ABSTRACTS

Sequential and Dynamic Decisions on Sales Price and Accepting the Customer's Demand by Markov Decision Process
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In this article, decisions about price and stock allocation for a seller with multiple customer classes are analyzed. With each customer arrival, the seller needs to decide about accepting or rejecting the customer's demand by considering the stock on hand. In the case of acceptance, one needs to decide about the selling price. After any change in the inventory level, decision about continuing or stopping the production is needed. The seller faces a sequential and dynamic decision making problem, which is modeled by the Markov decision process and the optimal policy is determined. Finally, the impact of optimal policy on the seller's profit is investigated by a numerical analysis.

Keywords: Markov decision process, Multiple customer classes, Sequential decisions, Stock allocation.

Phase II Nonparametric Profile Monitoring and Decision Making on Process Quality via a Mixed Model
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In many statistical process control applications, the quality of a process is characterized by a profile. A profile is a function in terms of one or more explanatory variables. In profile monitoring, one is interested to monitor the performance of a process or product using this functional relationship. Control charts for monitoring nonparametric profiles are useful when the relationship is too complex to be described parametrically. Most of the existing control charts in the literature are suitable for monitoring parametric profiles. This article focuses on nonparametric profile monitoring when within-profile autocorrelation is present. Our proposed phase II control chart considers mixed-effect model and uses the framework of a general smoothing spline analysis of variance (SS-ANOVA) along with Hoteling T^2 control scheme. The proposed method is especially suitable for categorical data. Numerical results show that the proposed method is capable of detecting profile shifts and identifying the exact location of problematic segments.

Keywords: Nonparametric mixed-effect model, Phase II, Phrases, Profile monitoring, Smoothing spline, Statistical process control.

Joint Optimization of Multiple Products Positioning and Pricing
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This paper addresses a new product positioning problem, in which prices of the products are simultaneously determined in order to maximize both customer satisfaction and seller's net profit. In this regard, customer willingness is identified with respect to the products within a family, upon which prices of the products are optimized so as to attain two objective functions: 1) maximizing customer satisfaction and 2) maximizing seller's net profit. Despite of the literature body which has taken this problem into account for a single product, the developed model in this paper considers the case of a multiple products for different customer segments.

To do so, an algorithm is developed which the considered problem is divided into a number of sub-problems solved by using GAMS and Matlab. Finally, a numerical example is illustrated.

A Two-objective Robust Optimization Model for Project Risks Response Selection and Explanation Solution Method
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Risk management is one of the most important aspects of project management that identifies, assesses and responds to project risks. Although many papers have been published in project risk response, presented tools and methods are poor. Hence, in this paper, we present an optimization model to respond project risk that seeks to optimize two key criteria of project: cost and time. The proposed model has two objectives that one of them is minimization of the total cost that include abatement action cost and the cost of risk loss on project, and the other one is minimization of the time loss of risk (i.e., maximization robust measure) according to a free float activity's measure. The model tries to choose abatement actions of risk that loss of them on time activity is greater than free float activity. Subsequently, three solution methods (i.e., exact, heuristic and meta-heuristic) are proposed. Then we create ten sample projects in three categories (i.e., small, medium and large scale) and solve the problems with the proposed methods and compare the results.

A Robust Fuzzy-Probabilistic Programming Model for a Reliable Supply Chain Network Design Problem
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Supply chain network design decisions are among the strategic decisions of supply chain management which play significant role on the efficient performance of the supply chain. However, there are two challenging factors which may have great impact on the supply chain performance. These factors are on the one hand disruptions and their attendant damages and on the other hand uncertain nature of business-as-usual parameters. Therefore, the supply chain being designed should be reliable against disruptions as well as should be robust under business-as-usual uncertainty. This paper proposes a new robust fuzzy-probabilistic programming model for designing a reliable multi-period supply chain network which can cope with the two challenging factors, simultaneously. At first, in order to design a reliable model, by taking into account two types of facilities, that are fail able and non-fail able against probabilistic disruptions, a hard worst case approach is employed. Then to deal with business-as-usual uncertainty a robust fuzzy programming is developed. Flexible constraints of customers and determining the optimum level of satisfying these constraints is also considered in the model. Furthermore, to incorporate the concept of reliability in the problem and to cover the important features of real life supply chains, uncertain partial disruption and constraints of expected delivery time of customers are taken into account in the model. Finally, an industrial case study related to a manufacturer engaged in the healthcare system of Iran is applied to demonstrate the effectiveness and the applicability of the developed model.

