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Abstract

This paper investigates a competitive location problem with reliability. The reliability is the probability of out of service facilities for customers who cannot be served because of natural causes or human reasons. In this case, for each customer, there are several levels of allocations. If a facility fails to serve a customer, the customer will be served by the facility at the next allocation level. The two firms determine their optimal location, respectively. The problem is modeled based on a Stackelberg game, in which the leader's and follower's facility locations are determined respectively. The follower chooses the location of his choice according to the leader choice. The object of each competitor is maximizing the profit. Demographic parameters are considered as effective factors in choosing the location for leaders and followers, which means that the candidate location with more positive demographic factors is a better choice for facility establishment. The behavior of customers in choosing any of the facilities is affected by the quality and distance parameters which are considered in the model. According to gravity huff model, when the distance between costumers and candidate location is shorter and the quality factor is higher, the candidate location is a better choice for establishment. To solve the small part of the problem, the full space searching method is used, in which all possible points in space of answer are investigated. The answers are compared and Pareto optimal solutions are obtained which are shown in figures. As the problem is NP-hard, NSGA-II meta-heuristics algorithm is used to solve the medium and large size of the problem. Representation of answer and crossover and mutation operator for algorithms also specified for the problem. Ultimately, the numerical problems are randomly generated and Pareto optimal solutions are identified for each problem which is shown in figures. The answers obtained from both methods for small size problem are also compared.

Key Words: Competitive location problem, stackelberg game, reliability, NSGAII algorithm.

smallest extreme value distribution has been done to effectively remove the cascade property in the discussed process. Subsequently, the performance of the proposed control schemes has been examined and investigated in terms of average run length (ARL) criterion under various censoring levels of low, medium and high (20%, 50% and 80%). Finally, the performance of the superior (the cumulative sum) control chart has been investigated in a real case study in Taktab Zarif company located in Kashan, Iran. The quality variable of interest is actually the tensile strength of thread which is affected by the proportion (weight) of raw materials. Moreover, the values corresponding to tensile strength of threads are recorded just in case that they are beyond the specified level. In other words, we encounter some data which are left-censored and thus remedial action should be considered to alleviate the mentioned obstacle for optimal multistage process monitoring.

Key Words: Survival analysis regression model, left censoring, conditional expected value, multistage process, likelihood function.

SIMULTANEOUS SELECTION OF SUPPLIERS AND DETERMINING INVENTORY POLICY OF MULTI-PRODUCT UNCERTAIN SUPPLY CHAINS WITH SIMULATION-BASED OPTIMIZATION APPROACH

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Abstract

Increasing business competitiveness forced companies to improve their business. Therefore, industry managers have found that it is necessary to focus on the supply of products in according to the wishes of the customer the quality and the cost of their intended use. We consider a three-stage supply chain involving multiple suppliers, manufacturer producing multiple type of product and a final customer. At each order, the manufacturer receives the raw material from a supplier based on optimal policy in a lot of size Q. The production process could produce additional nonconforming products, the manufacturer could be unavailable due to failures (following a general time-to failure distribution), and repair operations (following a general time-to-repair distribution) propose a control policy, which coordinates supplier selection, replenishment, production and quality inspection decisions. Upon reception, the manufacturer applies a simple lot-by-lot acceptance-sampling plan with attributes. This plan is characterized by a random sample of size n and an acceptance criterion c. Based on this inspection plan if the number of non-conforming items d found in this sample is equal to or less than c the lot will be accepted. Otherwise, the lot will be refused and returned to its original supplier and then a new order is placed. At this instant the manufacturer is not obliged to keep the same supplier. He can choose any one that offers better replenishment conditions. In this work. we aim to determine the optimal control policy for supplier selection replenishment and optimal quality control decisions that minimizes the total cost which includes inventory, backlog, inspection, replenishment and production costs. Coordinating decisions along the entire chain is critical since it requires determining carefully what to manufacture as well as what when and from whom to order. So simulation-based optimization is one of the methods for solving this problem. Numerical examples show the efficiency of the proposed method.

Key Words: Uncertain supply chain, optimal suppliers' selection quality control, simulation-based optimization.

