering in urban areas is predicting considerable settlement during excavation in the heterogeneous soil.
The face pressure is one of the most important parameters which affects surface settlement, which shall be calculated before arriving a certain section in order to apply to the face of tunnel by the operator. In the present paper, first, empirical and analytical methods for determination of face pressure by TBM excavation are studied. Then, by using Flac3D software, (a finite difference code), a fully aspect-oriented simulation of TBM-EPB is done, and as a result, the required face pressure is obtained.
Excavation of Mashhad's metro project of line 2 is done by the EPB-TBM, and its operational data, such as surface settlement, face pressure, and tail void grouting pressure, are used. Finally, results of empirical, analytical, and numerical methods for face pressure calculation are compared with the real data .In this paper, a parameter, called "allowable pressure" (Pall), is introduced which shall be used in order to predict the optimum pressure required in the excavation progress. This parameter is defined based on the damage assessment for the adjacent structures. In this study, the Rankin risk assessment was used to determine the maximum surface settlement.
The results illustrate that the empirical method (i.e., Peck relationship) does not satisfy the adequate accuracy, and this method is recommended for phase I design. On the other hand, the Broer method which considers the real condition, can predict the required face pressure with appropriate accuracy compared to the empirical method. Numerical simulation has high capability to calculate the face pressure in heterogeneous soil layers, so that the final result has about 6 % error.

Key Words: Face pressure, Flac3D, surface settlement, TBM-EPB, allowable pressure.

INTEGRATED PROJECT DELIVERY USING BUILDING INFORMATION MODELING

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Abstract
There are various weaknesses in the construction industry which should be improved. Improving these weaknesses leads to qualitative and quantitative improvements of the industry. Recently, new technologies and implementation methods have been emerged which lead to increasing productivity, reducing cost, and increasing efficiency for the construction industry. Building Information Modeling (BIM) is one of the most important technologies in this field. Building Information Model is a three dimensional (3D) model which displays physical and functional characteristics of a building digitally. This model is a shared database which can be used to make reliable decisions about the building anytime during its life cycle. Building Information Modeling (BIM), as a powerful tool in the hands of project managers, helps to improve project performance measures; measures like cost, schedule & quality. Despite the benefits of this new technology, due to fragmented nature of conventional contracts, much of its potential remain unused. On the other hand, as a new method in implementation of construction projects, Integrated Project Delivery (IPD), seeks to improve project outcomes through a collaborative approach of aligning the incentives and goals of the project team through shared risk and reward, collaborative decision making, early involvement of all parties, and a multi-party agreement. Integrated Project Delivery (IPD) is a relatively new implementation method in construction industry. Collaboration and good relation among parties is an important factor in the implementation of this delivery system, which highly depends on using BIM technology as a communication tool. Taking maximum advantages of Building Information Modeling becomes possible because of the nature of IPD. In this paper, firstly, Building Information Modeling and Integrated Project Delivery are introduced summarily. After that, the process of using BIM in implementation of IPD will be defined through a flowchart.

Key Words: Integrated project delivery, ipd, building information modeling, BIM, contracts, sustainable development.

reduces seismic demand of structure in comparison with moment-resisting frames with welded rigid connections. Moreover, post-tensioned connections modeled with the OPENSEES software and accuracy of modeling were compared with that of experimental results. The seismic demand of post-tensioned steel moment-resisting frames by a change in initial post-tensioning force for 4 ,7 and 10 story frames was evaluated under static and dynamic nonlinear analyses. The results indicated that with increasing initial post- tensioning force drift angle, residual drift angle was decreased, but by increasing the excessive initial force, leading to increase of base shear, energy dissipation in connections and development of local buckling in beam flange were redued.

Key Words: Post-tensioning force, drift angle, energy dissipate, relative rotation connection.