Modification of Classic Linear Assignment Method Including the Impact of the Distance between the Performances of Alternatives for Alternatives Evaluation and Ranking

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Abstract: This paper introduces a new method for incorporating the performance of alternatives into their ultimate ranking in a linear assignment method. This method is one of multi-criteria decision-making methods, in which the weight of criteria is incorporated in ranking the alternatives, and the distance between the performances of alternatives do not affect in ranking the alternatives. In order to modify the linear assignment method with the aim of incorporating the distance between the performances of the alternatives, some intervals are defined first, and each alternative is primarily ranked based on the interval that belongs to. In the ultimate ranking of the alternatives, the interval to which each alternative belongs to will be considered as the ranking criterion. Hence, not only the weight of the criteria, but also the distances between the performances of the alternatives has affected the ranking. The results of the modified method are compared to the TOPSIS method, as one of the most popular multi-criteria decision-making methods, and the outcome shows a better consistency between the modified model and TOPSIS.

A Decision-Making Model based on Mathematical Programming for Designing the Health Care Network of Tehran in Monopoly Conditions

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By having a comprehensive look at the existent hospitals and health care centers of the country, it can be understood that some basic principles were not considered in a large number of the mentioned health care centers. These neglected principles involve appropriate site selection and hospital accessibility. Therefore, undesirable patient service occurs that consequently leads to change the architecture of the hospitals. If a few facilities are utilized or if they are not located well this can lead to increase in mortality (death) and morbidity (disease). Therefore, this study aims on presenting a mathematical programming model to prepare the fundamentals of establishing an efficient health care network by selecting the optimal sites for building new health cares among some predefined candidate sites. The purpose of the proposed model is the maximum possible covering of the patient population, which has not been covered by the previous health care centers. Obviously this problem clarifies the necessity of establishing new health cares. The proposed model is considered and discussed in monopoly conditions. Subsequently, for validating the proposed model, a set of data related to 45 health care centers located in southern Tehran (i.e., Eslamshahr and Rey) are used and the obtained results are provided in the final section.

A Dynamic Multi-objective Rail-car Fleet Sizing Problem Solved by Non-dominated Sorting Genetic Algorithm-II

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The aim of this paper is to present an efficient method for a rail freight car fleet sizing problem. This problem is modeled mathematically as a multi-period, dynamic and multi-objective, in which the rail freight wagons are assumed to be heterogeneous. Demands for different wagons and all travel times are assumed deterministic. In order to increase the utilization of the available wagons in the network and to reduce the fleet ownership costs, assignment of empty wagons becomes important. Moreover, constraints on line capacity, vehicle capacity and vehicle formation are considered. The model includes determining the optimal number of freight wagons of various types, the optimal amount of unfulfilled demand and the optimal number of full and empty freight wagons. To find the Pareto-optimal front of the problem, a heuristic method based on the Non-dominated Sorting Genetic Algorithm-II is proposed that uses heuristic procedures to generate new solutions. The performance of the proposed algorithm is evaluated in comparison with a simulated annealing algorithm, in which the results demonstrate the good quality of solutions achieved in a reasonable computation time. To do comparisons, the parameters of test problem instances are in accordance with the current state of the Railways of Islamic republic of Iran.

