ABSTRACTS

Mathematical Modeling of a Hierarchical Hub Routing Problem and Using the Benders Decomposition and Artificial Bee Colony Algorithms to Solve it

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The hierarchical hub routing network consists of 3 levels (customer, the non-central and central hubs), which aims to find the optimum location of the central and non-central hubs, allocation of customers to established hubs to find the optimal path between customers and non-central hubs. Among the functions of this model are for post, banks, and sending and receiving services. In this study, a MIP mathematical model is proposed. The hierarchical hub routing is based on the traveling salesman problem. So it is an NP-hard problem too, and to solve this model in the medium and large sizes, Benders' decomposition and artificial bee colony algorithms are proposed respectively. The proposed artificial bee colony algorithms has some changes while it has been developed for continuous type problems. Results showed good performance of Benders decomposition and artificial bee colony in order to solve the model in medium and large sizes. Also the numerical examples and sensitivity analysis confirms validity of the proposed mathematical model.

Keywords: Artificial bee colony, Benders' decomposition, Hierarchical hub, Hub location, Routing.

The Design of Dynamic Model to Predict Money Demand in Tehran City in Automated Teller Machines (ATMs) (Case Study: Shahr Bank)

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ATMs are one of the most important cash distribution channels for banks. In this paper, asset and liability management model is investigated according to the ATMs failure times and ATMs failure to provide services by s, S policy. This paper seeks to provide a continuous review dynamic model for predicting demand with demands of money withdraw in a discrete way, in order to minimize the total costs of dormant money and lost opportunity for Shahr bank ATMs. The number of ATMs surveyed is 272 in Tehran city, and the second 6-month period in 1394 is intended to assess the machines behavior. Arena software is used to simulate the ATMs behavior. Results showed that this model is capable to provide money re-order point and money demand point up to desired size for bank ATMs. Accordingly, the optimal time and amount of money placement in ATMs and the minimum cost of the whole money putting process including optimization costs of the dormant money and lost opportunity are presented. With implementation of this model, in total, money placement costs of Shahr Bank ATMs in Tehran city has decreased by about 10 times.

Keywords: Demand prediction, Dynamic model, Shahr bank, Tehran city ATMs.

A Novel Approach to Analyze Quality Cost Using Hybrid Bayesian Networks

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Cost of quality (COQ) is an essential element of total quality management (TQM) system. It generally consists of conformance (preventing poor quality), and non-conformance (failure of product and service) costs. The accurate assessment and analysis of such costs can improve managing the quality of products and services significantly. The prevention–appraisal–failure (PAF) model is one of the most widely used models for analyzing and classifying the cost of quality. This approach identifies the different parameters affecting on COQ, which is generally affected by many parameters. However, the PAF model doesn't take into account the uncertainty (risk) involved in these parameters. Moreover, the casual relationships among these parameters and also environmental and qualitative factors, are not properly addressed. This paper aims to offer a probabilistic model to assess COQ by mapping the PAF model to Bayesian networks (BNs). BNs provide a framework for presenting inherent uncertainties, formal use of experts' judgments and probabilistic inference among a variables set. In this approach, first a qualitative model is developed to prioritize PAF groups. Then, in the group with highest priority (i.e. prevention) a quantitative model is presented. The model captures the affecting parameters in more details and provides a probabilistic analysis for qualitative and quantitative factors. The capabilities of the proposed approach are explained using data collected in a chemical products manufacturing company as a case study.

Designing Medicine Fuzzy Expert System for Diagnosis of Motor System Problems
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The purpose of expert systems is to expose the skills of experts to non-specialist people. Late diagnosis of motor system problems can lead to the problems for other parts. Hence, designing a system equipped with the knowledge of the expert who is able to diagnose and treat the diseases appropriately, can provide the patients timely treatment. In this paper, fuzzy expert system for diagnosis and management of motor system problems in wrist, elbow and shoulder have been designed using MATLAB software, and 15 experts knowledge acquisition for diseases diagnosis and treatment, which are the outputs of the Delphi-fuzzy and Delphi methods for diagnosis and treatment, respectively, are stored in the knowledge base of the system as the fuzzy rules. System results show that 86.7 percent of systemic diagnoses are similar to expert diagnosis. The proposed expert system can be used as a scientific source by students.