INVESTIGATION OF ZEOLITE EFFECT ON TENSILE STRENGTH OF BABOLSAR SAND STABILIZED WITH CEMENT

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Abstract
The lack of accessibility of high- quality materials and the increased costs associated with the use of these materials will finally necessitate engineers to use local soils. In such cases, ground improvement behaved satisfactorily in many conditions. Ground improvement can be defined as the procedure of increasing shear strength parameters and decreasing the permeability and compressibility of the soil. Different methods can be used to improve the geotechnical properties of the problematic soil, one of which is using additives. Additive stabilization is achieved by the addition of proper percentages of cement, lime, fly ash, bitumen, or combinations of these materials to the soil. The selection of type and determination of the percentage of additive to be used are dependent upon the soil classification and the degree of improvement in desired soil quality. It is known that, when using soil-cement as a compacted layer over low bearing capacity soil, the system failure usually happens under tensile stresses at the base of the improved layer. Then, it would seem more reasonable to use the tensile strength as a direct measure of the soil-cement strength. In this investigation, zeolite and its effect on compaction are studied as one of addictive material to cement. Therefore, Kilinopiolite kind of zeolite, Neka cement type 2, and Babolsar sand are used. 24 combination types of cement and zeolite include different cement percentages: 2, 4, 6, and 8 percent of the total dry weight of samples and replacement percent's of 0, 10, 30, 50, 70, and 90 zeolites with cement. In this article, first, soil mixture and producing samples based on standard compaction test have been done. Results show that by increasing the replacement percentages of zeolite with cement, decreasing maximum dry density and 14% optimum water content approximately concluded. Also, by replacing 30 percentage of cement by zeolite material, the tensile strength increased up to 40 % in comparison with cemented samples.

Key Words: Stabilization, cement, zeolite, compaction, brazilian tensile test.

3D STABILITY ANALYSIS Of HETEROGENEOUS FACE EXCAVATION BY TBM- EPB MACHINE -CASE STUDY LINE 2 METRO OF MASHAD

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Abstract
Surface settlement is a disadvantage of construction of shallow tunnels in urban areas which leads to the damaging the existing structures and subsurface utilities. One

MULTIPLE LOAD USING TOPOLOGY OPTIMIZATION

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Abstract

In the last two decades, strut-and-tie model (STM) has been the most widely used method for design of reinforced concrete disturbed regions. Continuum topology optimization is the latest method for determining appropriate STM. This method does not have limitations of conventional methods.

In this article, an efficient methodology is presented for development of STM for reinforced concrete members under multiple loading conditions. Solid isotropic material with penalization (SIMP) topology optimization algorithm is employed to minimize elastic strain energy of the models. In order to prevent checkerboard patterns and mesh dependency, the sensitivity filtering was applied and design variables were updated using the optimality criteria.

Two numerical examples were used to investigate the effectiveness of the proposed methodology. The first example is a shear wall with asymmetric opening under reversed static loading. The ultimate load to steel weight ratio was used as the criteria to compare the models with different volume fractions. CAST software was used for analysis and design of models. Nonlinear Finite Element models were developed to obtain load-deflection curves for different models.

In the second example, a new criterion was used to compare the STM of a corbel under horizontal and vertical static loads. Effects of different filtering radii were also investigated. The results of this example show that models obtained from topology optimization are efficient and require the minimal steel reinforcement when compared with conventional models. The results indicate that a volume fraction in the range of 0.35-0.45 leads to efficient and optimum models. A low filtering radius results in models with redundant members and a high filtering radius results in removal of members from model. It should be noted that using topology optimization under multiple loads also results in saving the CPU time for analysis and design.

Key Words: Strut-and-tie, topology optimization, multiple loads, shear wall, corbel.

THE EFFECTS OF INITIAL POST TENSIONING FORCE ON SEISMIC BEHAVIOR OF STEEL MOMENT RESISTING FRAMES BY POST - TENSIONED CONNECTIONS