Prediction of Acute Heart Attack using Logistic Regression (Case Study: A Hospital in Iran)

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Acute myocardial infarction is the most important reason of mortality in Iran. More than half of these deaths occur without the patient even reaching to a hospital. There is the evidence that patients with better knowledge of the symptoms of MI will seek help earlier. The purpose of this study is to determine how well a predictive model will perform based solely upon patient-reportable clinical history factors, without using diagnostic tests or physical exam findings. We use 28 patient-reportable history factors that are included as potential covariates in our models. Using a derivation data set of 663 patients, we build three logistic regression models and one decision tree model to estimate the likelihood of acute coronary syndrome based upon patient-reportable clinical history factors only. The best performing logistic regression model have a C-index of 0.955 and with an accuracy of 94.9%. The variables, severe chest pain, back pain, cold sweats, shortness of breath, nausea and vomiting is selected as the main features. A decision tree model has a C-index of 0.938. The variables, shortness of breath, palpitations, edema, sweats, left chest pain, age, severe chest pain and nausea are selected as the main features. This model can have important utility in the applications outside of a hospital setting when objective diagnostic test information is not yet available. Given the very high mortality from MI in the Iran, even a small reduction in median time from onset of symptoms to treatment can translate into a substantial number of lives saved.

Optimizing Wholesale and Retail Prices, Quality and Marketing Improvement Efforts in a Closed-Loop Supply Chain Using a Game Theory

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This paper develops a closed-loop supply chain including one manufacturer, one retailer and a third party, in which the manufacturer produces a product under appropriate quality and sells it through a retailer in the market. The retailer pays the expense of marketing effort and a third party collects the used products from consumers and sends to the manufacturer. The manufacturer remanufactures the recived second hand products such that the quality of the remanufactured items bacome as same as the new ones. We use two different Stackelberg games, and the decision vraibles of the model are the quality level, marketting expenditure, whole sale and retail prices. After investigating the concavity of the profit functions, the optimal closed-form solutions for all decision varaibales are derived. Subsequently, to show the applicability of the proposed models, a numerical example is presented and a sensitivity anslysis is then conducted to investigate the effects of key parameters on the values of decision variables.

Introducing an Applicable Technique for Ranking and Selecting Project Portfolio, based on Qualitative Risk Assessment

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Projects execution is an important way to implement organizational strategies, especially in the project-based organizations. In such organizations, the decision-makers usually encounter a problem of the project portfolio selection. Of course, regarding the decision-makers' risk attitude, they tend to direct organizational resources toward projects with low threats and high opportunities. This paper introduces a new technique for ranking projects and selecting a project portfolio, taking into account the decision-makers' risk attitudes. In this technique, for application easiness, experts' judgments are received as qualitative estimations. Besides, the proposed technique includes a special way to calculate the total risk level so that it avoids the computational issues of the traditional methods. At the end of this paper, an application of the proposed technique in a real case extracted from steel structure industry is analyzed.

Location and Allocation of a Distribution System Considering Disruption in Mobile Warehouses and Backup Facilities

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In this paper, a facility location problem of distribution systems, as one of the important and strategic issues in supply chain management, has been studied in a three-level supply chain under a stochastic condition. For this purpose, a two-stage mathematic model has been proposed for the location-allocation problem of distribution systems with regard to backup facilities for disrupting warehouse storage facilities in the three-level supply chain that minimizes the sum of the costs. In the first stage, locating the mobile warehouse of distribution systems and transferring the products between manufactures and mobile warehouses have been decided and in the second stage, meeting customer demands with regard to disrupting mobile warehouses and backup facilities have been also decided. In addition, disruption in warehouses is considered as different scenarios for overcoming computational time in large dimensions. Moreover, a Lagrangian relaxation solution framework to reduce solution time is used. Finally, numerical examples are solved with GAMS software and then the objective function of the problem is compared with the objective function of a Lagrangian relaxation solution to show the effectiveness of the proposed model.

Keywords: Backup facilities, Location-allocation of distribution systems, Mobile warehouse, Scenario-based stochastic programming.