« **Research Note** »

Flood Routing in Channel Networks Using Adaptive Modified Muskingum Methods via Tabu Search

M. Nasseri[1*], K. Asghari[2], M. R. Koohkan[3]

1. Ph.D. Student of Water and Environment, Shiraz University
2. Assistant Professor, Civil Engineering Dept., Isfahan University of Tech.
3. Msc. Student, Civil Engineering Dept., Isfahan University of Tech.

[*] **Zand Ave., Engineering School, Shiraz University, Shiraz, Iran**
mm_nasseri@yahoo.com

Abstract

The present model structure is based on modified Muskingum method for channel network simulation for obtaining a real time hydrologic model of run-off. The field application of the model was checked using three flood events of the Khosk River Basin in Shiraz-Iran, which is based on their hydrometric station records upstream and downstream. In order to optimize the model parameters, tabu search method was used and compared with the results provided by genetic algorithm. The numerical simulator was derived in explicit finite difference scheme. The statistical results when compared to the genetic algorithm show the better performance of the current method.

Keyword: Modified Muskingum Method, Tabu Search Algorithm, Adaptive Modeling.

« Research Note »

Real Time Forecasting Using Regression and Artificial Neural Network Models

S. Alimohamadi[1*], O. Bozorg Hadad[2], A. Afshar[3]

1. Assistant Prof. of Water Resources, Sh. Abbasspour Univ.
2. Assistant Prof. of Irrigation, Tehran Univ.
3. Professor, Dept. of Civil Engineering, Iran Univ. of Science and Tech.

[*] **P.O. Box 1719-16765, Tehran, Iran**
Alimohammadi@iust.ac.ir

Abstract

Knowledge of the time and the amount of flood occurrence has a significant impact in reducing human and financial damages caused by the flood. Traditional flood forecasting methods have usually been in forms of classical methods such as rainfall-runoff, routing, and regression. Recently the use of artificial neural networks (ANN) has been proposed. In this study the ability of ANN in site floods forecasting under limited data conditions has been investigated and compared with previously studied methods. Hence, two models have been prepared. The first model is a multiple regression model and the second an ANN model. In this study, the models were prepared using statistics and data from 10 simultaneous floods in four hydrometric stations, upstream of the case study site. Seven floods were used for calibrating and three for testing the models. In each model, multiple parameters were investigated. Comparison of the results of two models indicated that ANN showed a convenient and promising operation in flow forecasting and presented more precise forecasts when compared to the other model.

Keywords: Real Time Forecasting, Flood, Multiple Regression, Artificial Neural Network.

Optimal Design of Sewer Networks Using Mathematical Programming and Genetic Algorithm

M.H. Afshar[1*], M.H. Setoodeh[2]
1. Associate professor, Dept of Civil Engineering, Iran Univ. of Science and Tech.
2. M.S student of Civil Engineering, Iran Univ. of Science and Tech.

[*] **P. O. Box: 16844, Tehran, Iran**
mhafshar@iust.ac.ir

Abstract

Industrialization of the human life requires that more attention is paid to the environmental issues. Sewers are one of the main sources of pollution and must carefully be collected and disposed. The cost of construction and maintenance of the sewer systems is very high in particular the large scale systems required for populated cities. Any reduction in the design cost of these structures lead to a considerable savings. Many researchers have studied the use of optimization algorithms for the optimal design of sewer networks. In this paper the capabilities of mathematical programming and genetic algorithm for the optimal design of sewer networks are investigated and compared for networks with fixed layout. Two different models, namely modified Hazen-Williams and Manning formula with fixed and variable friction coefficient is used for hydraulic simulation of the network. Nodal elevations of the network are considered as the decision variables of the problem leading to the possibility of discrete determination of the pipe diameter. Successful application of these algorithms demonstrates the ability of proposed models to optimal design of sewer networks.

Keywords: Mathematical Programming, Genetic Algorithm, Optimal Design of Sewer Networks.