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Abstract

After Northridge earthquake in 1994, different details were recommended for constructing new moment-resisting connections to attain a ductile behavior under earthquake excitations. The main aim of these aforementioned details, was just to avoid the occurrence of failure in the weld and transmit the inelastic deformation of beams in the interior span of the beam rather than the joint connection area. As a substitution instead of welded moment-resisting connections, researchers recommended the utilization of post-tensioned moment connections in moment-resisting frames to resist against earthquake loading. This study is to investigate the seismic behavior of the connections. Post-tensioned connections are composed of high-strength steel cables, which are erected parallel to the beam webs, and then are crossed through the column, and finally would be fixed at the column's flange face. Firstly, steel cables create compression between beam and column flanges; secondly, they provide the resisting-moment of connections against applied service loads, and eventually these cables would cause self-centering of columns, which means that the columns would get back to their initial position after they are tilted by earthquake excitation. Moreover, two steel angle sections are added at the top and bottom surfaces of these connections, in order to dissipate the earthquake energy in the joint area. Results of previous research indicate that the use of post-tensioned connections in steel moment-resisting frames

corresponding risks. An appropriate risk management of a project helps project managers in getting safe conditions for project design and implementation. Therefore, one area in which there is a necessary need for decision making is project risk management. One of the main steps in risk management is risk assessment and risk ranking, which are important parts of risk management. On the other hand, tunneling projects are now risk-prone activities in mining engineering context. Missing or incomplete risk management in tunneling projects leads to negative consequences, such as longer project time and increased costs. Due to the multiplicity of risk factors in an urban mechanized tunneling project by Earth Pressure Balance (EPB) machine, ranking risk is a complex convoluted procedure. So, it is necessary to use multi-criteria decision-making (MCDM) methods. Hence, in this paper, in order to analyze the risks of a tunneling project in Tehran Metro-Line 7, we suggest to use Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) method. It is a method for aggregation that compares a set of alternatives by identifying weights for each criterion. It then normalizes scores for each criterion and calculates the geometric distance between each alternative and the ideal alternative. The obtained results show that financial and human resource factors get the first high risk ranks. Furthermore, the risk of dealing with a network of aqueducts is the most well-known problems of the Tehran Metro-Line 7 project. Conducted field studies of the project and visiting the workshop site confirmed the validity of analysis.

Key Words: Mechanized tunnelling, risk management, ranking, MCDM method, TOPSIS, line no. 7 Tehran subway.

ASSESSING THE PERMEABILITY OF THE OIL AND ITS COMPONENTS INTO POROUS CONCRETE USING NEW CYLINDRICAL CHAMBER METHOD

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Abstract

In the concrete storage tanks used in oil industry, displacements, cracking, durability, and permeability are the factors to which must be paid enough attention. Furthermore, in order to evaluate the durability of any concrete structure, its strength and liquid permeability as the most influential factors should be assessed. Oil and its components can harm concrete in two ways. One way is the corrosion of the reinforcement in the reinforced concrete structure, and the other is the detrimental effect of the oil and its components on the constituent materials of the concrete by dissolving them and producing new products with much less strength and durability. Therefore, in this paper, the results of the use of a newly developed "cylindrical chamber" method, which was used to assess the permeation of oil and gasoline into concrete with different strengths, are presented. The portable "cylindrical chamber" apparatus consists of a metallic base ring, a cylindrical chamber, a pressurizing screw, and a dial gauge. In order to measure the liquid permeability of a medium, the base ring is attached to the surface of the medium using high strength epoxy glue. After setting and hardening of the glue of the base ring, which is usually completed by about 24 hours, the cylindrical chamber is attached to the base ring simply by twisting the chamber and fixing it. The lower section of the cylindrical chamber is equipped with a rubber ring which prevents the leakage of the liquid. Having fixed the cylindrical chamber on top of the base ring, the chamber is filled with the intended liquid. For pressurizing the liquid, the screw is turned clockwise until the required pressure is shown on the dial gauge. For the present research, concrete cubes with different strengths were cast and cured for 28 days, using water tank for curing. The strength of the concrete mixes used ranged from 20 to 50 MPa. The results show that as the concrete strength increases, the permeability of the liquids used tends to decrease. It was also seen that any increase in the unit weight of the liquids used tends to reduce the amount of the permeated liquid in the concrete.

Key Words: Permeable medium, permeability, cylindrical chamber, oil components, concrete.