SEQUENTIAL COMPETITIVE LOCATION WITH CONSIDERING RELIABILITY AND GRAVITY

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MODELING AND SOLVING MULTI-OBJECTIVE DUAL-RESOURCE CONSTRAINED OPEN SHOP SCHEDULING PROBLEM

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Abstract

Due to the competitiveness of the market, manufacturers have been forced to increase their activity effectiveness and efficiency. The shortening of the life cycle and the period of product supply to the market have forced manufacturers to increase the efficiency of their activities and production processes. As regards, the scheduling process and sequencing of efficient operations in manufacturing environments is one of the strategic issues for survival in the competitive market. Workshop environments such as job shop and flow shop are used in many industrial and service processes. One of the most challenging scheduling problems is the open shop scheduling one, but researches in this realm have not paid much attention to human resources. When there is no limit to the processing route of any job on shop machines, this model is referred to as an open shop. The open shop scheduling problem is a strategic issue. However, in most of available schedules in the literature, only workshop equipment, such as machines, is considered as limited resources, but in reality we are confronted with limited human and machine resources. In this study, a mixed-integer programming model is presented for the bi-objective open shop scheduling problem with limited human and machine dual resources. Small-sized problems are solved by using the exact epsilon-constraint method. According to the Np-hardness of this problem, two pareto-based meta-heuristics algorithms were used which are the Non-Dominated Sorting Genetic Algorithm (NSGAII) and Multi-objective Vibration Damping optimization (MOVDO). In order to analyze and compare the algorithms, we used four different indicators which include: The number of members of the first Pareto front, mean of ideal distance and diversity and spacing measures. Also, 30 problems in three scales (small, medium, large) have been generated. The computational results shows that the NSGAII is more functional and has better output in comparison to the other presented algorithm.

Key Words: Open shop scheduling, dual resource constrained, mixed integer linear programming model, multi objective optimization, non dominated sorting genetic algorithm, multi objective vibration damping optimization.

MONITORING LEFT-CENSORED DATA IN MULTISTAGE PROCESSES ON THE BASIS OF SURVIVAL ANALYSIS REGRESSION MODELS

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Abstract

Nowadays, most products are the results of multistage processes with cascade property. In each step of multistage processes, several variables with reliability characteristic may affect the performance. These reliability variables have some unique properties such as censoring and following the family of location-scale and log-location-scale distributions including Weibull, Log-normal and Log-logistic. The purpose of this paper is to monitor left-censored reliability data with the aid of advanced statistical process control (SPC) techniques in line with statistical modeling approaches. To this end, data modeling has been studied using survival analysis regression models. In fact, the accelerated failure time (AFT) regression model has been employed to establish the relationship between quality variables. Then, two monitoring schemes including a cumulative sum (CUSUM) and an exponentially weighted moving average (EWMA) control charts have been proposed by constructing likelihood function and conditional expected values (CEVs) respectively. It should be noted that the transformation of Weibull distribution to standard

supply chain. Furthermore, none of them considered disruption.

Current research investigates redesigning a green-resilient water supply system. Two risk mitigation strategies, namely lateral transshipment between water tanks and fortification of the pipeline are applied to face against disruption. A multi-objective mixed-integer linear programming is developed for the problem. The objectives are minimizing cost and environmental pollutant. The total cost includes the cost of establishments of new water tanks and new pipelines, cost of resizing the water tanks, cost of purchasing and installing new water pumps, cost of used electric energy by water pumps, cost of pipeline fortification. And the environmental objective is related to pollutants created by the supply chain's activities including pollutants created by using electric energy, establishments of new water tanks, new pipeline and resizing the water tanks.

The application of the proposed model is investigated in a real case study in the water supply of Shahr-e-kord. The supply chain of the case study includes suppliers (e.g., walls and the Kohrang River), pump stations, water tanks, and water distribution center. The water supply network of Shahr-e-kord has two types of disruptions. First, suppliers may disrupt due to chemical pollutant (e.g., disruption in walls) or natural disaster (e.g., disruption in the Kohrang River due to flood). The second disruption is related to pipelines failures. Results revealed that the resilient model outperformed the non-resilient model. The cost of the resilient model enjoys a slight decrease in comparison with non-resilient mode while its environmental objective is 33% better than the non-resilient one. Additionally, lateral transshipment strategy has a better performance in both cost and environmental objectives than fortification strategy.

Key Words: Green supply chain, supply chain redesign, disruption, resilience, water supply network.