A Robust Optimization Model of Facility Location-reliable Network Design in Competitive Environment under Uncertainty
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In this article, it is proposed a mixed integer bi-criterion linear programming model for network design facility locations under uncertainty. This model takes into consideration the possibility of competition and interruption in servicing availability. The objective functions are of cost minimization and facility attraction maximization. Given the facts that customers' demands as well as transportation expenses are uncertain, it has been employed robust type modeling of the problem, taking scenario approach into consideration. On the other hand, in order

to consider the facility location in the competitive environment, the attractiveness function is used. In order to show the application of the proposed model, a real case study discussing the facility location design and facility implementation for a new CT-Scan system in Yazd province was studied. Results indicate that Yazd province has a capacity for three CT-Scans that can be positioned in the towns of Yazd, Meybod and Sadoogh. Finally, a sensitivity analysis is done to provide an insight into the behavior of the proposed model in response to key parameters changes of the problem. Additionally, to help the decision-makers in determining suitable solution, a tradeoff between solution robustness and model robustness for various values of parameter, is performed.

A New Intuitionistic Fuzzy Goal Programming Approach to Develop a New Product

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The intuitive fuzzy set theory has attracted many researchers of various fields. Intuitive fuzzy set is a generalization of fuzzy set which offers a new way to express uncertainty by determining the membership and non-membership degree. The intuitive fuzzy set in an ideal planning model in the new product development process, is combined in this study. In this model, considering the threshold values for each ideal by intuitive fuzzy numbers, the allocations for each supplier and the appropriate assembly process in a new product development process at the same time were determined. Besides, the importance of targets including linguistic expressions is determined. Finally, a numerical example explains the fuzzy sets use in a goal programming intuitive model.

Cooperative Advertising and Pricing in a Competitive Market with Customers' Excitations Effects

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This paper tries to determine the price, cost, local and optimization rate of national advertising in a supply chain with one manufacturer and two retailers. Two methods are assumed for advertising. The first one considers the situation, in which retailers do not advertise cooperatively; whereas in the second one, they have cooperative advertising. A model which is presented in this paper, is based on markets noise effects and disarray. So, after solving, optimal value for decision variables and optimal profit for chain members are gained. Game theory is used for solving this model, in which the retailers are followers and the manufacturer is leader. In the first method, we used Nash equilibrium because of the completion between the retailers. Yet in the second method the variables are the same because of the cooperation between them. At the end, a numerical example of sensitivity analysis is measured for the variable, and the reports are explained. One of the main results is that the competition between retailers, influences the manufacturer benefit. So that by increasing

the competition between retailers, the manufacturer profit decreases.

Lot-Sizing and Scheduling on Parallel Machine due to Earliness and Tardiness Cost

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In this research, lot-sizing and scheduling problem on parallel machines has been studied. Holding inventory and backlog cost has been considered as an earliness-tardiness penalties. A mixed integer programming formulation has been proposed based on TSP. Number of product batch is calculated as a parameter before solving the model. The computational result demonstrated that the MIP uses large CPU time to get result due to the problem complexity. So in the next step, problem has been modeled by constraint programming method that reduces solving time significantly. So that for an instance with 2 hours CPU solving time in MIP, the CP method reduces solving time to 2 minutes. To complete the solving process, a heuristic algorithm is proposed to assign orders to products. A case-study in steel-mill industry shows the efficiency of designed system rather than the existing system. Experimental results show that the proposed system have planned the orders less than 10 minutes solving time for different instances; while this is 1 to 2 hours for the existing system.