DETERMINING OPTIMAL STRUT-AND-TIE MODEL FOR REINFORCED CONCRETE DISTURBED REGION UNDER

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Abstract

Formerly, because of the ease to run and more economical advantage, used widely in steel structures, despite of ambiguities in the nature of the modeling and seismic behavior of the Saddle connections. As expected semi-rigid behavior of these connections, was modeled, designed, and run in detail. In the past decade, large volumes of the construction structures have done with Saddle connections, which the majority of them need for improvement and reinforcement. The need for reinforcement of these structures, make the behavior and function cognition of this connections inevitable. However, many studies have done in this field, but there are a few researches about Saddle connections behavior under both gravity and lateral loads. Although, the gravity load may affect the seismic behavior parameters of this connection. In this paper, the contemporary effects of gravity and lateral loads are studying in various Saddle Kike connections samples. For this, analysis doing nonlinear. First, drawing the moment-rotation curve of the connection under cycle lateral and gravity loads, and for gain to the primary and the secondary hardness of the connection, drawing Push and Hysteresis curves. Also, calculating the maximum Von Mises stress ($(\sigma v)max$), max Hydrostatic stress ($(\sigma n)max$), the max Equivalent plastic strain (PEEQmax) for prop, pillar, critical weld lines, and up and down cornerstones, in connection parts. Finally, determining the Three-axial (TI) and Equivalent plastic strain (PEEQI) Indexes for connections comparison.

Some results of recent study, after survey and comparison of model connections:

1-Increasing the cornerstone length size ratio and so, increase of the prop section's elastic module cause to inconspicuous the gravity load effect on connection behavior characteristics (primary hardness, secondary hardness and surrenders moment).

2-Survey of the TI rapture index in the studied samples cleared that upper cornerstone length increasing, however, increase connection hardness, but according to TI index, the pillar failure possibility in connection state significantly increases. Also, the increasing of the pillar high, noticeably increases this index in pillar connection.

3-With a survey of the PEEQI rupture index in the studied samples cleared which has not significant value in different pillars.

Key Words: Saddle connection, cycle load, gravity load, connection hardness, nonlinear analysis.

RISK EVALUATING FOR MECHANIZED TUNNELING IN THE TEHRAN METRO-LINE 7 BY MULTI-CRITERIA DECISION-MAKING METHOD

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Abstract

Risk management is today known as one of the nine major project management bodies of knowledge science. An effective risk management allows decision makers to identify the project's strengths, weaknesses, and opportunities. Also, they will be ready to respond if they arise. It includes identifying, recording, ranking and recognizing of response actions and also allocation of actions to

By taking advantage of incremental dynamic analysis (IDA) and defining an appropriate damage state, equipment seismic response is evaluated. Many measures of earthquake ground motion intensity, rather than PGA, have been examined. Finally, it is decided that the peak ground displacement (PGD) can better represent the equipment seismic response among all other alternative measures. Afterwards, porcelain insulator breakage (which outnumbers any other reported failure modes of CVT and LA) and breakage of conductor terminal pads are taken as the two main failure mechanisms of 2-item set of equipment. Moreover, the influence of the gap between FPS stoppers is one of the most prominent variables considered in the present study. The rationale behind the decision refers to pounding of slider against stoppers, which seemes to be a matter of concern.

The IDA curves of the non-isolated 2-item set of equipment revealed that LA is much more susceptible to failure. In order to evaluate the isolation effect on the seismic performance of the 2-item set of equipment, two different cases are supposed: A. Base isolation of CVT while LA is fixed-base; B. Base isolation of LA while CVT is fixed-base. Case A was found to be much more suitable than case B to enhance the seismic performance. Eventually, it is concluded that FPS isolator has the potential to decrease flexural stresses caused by intense ground motions, and this could be enhanced by widening the gap between stoppers of isolator.

Key Words: Capacitor vlotage transformer (CVT), lightning arrester (LA), friction pendulum system (FPS), conductor interaction, incremental dynamic analysis (IDA).