MULTI-HOP CLUSTERING BASED ROUTING FOR WIRELESS SENSOR NETWORKS: A HYBRID SWARM INTELLIGENCE BASED APPROACH

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Abstract

Wireless sensor networks (WSN) comprise of a large number of low-power but low-cost small sensing nodes which distributed randomly in a specific area far from the human reach , for the purpose of surveillance, recognition and monitoring the nearby environment based on their inter communication. Each node includes units i.e. sensing, processing, transducing, location positioning and power supply. Owing to various features of sensors such as quickness, self-awareness and self-configurability, WSNs have various applications in different areas and many methods are being developed to improve their performance in an application specific way. WSNs face many challenges, including energy restrictions, security, communication reliability, design, and so on. It should be mentioned that it is hardly possible to balance all these challenges due to the conflicts they have with each other. Hitherto, researchers have done extensive studies to bridle these concerns. Sensor nodes are small and have often limited and irreplaceable sources of energy. Furthermore, they can send information at short distances. In long run operations, each node generally does the data collection singly. In this paper, a multi-objective swarm intelligence-based algorithm built on Shuffled frog-leaping and Firefly Algorithm (named MOFSA) is presented as an adaptive clustering-based multi-hop routing protocol for WSNs. MOFSA's multi-objective function regards different criteria (e.g., inter- and intra-cluster distances, residual energy of nodes, distances from the sink, overlap and load of clusters) to select appropriate cluster heads at each round. Moreover, another multi-objective function is proposed to select the forwarder nodes in the routing phase. The controllable parameters of MOFSA in both clustering and multi-hop phases can be adaptively tuned to achieve the best performance based on the network requirements according to the specific application. Simulation outcomes demonstrate average lifetime improvements of 230% compared with LEACH, 100% compared with ERA, 38% compared with SIF and 260% compared with FSFLA in different network scenarios.

Key Words: Wireless sensor networks, clustering, multi-hop routing, shuffled frog leaping algorithm, firefly algorithm.

models, for the importance measures equips them with Markov models capabilities in resolving the mentioned weaknesses. The obtained results of implementation of the extended Importance measures in Markov chain on a real world case study taken from literature, illustrates their effectiveness.

Key Words: Risk analysis, risk importance measures, fault tree, markov chain.

BAYESIAN CUSTOMER RISK MODEL BASED ON THEIR OPERATIONAL CHARACTERISTICS IN ORDER TO FORMULATE A SUCCESSFUL STRATEGY FOR KEEPING CUSTOMERS

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Abstract

Costumer information can be take an important basis in the analysis of costumer behavior. It's obvious that one of the most essential characteristics of the customer behavior is the customer risk modelling in order to the customer risk assessment. Today, it's very important to keep up stable costumers to confront with the rival market and get it. In this research, at the first we introduced introduction in order to survey prior research about risk modelling and assessment in work field. There are a lot of procedure to risk modelling because the usage of this methodology is very comprehensive whiles there is not any distinctive structure to risk assessment and modelling. In section two, we are considered descriptive variables of customer such as age, weight, usage, prehistory and occupation to analyze past behavior of customer with respect to the future behavior by definition experimental function from determinative historical data. It approach used to model customer future behavior. Then we are assessed purchase risk in order to predict the future behavior of customer. At first, according to the many characteristics that driven from the specific sample of new strongbox company customers, experimental functions generated and are compared to gather with the information that gains from the descriptive statistics and distribution diagrams on this data and then, purchase risk is evaluated experimentally. In the next section, the Bayes risk of customer is analyzed and used to classify customers according to the prior data. After it, we proposed guidance for improve the production programing and sale management decision tree technique. The approach mentioned in this research is used as a case study about the products of Kaveh strongbox company that readers can be realize the practical usage of this research as much. All data in this research that obtains from thoroughbred replier is done by expert questioner. The software that we used in this research are MINITAB and Expert Choice.

Key Words: Risk analysis, classify, bayesian model, prediction, decision tree.

RESILIENT-GREEN SUPPLY CHAIN REDESIGN TO WATER SUPPLY SYSTEM: A CASE STUDY OF SHAHR-E-KORD'S WATER SUPPLY SYSTEM

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Abstract

In recent years, due to globalization along with the increased rate of natural and man-made disasters, designing a resilient supply chain to cope against disruption is crucial. Moreover, the water supply networks encounter increasing probability of disruption by passage of time. The water supply systems have dedicated structure which studied by few papers in the context of the

Abstracts of Papers in English

RELIABILITY IMPORTANCE MEASURES IN MARKOV CHAINS

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Abstract

Reliability importance measures are significant and effective tools for analyzing systems reliability, risk and safety. These measures are traditionally defined in fault tree context, and are widely used in eminent methods such as probabilistic safety and risk assessment. Although fault tree is a well-known and powerful tool in systems risk analysis, but it has remarkable weaknesses. The most important weakness of fault tree is its inability in considering dynamic dependencies between system components that is caused by its restriction in considering the effect of time of failure of the system components. Another significant weakness is that fault tree considers system components to be unrepairable, while most of the real world systems are repairable and have repairable components and parts. The other weakness is rare-event approximation that has remarkable effect on the results obtained from fault tree. On the other hand, Markov chain is influential tool for systems risk analysis that can overcome the mentioned weaknesses. Markov models are outstanding tools for dynamic analysis of the systems operations. In fact, the effect of failure times of the system components on the whole system functioning and failure can be easily captured by using Markov models. Furthermore, failure and repair rates of the system components can both be considered in Markov models when modeling the system operation. Markov models are efficient tools for considering repairable components and has straightforward scheme for simultaneous consideration of failure and repair rates. So, extending the definitions of the importance measures in Markov chain is an important issue which is addressed in this paper. Extending a new modeling basis, i.e. Markov