Estimating of Soil Saturated Hydrodynamic Using Numerical Inverse Model

J. M. V. Samani[1*]; P. Fathi[2]
1. Associate Professor, Dept. of Water Structures, Tarbiat Modares University
2. Assistant Professor, Dept. of Water Engineering, Kurdistan University

[*] **P. O. Box: 14155-4838, Tehran, Iran**
J_samani@yahoo.com

Abstract

The saturated hydraulic conductivity *K* and the effective porosity *f* are two important input parameters needed for lateral drainage spacing design and many other applications. The current design procedure is based upon calculation of the lateral spacing, using some average values of saturated *K* and *f* within the area to be drained. This procedure causes error in most of the cases. Numerical modeling is a powerful tool in simulating water table around drains. The objectives of this study were to simulate water flow toward drains and to simultaneously estimating *K* and *f* using the optimization process within the inverse problem technique. To collect the necessary data of spatial and temporal water table monitoring, a physical drainage model was established in the laboratory and carefully packed with a sandy loam soil. Different data sets from the conducted experiments and literature were used for calibration, using the inverse problem technique. The proposed approach that is based upon measuring water table profiles at different times was then evaluated with both constant and variable *f*. The estimated values with the proposed approach indicated reasonable agreement with the measured data. With variable effective porosity, the method was even more accurate to predict the water table profiles. Also, the inverse problem method provided good agreement compared to the ones obtained by employing the average soil saturated hydrodynamic properties.

Keywords: Numerical Method, Inverse Problem Technique, Effective Porosity, Saturated Hydraulic Conductivity.

Evaluation of Wave-Diffraction Forces on a Submerged Sphere Using a Hybrid BE-FE Method

R. Hafizi[1], N. Khaji[2]*, and M. Shafieefar[3]

1. M.Sc in Marine Structures Engineering, Tarbiat Modares University
2. Assist. Prof., Department of Civil Engineering, Tarbiat Modares University
3. Assoc. Prof., Department of Civil Engineering, Tarbiat Modares University

* **P. O. Box 14115-143, Tehran, Iran**
nkhaji@modares.ac.ir

Abstract

Computational methods for predicting wave effects are important in the design and operation of offshore structures. Structures with rather large dimensions in comparison to the wavelength must be analyzed considering the diffraction theory. In this research, a frequency domain Boundary Element Method (BEM) is presented for 3D diffraction phenomenon by which, wave effects on rigid structures could be evaluated. To verify the present methodology, a submerged sphere, affected by sea waves, has been modeled by a BEM code. By means of the code, the sphere surface is discretized by a consistent mesh, and the point collocation method is applied to solve the system of linear algebraic equations for the nodal potentials. In order to employ the advantages of hybrid methods, the BEM results (in form of hydrodynamic pressures on nodes) are coupled with Finite Element Method (FEM) analysis of the sphere modeled in ANSYS, for its high reliability in analysis and ability to link with available geometry sources by APDL programming. Numerical results show a promising performance of proposed method in comparison to the Froude-Krylov theory.

Keywords: Wave Effects, Diffraction Theory, Laplace's Equation, Potential Theory, BEM, FEM, Hybrid Model.

Energy Loss Evaluation of Two Phase Over- Flow of Stepped Spillway with Downstream Scour Depth Method

A. Mardashti[1*], N. Taleb- beydokhti[2], M. Javan[3]
1. ph D Student of Civil Engineering Dept., Engineering School, Shiraz University
2. Prof. of Civil Engineering Dept., Engineering School, Shiraz University
3. Assoc. Prof. of Water Engineering Dept., Agriculture School, Shiraz University

[*] **Zand Ave., Engineering School, Shiraz University, Shiraz**
a.mardashti @ yahoo.com

Abstract

Stepped spillways with high roughness initiate the formation of vertical turbulence with high intensity. This turbulence causes air entrainment and as a result a two phase flow is formed. Energy dissipation under this condition is one of the most important aspects of the complicated nature of stepped spillways. In this study, energy loss was determined by the method of downstream scour depth measurement. Two slope angles of 18.8 and 28 degrees with four step heights of 3,5,8 and 12 centimeters and five discharges of 6,10,15,20 and 25 liters per second were implemented (total of 40 runs). The results showed that when the above method was compared to the method of air concentration measurement, the scour depth method was simpler and more practical. The analysis also showed that a strong correlation exists between roughness Froude number and flow condition for the three different cases. This is an indication of the significance of this dimensionless number in stepped spillway studies. Finally the method used in this study for residual energy measurements under a wide range of flow condition, yielded a new empirical formula. Roughness Froude number, number of steps and slope of the spillway are the main parameters of this formula.

Keywords: Energy Loss, Two Phase Flow, Stepped Spillway, Scour Depth.