EXPERIMENTAL, NUMERICAL, AND ANALYTICAL INVESTIGATIONS OF BEARING CAPACITY OF CIRCULAR AND RING FOOTINGS ON REINFORCED SAND

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Abstract

Ring foundations can be used for communication towers, water and oil tanks, and generally for most structures with axial symmetry about the central axis perpendicular to the foundation. Since lower amount of construction material is used to build the ring footings compared to circular footings with the same external diameter, it can be considered a more efficient and economic foundation than circular foundations. The bearing capacity of shallow foundations depends not only on soil properties, but also on the shape of these footings. The classical relations developed for determination of bearing capacities of such footings are different for square, rectangular, circular and strip footings. A widely accepted relation for determining the bearing capacity of ring foundation cannot be found in literature. The bearing capacity of ring foundation has, therefore, been the subject of some studies in recent decades. In this paper, the results of studies that have been conducted on physical and numerical models of circular and ring foundations are presented. The physical models were made from rigid material with small sizes. All the tests were performed in geosynthetic laboratory of Shiraz University. The computer code PLAXIS 3D foundation, which is finite element software, was used to perform the numerical analysis. Analytical analysis was also performed using classical methods. Finally, numerical, analytical, and laboratory results were compared. The results showed the significant effect of geogrid on the increase of bearing capacity of both types of foundations. In either case, considering circular and ring footings on unreinforced and reinforced sands with a geogrid layer, the results were close to experimental results. The results of numerical analysis of bearing capacity values were, however, lower than those obtained experimentally. The bearing capacities of ring footings were found to be higher than the capacity of counterpart circular footings in all similar conditions. The analytical results showed that lower values of bearing capacities compared to experimental and numerical results due to the scale effect.

Key Words: Circular foundation, ring foundation, bearing capacity, reinforced sand.

SURVEY OF THE SADDLE CONNECTIONS BEHAVIOR UNDER CONTINUES GRAVITY AND LATERAL LOADS

tic boundaries; second, highlight special cautions about minimum element size to cover proper frequency range of interest, and third, to introduce the idea of extending the boundaries to the main model in order to substantially increase their absorbing performance.

Key Words: Soil-structure interaction, radiation damping, artificial boundaries, Abaqus.

USE MASS DAMPER WITH NONLINEAR STIFFNESS AND SEMI-ACTIVE DAMPING

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Abstract

Structures can have desirable efficiency against natural hazards, such as wind and earthquake, if the maximum displacements remain as small as possible. In order to decrease the structural undesirable seismic noise, increase of ductile and dampers has been studied. In semi-active tuned mass dampers, the proper time dependent damping can be determined using fuzzy control.

A tuned mass damper with nonlinear stiffness and a fuzzy controller is designed in this study for semi-active tuned mass damper to decrease seismic vibration of buildings. Fuzzy control can connect input variables to output ones; in this way, not only the computational efforts are reduced, but also the uncertainty of parameters can also be considered and investigated due to using linguistic variables rather than numeric variables.

A multi-degree freedom building structure with ten stories is analyzed. This building has been subjected to the Abgine, Avaj and El Centro earthquakes. The structure analyses are performed for without damper, passive damper, and the proposed damper cases; in each case, maximum displacement of the stories, RMS displacement of the stories, and RMS acceleration of the stories are compared with one another. The results show that the proposed damper decreases the structural displacements where more desirable results can be obtained with smaller structural damping.

In El Centro earthquake, by the proposed damper, the reduction of peak displacements is more than 37%, the reduction of RMS displacements is more than 84%, and the reduction of RMS accelerations is more than 72%. In Abgine earthquake, by the proposed damper, the reduction of peak displacements is more than 30%, the reduction of RMS displacements is more than 53% and the reduction of RMS accelerations is more than 27%. In Avaj earthquake, by the proposed damper, the reduction of peak displacements is more than 36%, the reduction of RMS displacements is more than 69%, and the reduction of RMS accelerations is more than 49%.

Key Words: Mass damper, fuzzy controller, semi-active damper, nonlinear stiffness.

INVESTIGATION INTO THE EFFECT OF FRICTION PENDULUM SYSTEMS ON SEISMIC DAMAGE REDUCTION OF SUBSTATION EQUIPMENT

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Abstract

Substation damage, and consequently electricity cut-off, have been always one of the costly earthquake disastrous outcomes. In the present study, a 2-item set of equipment, including capacitive voltage transformer (CVT) adjacent to a lightning arrester (LA) known as vulnerable instruments existing in substations, is aimed to seismically strengthen by isolation strategy. The isolator device considered in the present study is a single friction pendulum system (FPS) which possesses sliding and re-centering mechanisms integrated in one unit. In addition, CVT and LA instruments are cable-connected as well. Since interaction of conductors between equipment subjected to earthquakes is a challenge for seismic design of substations, it is prudent to design the cable-connected system with sufficient cable slackness.

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Abstract

This paper presents two effective methods for damage identification in engineering structures by defining damage prognosis problem as an optimization problem. Both of the presented methods are based on the diagonal members of the Generalized Flexibility Matrix (GFMt). In the first method, the objective function is formulated by means of a direct fitting data strategy via inspecting the diagonal members of the GFMt. However, the second cost function is defined by searching the correlation of the diagonal members of the GFMt through Modal Assurance Criterion (MAC). In the proposed methods, we employ the Imperialist Competitive Optimization Algorithm (ICOA) to solve optimization problem. This algorithm is inspired by a socio-political event and applied to a number of scientific problems for finding the optimal solution. The applicability of the presented methods is investigated by studying three numerical examples of engineering structures, namely a three-story steel frame, a plane truss with fifteen elements, and a simply supported beam. Different damage patterns are considered and several challenges, such as the impacts of random noise on the measured modal data and the number of available modal data for creating GFMt, are studied. All of the obtained results emphasize the robustness and good performance of the presented methods in damage localization and quantification in the engineering structures. As a result, the comparison between the presented cost functions concluded that the second objective function can be more effective than the first one in terms of an accurate estimation of damage in the real applications. In addition, some studies are conducted for evaluating the robustness of the ICOA in solving optimization problem by running it five times for a special damage scenario. Under the same conditions, the problem is solved by using Genetic Algorithm (GA) for drawing a conclusion about the performance of the optimization procedures in reaching the global minimum point. Although the ICOA reaches to the general optimum point, the GA is arrested by local minimum points in a number of runs. So, it can be concluded that the ICOA is more effective than the GA in searching a complex domain for finding the optimal solution.

Key Words: Structural damage detection, generalized flexibility matrix, modal assurance criterion, imperialist competitive optimization algorithm, engineering structures.

CALIBRATION OF 2D NUMERICAL MODELS FOR THE CASE OF SOIL-STRUCTURE SYSTEMS WITH SURFACE FOUNDATIONS

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Abstract

Finite element simulations are widely used in soil-structure interaction (SSI) problems. It is usual that the semi-infinite soil medium becomes truncated to a manageable size through artificial boundaries with finite degrees of freedom. However, ambiguous points still exist in different aspects of reasonable modeling of such boundaries. Fixed boundary condition in static analysis can be used with appropriate distance from structure without sacrificing much in terms of accuracy. Using fixed boundary condition in dynamic analysis neglects the propagation of waves into infinity. From this point, the mentioned ambiguity starts with free field motion analysis which normally precedes each SSI problem. Although considering wide soil domain with material damping can help vanish the reflected waves, it is computationally expensive. The current practice suggests viscous or viscoelastic boundaries including spring and dashpot elements. Introducing input motion to the system through such boundary elements should guarantee the correct free field motion in the medium before structural positioning. However, seismic loading from such borders faces frequency content distortions which need to be treated appropriately. In the second stage, the boundaries should be able to properly simulate the outward propagation of waves, emanated by SSI, i.e., radiation damping. Although viscous boundary condition is capable of damping out most of the reflecting waves due to the assumption of 1D wave propagation in setting damper coefficients, it is not able to absorb whole of the body waves with different angles of incident. This weakness becomes augmented in the case of surface waves. Here, the existing limitations on seismic loading in boundaries are discussed. Then, practical solutions are suggested that can improve the arrival and transmitting out of seismic waves from viscoelastic boundaries, properly. The major contribution of this research belongs to new approaches to, first, remove frequency distortion of input motion caused by viscoelas-

intelligence of the Particle Swarm Optimization (PSO) is used to develop an alternative solution method for the ODMAP. The proposed method is applied to solve the problem for Tehran metropolis, and the results are compared against those of the gradient one. The results reveal that the gradient is slightly superior to the PSO in the sense of reduction the objective function value, but the PSO obviously outperforms the gradient method when considering the structure of the adjusted matrix and the sum of its elements. Regarding the CPU times, the PSO can solve the problem in shorter time, due to its simplicity, while both methods use the same algorithm for the lower level problem. The results are promising and encourage further investigation to use the PSO for updating old matrices in transportation studies.

Key Words: Transportation demand, O-D matrix adjustment, bi-level programming, Gradient method, particle swarm optimization (PSO).

OPTIMIZATION OF STORAGE TANKS CONSIDERING WATER QUALITY CONSTRAINTS IN WATER DISTRIBUTION NETWORKS

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Abstract
The optimum design is considered as very important topic in engineering issues. Water distribution networks are one of the crucial urban infrastructures. In urban water supply systems, tanks or service reservoirs are constructed for purposes of water storage for balancing consumption, emergency and fire as well as preparing design pressure. Considering that a significant portion of the cost of urban water projects is related to tanks and service reservoirs, designers should optimize the reservoir cost as well as its hydraulic and quality performances. Optimization issues in the design and operation phases of water distribution networks mostly focus on pipes or pump's schedule and less on storage capacity, or constraints associated with quality parameters are less considered. The reason is that water quality shows its importance in the operation stage; therefore, controlling water quality is done in the operation stage with sampling from different parts of the network. In this paper, in order to optimize the performance and quality of the water distribution network, high performance and easy implementation algorithm of NAACO (Non-dominated Archiving Ant Colony Optimization) is developed in Visual C++, which minimizes the cost and maximizes the reliability of storage tanks. To achieve this goal, the Ant Colony Optimization algorithm (ACO) is combined with simulation software (EPANET) which is capable of both hydraulic and quality analyses. Optimal solutions are presented in pareto curves. Application of the proposed approach to the well known test network of Anytown shows the advantages of this methodology. Also, differences in outcomes based on demand and head driven hydraulic analyses are examined and a relationship between hydraulic reliability of tank and network is proposed. Results show that this methodology can well cover the aspects of the problem and leads to the favorable decisions in the operation of storage tanks in water distribution networks considering quality constraints.

Key Words: Cost, multi-objective ant colony optimization, , reliability ,storage tank, water quality.

DIRECT AND GEOMETRICAL TRACING OF THE DIAGONAL MEMBERS OF THE GENERALIZED FLEXIBILITY MATRIX VIA OPTIMIZATION-BASED APPROACH FOR STRUCTURAL DAMAGE IDENTIFICATION

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A COMPARISON OF THE PSO AND GRADIENT ALGORITHMS IN ADJUSTING THE O/D MATRIX OF METROPOLITAN TEHRAN

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Abstract

Origin-Destination demand information, namely the O-D matrix, is one of the essential inputs for many studies of operational analysis of transportation networks. Obtaining such a matrix by conventional surveying methods needs a considerable amount of time and consumes a significant portion of studies' budget. Instead, many researchers have tried to develop some methods to solve the OD matrix adjustment problem (ODMAP), that is, how to adjust an outdated (initial) O-D matrix using easily available traffic counts. These methods are known as low-cost surrogates to the conventional methods and some of them have been shown to cope well with the ODMAP. The problem is formulated as a bi-level programming model where the upper level problem resembles an O-D matrix which can reproduce the counts as close as possible, and the lower level problem performs an equilibrium traffic assignment for any given solution. The gradient algorithm is the most used solution method to the ODMAP, but its efficiency for large-scale problems is not well determined. The method requires significant computational effort to calculate the derivatives of the objective function of the upper level problem when the size of the matrix is large. Moreover, the solution of the gradient is shown to be highly sensitive to the percentage of the links of the network that are counted. Our study also shows that the solution of the gradient method could not remain close enough to the structure of the initial matrix. In this paper, the meta-heuristic